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THE

ENGLISH ENCYCLOPÆDIA.

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Britannia having laid aside the Implements of War is now instructing her Sons in the Arts & Sciences.

THE

ENGLISH ENCYCLOPÆDIA:

BEING

A COLLECTION OF TREATISES,

AND

A DICTIONARY OF TERMS,

ILLUSTRATIVE OF THE

ARTS AND SCIENCES.

COMPILED FROM MODERN AUTHORS OF THE FIRST EMINENCE IN THE DIFFERENT BRANCHES OF SCIENCE.

IN TEN VOLUMES.

THE WHOLE ILLUSTRATED WITH UPWARDS OF FOUR HUNDRED COPPER-PLATES.

VOL. I.

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PREFACE.

To facilitate the labours of the induſtrious and the ingenious, to guide the hand of the diligent mechanic, and to extend the purſuits of the ſkilful artiſt, are the chief objects of Publications like this; which, as their title of Encyclopædia expreſſs, embrace, in the complete Circle of the Arts and Sciences, the true principles of ſocial life.

In proportion only as knowledge is diffuſed, and the advantages of it are clearly underſtood, the importance of ſuch a work can be juſtly eſtimated. It preſents, not ſolely a baren gratification to curioſity, but it is the ſpring of action, and the ſource of opulence: it inſtructs us to ſupply by human Art the deficiencies of Nature; it controls Fancy by Experience; and placing before our eyes a long ſeries of experiments, it enables us to reject the falſe, to adopt the true, and to improve the uſeful.

Thus in Husbandry, Theory is corrected or confirmed by Practice: inſtead of abandoning the agriculturaliſt to the dangerous ſuggeſtions of a lively imagination, he is *here* taught to enlarge his expectations, or to contract his hopes, by the ſucceſs or diſappointments of others. By turning to a ſingle article, he is not only introduced to the various inſtruments,

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which upon trial have been found beſt calculat to diminiſh his toils and advance his intereſts ; he is not dy made acquainted with their names and their conſtructio their principles and their purpoſes, but he ſees at once th effects that they have produced, and the ſpecific proportio in which they have anſwered.

He purſues the clue, and it gradually unfolds ; his ſight the accumulated treaſures of ſucceſſive ages ! he holds the productions of happier ſoils tranſplanted to his ow. He is impelled by example to revolve the means by wich they may be multiplied and improved ; his mind expandswith his enquiries ; he traces the ſource of his own wealth, an of his country's proſperity ; and he exults while he reflects, hat the increaſe of herbage augments the number of his flocks and herds, which in their turn contribute to fertilize the pſtures they graze in.

In the conduct of our work, we have indeed choſe the article of Huſbandry as the foundation of Manufactures, ſince the productions of nature are the materials for ſkill ; bu the ſame aſſiduous attention has been paid to all the Liberal and Mechanical Arts, to every Science, human or divine. Each forms a ſeparate Treatiſe ; each has been adorned with whatever uſeful information could be gleaned from ancient or from modern Literature ; and the whole, thus carefully arranged and combined, preſents to the Reader a convenient Library, replete with ready and profitable inſtruction on every ſubject.

We are not backward, indeed, to confeſs that our work has profited in ſome conſiderable degree from the labours of

our northern predeceſſors; but the Encyclopædia Britannica, excluſive of the imputation of national partiality, has been conducted on ſo wide and ſo expenſive a ſcale; has been ſwelled with ſuch a variety of unintereſting biography; with tedious geographical deſcriptions of obſcure towns and villages; with minute hiſtories of fabulous heroes and divinities; as ſufficiently to juſtify the compilation of a Dictionary of the Arts and Sciences, both leſs coſtly and leſs cumberſome, though we truſt not a whit leſs uſeful than their voluminous publication.

Neither muſt it be forgotten by our readers, that years have elapſed ſince the firſt publication of the Encyclopædia Britannica. During this period, the active genius of man has explored a great variety of new paths in the regions of Science; and of theſe it will be found that we have fully availed ourſelves, not only in the body of the work, where moſt of the recent diſcoveries and inventions are carefully noted, but alſo in our SUPPLEMENT, which, whilſt it enabled us to ſupply ſome omiſſions, and to correct ſome errors (unavoidable in ſo multifarious a work), has afforded us an opportunity of tracing the labours of the learned and ingenious up to the *preſent Time*; a motive which, we truſt, will ſufficiently account for and excuſe its extenſion *ſomewhat beyond* what we intended, or our ſubſcribers may have expected*. Nor are the Proprietors of this Work afraid to aſſert, that the Engravings which accompany it, poſſeſs a ſtriking ſuperiority, both in number and exe-

* For the accommodation of thoſe who may apprehend the TENTH volume too bulky when the *whole* of the Supplement is included in it, and who may alſo be aware of the great convenience of having *all the Plates bound together, we have ſupplied a ſuitable Title-page.*

cution, over thoſe which have been given in any ſimilar performance.

Evident indeed, as they flatter themſelves it muſt appear, that neither labour nor expence has been ſpared, to render the work in every way uſeful and acceptable, the Proprietors throw themſelves on the indulgent judgment of the Public. The merit they claim is that of having imparted the ſame knowledge to their countrymen at a far leſs price than their predeceſſors or competitors. The publication of the Work in Numbers, has rendered it acceſſible to perſons of the moſt moderate income, notwithſtanding the augmentation of price conſequent on the enormous advance on printing paper; and placed it within the reach of the Farmer, the Mechanic, and the Tradeſman. The principles of each occupation have been explained and ſimplified: and while the Artiſt plies the loom, and guides the ſhuttle, his mind may now accompany his hand; toil will be cheered by reflection; and his diligence ſtimulated, while he is made clearly to comprehend the nature and object of his exertions.

THE

ENGLISH ENCYCLOPÆDIA.

A.

A A B

A, THE firſt letter of the alphabet in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deſervedly the firſt place in the alphabet, on account of its ſimplicity, very little more being neceſſary to its pronunciation than opening the mouth.

In the Engliſh language it has three different ſounds, termed, by our grammarians, the *broad*, the *open*, and the *ſlender*. The firſt reſembles that of the German A, is found in ſeveral monoſyllables, as in *wall*, *ſalt*, &c. and is pronounced as *au* in *cauſe*. It is probable that the Saxons expreſſed only this broad ſound of the letter, as it is ſtill commonly retained in the northern diſtricts of England, and univerſally throughout Scotland; as *tauk* for *talk*, *wauk* for *walk* or *wake*. The *open* A reſembles that of the Italians in *adagio*, and is the ſame with that of *a* in *father*, *rather*, &c. The *ſlender* ſound is peculiar to the Engliſh language, reſembles the ſound of the French diphthong *ai* in *pais*, and is exemplified in *place*, *waſte*, &c. alſo in *toleration*, *juſtification*, and all words ending with *ation*.

A is very frequently uſed as an article, in which caſe it has no plural ſignification, and is uſed to denote the number *one*, as *a* houſe, *a* field, &c. When placed as an article before a vowel, it is joined with the letter *n*; as *an* iſland, *an* orator, &c. In the three following caſes, A is a prepoſition—1. When it goes before a participle, or noun derived from a participle; as, I am *a* doing this or that. 2. When uſed before local ſurnames, as Cornelius *a* Lapide, Thomas *a* Kempis, &c.—3. When it is uſed in compoſition; as, *afoot*, *aſleep*, &c.—In ſome inſtances it denotes the proportion of one thing to another; as ſo much *a* week, *a* man, *a* head, &c.

Among the Romans, A was a numeral letter, and ſignified 500; and with a daſh on the top, $\bar{A}$, 5000.

In the Julian calendar, A is the firſt of the ſeven DOMINICAL letters.

Among logicians, it denotes an univerſal affirmative propoſition; according to the verſe,

"*Aſſerat A, negat E, verum generaliter ambæ.*"

Thus, in the firſt figure, a ſyllogiſm conſiſting of three univerſal affirmative propoſitions, is ſaid to be in Bār-bā-rā; the *A* thrice repeated, denoting ſo many of the propoſitions to be univerſal, &c. See BARBARA.

A, among the Romans, was uſed in the giving of votes or ſuffrages. When a new law was propoſed, each voter had two wooden ballots put in his hand; the one marked with a capital *A*, ſignifying *antiquo*, q. d. *antiquam volo*; and the other with *V. R.* for *uti rogas*. Such as were againſt the law, caſt the firſt into the urn; as who ſhould ſay, I refuſe it, I antiquate it; or, I like the ancient law, and deſire no innovation. And in the trials of criminal cauſes, it alſo denoted abſolution: whence Cicero, *pro Milone*, calls *A*, *littera ſalutaris*, a ſaving letter. Three ballots were diſtributed to each judge, marked with the letters *A* for *abſolvo*, I acquit; *C* for *condemno*, I condemn; and *N. L.* for *non liquet*, It is not clear. From the number of each caſt into the urn, the prætor pronounced the priſoner's fate. If they were equal in number, he was abſolved.

A, in ancient inſcriptions, has a great variety of ſignifications. When double, it denotes *Auguſti*; when triple *aurum*, *argentum*, *æs*; and ſometimes its meaning can only be collected from the reſt of the inſcription. When it occurs after the word *miles* (ſoldier), it denotes him young. On the reverſe of ancient medals, it denotes them ſtruck by the city of Argos, ſometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

Its abbreviations are well known: as A. D. for *anno Domini*; A. M. *artium magiſter*, &c.

The letter a, with a line above it thus, ā, (or ſometimes āā) is uſed in medical preſcriptions for *ana*, of each.

A, put to bills of Exchange, in England ſignifies *accepted*, and in France *accepté*. It is likewiſe uſual among merchants to mark their ſets of books with the letters A, B, C, &c. inſtead of the numbers 1, 2, 3, &c.

A.A.A. The chemical abbreviation for Amalgama, or Amalgamation.

AA, the name of ſeveral rivers in France, Germany, and Switzerland.

AACH, a little town in Germany, in the circle of Suabia; E. Long. 9. 0. Lat. 47. 55.

AAHUS, a little town in Germany, in the circle of Weſtphalia; E. Long. 7. 1. N. Lat. 52. 10.

AAM, or HAAM, a liquid meaſure in common uſe among the Dutch, and containing 128 meaſures called *mingles*, each weighing nearly 36 ounces avoirdupoiſe; whence the *Aam* contains 288 Engliſh, and 148 pints, Paris meaſure.

AAR, the name of two rivers, one in Switzerland, and another in Weſtphalia in Germany. It is alſo the name of a ſmall iſland in the Baltic.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their eccleſiaſtical year, which begins with the month Niſan. It anſwers to the moon of July; that is, to part of our month of the ſame name, and to the beginning of Auguſt: it conſiſts of thirty days. The Jews faſt on the firſt of this month, in memory of Aaron's death; and on the ninth, becauſe on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The ſame day is alſo remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a diſtance from Jeruſalem, in order to lament the deſolation of that city. The 18th of the ſame month is alſo a faſt among the Jews; becauſe the lamp

in the ſanctuary was that night extinguiſhed, in the time of Ahaz. In the Syriac calendar, it is alſo the name of the laſt ſummer-month. The firſt day of this month they called *Suum Miriam*, the faſt of the virgin, becauſe the eaſtern Chriſtians faſted from that day to the fifteenth, which was therefore called *Fathr-Miriam*, the ceſſation of the faſt of the virgin.

ABACA, a kind of flax, or hemp, obtained from the Manillas, or Philippine Iſlands. It is of two kinds; the white, of which very fine linen is made; and the gray, which is only fit for cordage.

ABACATUAIA, in ichthyology, a barbarous name of the zeus vomer. See ZEUS.

ABACH, a market-town of Germany, in Lower Bavaria, ſeated on the Danube; E. Long. 11. 56. Lat. 48. 53.

ABACINARE, or ABBACINARE, deſcribed, in writers of the middle age, as a ſpecies of puniſhment, in which criminals were blinded, by holding a hot baſon of metal before their eyes.

ABACK, a ſea-term, the ſituation of the ſails when their ſurfaces are flatted againſt the maſts by the force of the wind. The ſails are ſaid to be *taken aback* when they are brought into this ſituation, either by a ſudden change of the wind, or by an alteration in the ſhip's courſe. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the ſea-phraſe, to give the ſhip *ſtern-way*, in order to avoid ſome danger diſcovered before her in a narrow channel, or when ſhe has advanced beyond her ſtation in the line of battle, or otherwiſe.

ABACOT, the name of an ancient cap of ſtate worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or ABACTORES, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and are therefore very properly diſtinguiſhed from *fures* or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. The Romans had their *abaci*, beds, &c. plated with gold. It is from the Greek ἄβαξ.

ABACUS, among the ancient mathematicians, ſignified a table covered with duſt, on which they drew their diagrams; the word in this ſenſe being derived from the Phœnician *abak*, duſt.

ABACUS, in architecture, ſignifies the ſuperior part or member of the capital of a column, and ſerves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. See ARCHITECTURE. The form of the abacus is not the ſame in all orders: in the Tuſcan, Doric, and Ionic, it is generally ſquare; but in the Corinthian and Compoſite, its four ſides are arched inwards, and embelliſhed in the middle with ſome ornament, as a roſe or other flower. Scammozzi uſes *abacus* for a concave moulding on the capital of the Tuſcan pedeſtal; and Palladio calls the plinth above the echinus, or boultin, in the Tuſcan and Doric orders, by the ſame name.

ABACUS is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. That chiefly uſed in Europe is made by drawing any number of parallel lines at the diſtance of two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies 1; on the 2d, 10; on the 3d, 100; on the 4th, 1000, &c. In the intermediate ſpaces, the ſame counters are eſtimated at one-half of the value of the line immediately ſuperior, viz. between the 1ſt and 2d 5; between the 2d and 3d, 50; &c. See Plate I. where the ſame number, 1783 for example, is repreſented under both diviſions by different diſpoſitions of the counters.

ABACUS is alſo uſed by modern writers for a table of numbers ready caſt up, to expedite the operations of arithmetic. In this ſenſe we have *abaci* of addition, of multiplication, and diviſion.

Chineſe ABACUS. See SWANPAN.

Abacus Pythagoricus, the common multiplication-table, ſo called from its being invented by Pythagoras.

Abacus Logiſticus, is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly oppoſite. This is alſo called a *canon of ſexageſimals*.

Abacus & Palmula, in the ancient muſic, denote the machinery, whereby the ſtrings of Polyplectra, or inſtruments of many ſtrings, were ſtruck with a plectrum made of quills.

Abacus Harmonicus, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough wherein ore is waſhed.

ABADIR, in the Roman mythology, is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence it ridiculouſly became the object of religious worſhip.

ABAFT, a ſea-term, ſignifying the hinder part of a ſhip, and uſed in oppoſition to AFORE. It is alſo uſed as a prepoſition, and ſignifies *further aft, or nearer the ſtern*; as, the barricade ſtands *abaft* the main-maſt, *i. e.* behind it, or nearer the ſtern.

ABAISSED, *abaiſſé*, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the ſhield, or when the wings are ſhut, the natural way of bearing them being extended.

ABALAK, a town of Siberia, two miles from Tobolſk; E. Long. 64. 10. N. Lat. 57. 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABANGA. See ADY.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABAPTISTON, in ſurgery, an ancient name for the perforating part of the TREPAN.

ABARA, a town in the Greater Armenia, under the dominion of the Turks; Long. 46. 25. Lat. 39. 45.

ABARANER, a town of Aſia, ſeated on the river Alingena; Long. 46. 30. Lat. 39. 50.

ABARCA, an ancient kind of ſhoe uſed in Spain for paſſing the mountains with. It was made of raw hides, and bound with cords, which ſecured the feet of travellers againſt the ſnow.

ABARTICULATION, in anatomy, a ſpecies of articulation, admitting of a manifeſt motion; called alſo Diarthroſis, and Dearticulatio, to diſtinguiſh it from that ſort of articulation which admits of a very obſcure motion, and is called Synarthroſis.

ABAS, a weight uſed in Perſia for weighing pearls. It is 1-8th leſs than the European carat.

ABASCUS, a river of Aſiatic Sarmatio.

ABASSI, or ABASSIS, a ſilver coin current in Perſia, equivalent in value to a French livre.

ABATAMENTUM, in law, is an entry to lands by interpoſition, *i. e.* when a perſon dies ſeiſed, and another who has no right enters before the heir.

To ABATE, (from the French *abbatre*, to pull down, overthrow, demoliſh, batter down, or deſtroy), a term uſed by the writers of the Engliſh common law both in an active and neutral ſenſe; as, To abate a caſtle, is to beat it down. To abate a writ, is, by ſome exception, to defeat or overthrow it. A ſtranger abateth; that is, entereth upon a houſe or land void by the death of him that laſt poſſeſſed it, before the heir takes poſſeſſion, and ſo keepeth him out: wherefore, as he

that putteth out him in poſſeſſion is ſaid to diſſeize, ſo he that ſteppeth in between the former poſſeſſor and his heir is ſaid to abate. In the neuter ſignification thus: The writ of the demandant ſhall abate; that is, ſhall be diſabled, fruſtrated, or overthrown. The appeal abateth by covin; that is, the accuſation is defeated by deceit.

ABATE, in the manege, implies the performing any downward motion properly. Thus a horſe is ſaid to abate or take down his curvets, when he puts both his hind-legs to the ground at once, and obſerves the ſame exactneſs in all the times.

ABATELEMENT, in commerce, a term uſed for a prohibition of trade to all French merchants in the ports of the Levant who will not ſtand to their bargains, or who refuſe to pay their debts. It is a ſentence of the French conſul, which muſt be taken off before they can ſue any perſon for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure ſuppoſed to have been added to coats of arms, in order to denote ſome diſhonourable demeanour or ſtain, whereby the dignity of coat-armour was rendered of leſs eſteem. See HERALDRY.

ABATEMENT, in law, the rejecting a ſuit through ſome fault either in the matter or proceeding. Among traders, the ſame with *rebate* or *diſcount*.

ABATION, an erection at Rhodes, as a fence to the trophy of Artemiſia, queen of Halicarnaſſus, Coos, &c. raiſed in memory of her victory over the Rhodians.

ABATIS, an ancient term for an officer of the ſtables.

ABATIS, in fortification, a range of large trees, laid ſide by ſide with their boughs outwards, to hinder the approaches of an enemy.

ABATOR, in law, a term applied to a perſon who enters to a houſe or lands void by the death of the laſt poſſeſſor, before the true heir.

ABAVO, in botany, a ſynonime of the ADANSONIA.

ABB, a term among clothiers, applied to the yarn of a weaver's warp. They ſay alſo *Abb wool* in the ſame ſenſe.

ABBA, in the Syriac and Chaldee languages, literally ſignifies *a father;* and figuratively, a ſuperior, reputed as a father in reſpect of age, dignity, or affection. It is more particularly uſed in the Syriac, Coptic, and Ethiopic churches, as a title given to the biſhops. The biſhops themſelves beſtow the title *Abba* more eminently on the biſhop of Alexandria; which occaſioned the people to give him the title of *Baba*, or *Papa*, that is, *Grandfather;* a title which he bore before the biſhop of Rome. It is a Jewiſh title of honour given to certain rabbins called *Tanaites;* and it is alſo particularly uſed, by ſome writers of the middle age, for the ſuperior of a monaſtery, uſually called ABBOT.

ABBE, in a monaſtic ſenſe, the ſame with ABBOT; in a modern ſenſe, the name of a deſcription of perſons in France. The term is not to be rendered in our language, as the exiſtence of the being which it denominates is poſterior to the Reformation, and no ſuch character was known among the Romaniſts till about a century and a half ago.

According to the ſtricteſt definition, they are perſons who have not yet obtained any preciſe or fixed ſettlement in church or ſtate, but moſt heartily wiſh for, and would accept of, either, juſt as it may happen. In the mean while, their privileges are many. They are admiſſible in all companies, and no degradation to the beſt, notwithſtanding they are ſometimes found in the worſt. Their dreſs is rather that of an academic, or of a profeſſed ſcholar, than of an eccleſiaſtic; and, never varying in colour, is no incumbrance on the pocket.

Theſe abbés are, in colleges, the inſtructors of youth; in private families, the tutors of young gentlemen; and many procure a decent livelihood by their literary and witty compoſitions of all kinds. They are, in ſhort, a body of men who poſſeſs univerſal talents and learning.—A diſtinguiſhing part of their character too, is their devotion to the fair ſex; whoſe favourites, in return, they have the honour of being. Hence they diligently frequent all public ſpectacles, which are thought incomplete without them; as they compoſe the moſt intelligent part of the company, and are the moſt weighty approvers or condemners of what paſſes in almoſt all places.

ABBESS, the ſuperior of an abbey or convent of nuns.—The abbeſs has the ſame rights and authority over her nuns that the abbots have over their monks. The ſex indeed does not allow her to perform the ſpiritual functions annexed to the prieſthood; but there are ſome abbeſſes who have a privilege to commiſſion a prieſt to act for them. They have even a kind of epiſcopal juriſdiction, as well as ſome abbots who are exempted from the viſitation of their dioceſans.

Martene, in his treatiſe on the rights of the church, obſerves, that ſome abbeſſes have formerly confeſſed their nuns. But he adds, that their exceſſive curioſity carried them ſuch lengths, that there aroſe a neceſſity of checking it. However, St. Baſil, in his Rule, allows the abbeſs to be preſent with the prieſt at the confeſſion of her nuns.

ABBEVILLE, a conſiderable city of France, in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts; E. Long. 2. 6. Lat. 50. 7.

ABBEY, a monaſtery, or religious houſe, governed by a ſuperior under the title of *abbot* or *abbeſs*. *Abbeys* differ from *priories*, in that the former are under the direction of an abbot, and the others of a prior: but abbot and prior (we mean a prior conventual) are much the ſame thing, differing in little but the name.

Monaſteries were at firſt nothing more than religious houſes, whither perſons retired to ſpend their time in devotion. But they ſoon degenerated, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the Reformation; and as they increaſed in riches, ſo the ſtate became poor: for the lands which theſe regulars poſſeſſed, were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave riſe to the ſtatutes againſt gifts in *mortmaine*, which prohibited donations to theſe religious houſes: and Lord Coke tells us, that ſeveral lords, at their creation, had a clauſe in their grant, that the donor might give or ſell his land to whom he would, excepting Monks and Jews.

Theſe places were wholly aboliſhed in England at the time of the Reformation; Henry VIII. having firſt appointed viſitors to inſpect into the lives of the monks and nuns, which were found in ſome places very diſorderly: upon which, the abbots, perceiving their diſſolution unavoidable, were induced to reſign their houſes to the king, who by that means became inveſted with the abbey-lands: theſe were afterwards granted to different perſons, whoſe deſcendants enjoy them at this day: they were then valued at 2,853,000l. per annum—an immenſe ſum in thoſe days!

Every abbey had at leaſt one perſon whoſe office it was to inſtruct youth; and the hiſtorians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In theſe houſes the arts of painting, architecture, and printing, were cultivated. The religious houſes were hoſpitals for the ſick and poor; affording likewiſe entertainment to travellers at a time when there were no inns. The neighbouring places were alſo greatly benefited by the fairs procured for them; and by their exemption from foreſt-laws.

ABBEYBOYLE, a town of Ireland, in the county of Roſcommon; W. Long. 8. 32. Lat. 56. 54.

ABBEYHOLM, a town in Cumberland. It ſtands on an arm of the ſea; W. Long. 2. 38. Lat. 54. 45.

ABBOT, or ABBAT, the ſuperior of a monaſtery of monks erected into an abbey or prelacy. The name *Abbot* is originally Hebrew, where it ſignifies father. The Jews call *father*, in their language, *Ab;* whence the Chaldeans and Syrians formed *Abba;* thence the Greeks Ἀββᾶς, which the Latins retained *Abbas;* and hence our *Abbot*, the French *Abbé*, &c. The name *Abbot* appears as old as the inſtitution of monks itſelf. In early days, they were ſubject to the biſhops and the ordinary paſtors; but at length there aroſe new diſtinctions between them. *Mitred* abbots were privileged to wear the mitre, and exempted from the juriſdiction of the biſhop.—Others were called *croſiered* abbots, from their bearing the croſier or paſtoral ſtaff. Others were ſtyled *œcumenical* or univerſal abbots, in imitation of the patriarch of Conſtantinople: while others were termed *cardinal* abbots, from their ſuperiority over all other abbots.—Among us, the mitred abbots were lords of parliament; and called abbots-ſovereign, and abbots-general, to diſtinguiſh them from the other abbots.

At preſent, in the Roman-catholic countries, the principal diſtinctions obſerved between abbots are thoſe of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are ſeculars, though they are obliged by their bulls to take orders when of proper age.

Anciently, the ceremony of creating an abbot conſiſted in clothing him with the habit called *cuculus*, or cowl; putting the paſtoral ſtaff into his hand, and the ſhoes called *pedales* on his feet; but at preſent, it is only a ſimple benediction, improperly called, by ſome, conſecration.

ABBOT is alſo a title given to others beſide the ſuperiors of monaſteries: thus biſhops whoſe ſees were formerly abbeys, are called abbots; as are the ſuperiors of ſome congregations of regular canons, particularly that of St. Genevieve at Paris: and among the Genoeſe, the chief magiſtrate of their republic formerly bore the title of Abbot of the people. It was likewiſe uſual, about the time of Charlemagne, for ſeveral lords to aſſume the title of *count-abbots*, *alba-comites;* and that for no other reaſon, but becauſe the ſuperintendancy of certain abbeys was committed to them.

ABBOTSBROMLEY, a town in Staffordſhire; W. Long. 1. 2. Lat. 52. 45.

ABBOTSBURY, a ſmall town in Dorſetſhire; W. Long. 1. 17. Lat. 50. 40. The abbey near this town was founded by a Norman lady, about the year 1026.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or paſſage; made by dropping ſome of the letters, or by ſubſtituting certain marks or characters in their place.—Lawyers, phyſicians, &c. uſe abundance of abbreviations; but of all people the Rabbins are the moſt remarkable for this practice, ſo that their writings are unintelligible without the Hebrew abbreviatures.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions, when granted by him, into proper form for being converted into bulls.

ABBUTALS, ſignify the buttings or boundings of land towards any point.

ABCEDARY, or ABCEDARIAN, an epithet given to compoſitions, the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay Abcedarian pſalms, lamentations, hymns, &c.

ABCOURT, a town near St. Germains, four leagues from Paris.

ABDALS, in the Eaſtern countries, a kind of Saints ſuppoſed to be inſpired to a degree of madneſs. They are often carried by exceſs of zeal to run about the ſtreets, and kill all they meet of a different religion. The Engliſh call this, *running a muk*, from the name of the inſtrument, a ſort of poniard, which they employ on thoſe deſperate occaſions. If they are killed, as it commonly happens, before they have done much miſchief, they reckon it highly meritorious; and are eſteemed, by the vulgar, martyrs for their faith.

ABDELAVI, an Egyptian plant very like a melon, except that the fruit is more oblong, and acute at the ends.

ABDEST, a Perſian word, properly ſignifying the water placed in a baſon for waſhing the hands, but uſed to imply the legal purifications practiſed by the Mahometans before they enter on their religious ceremonies.

ABDICARIA *propoſitio*, in *logic*, is uſed for a negative propoſition.

ABDICATION, the action whereby a magiſtrate, or perſon in office, renounces and gives up the ſame before the term of ſervice is expired. This word is frequently confounded with *reſignation;* but differs from it, in that abdication is done purely and ſimply, whereas reſignation is in favour of ſome third perſon. Among the Roman writers it is more particularly uſed for the act whereby a father diſcarded or diſclaimed his ſon, and expelled him the family. It is diſtinguiſhed from *exhæredatio* or *diſinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: ſo that whoever was abdicated, was alſo diſinherited; but not *vice verſa*.

ABDOMEN, in anatomy, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See ANATOMY.

ABDOMINALES, or ABDOMINAL FISHES, conſtitute the IVth Order of the *Fourth Claſs* of Animals, in the Linnæan ſyſtem. See ZOOLOGY.

ABDUCTION, in logic, a kind of argumentation, by the Greeks called *apagoge*, wherein the greater extreme is evidently contained in the medium, but the medium not ſo evidently in the leſſer extreme as not to require ſome farther medium or proof to make it appear.

ABDUCTION, in ſurgery, a ſpecies of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, or ABDUCENT, in anatomy, a name given to ſeveral of the muſcles, on account of their ſerving to withdraw, open, or pull back the parts to which they belong.

ABELARD (Peter), one of the moſt famous doctors of the twelfth century, and the lover of Heloiſe, whoſe ſtory employed the talents of the great Mr. Pope. He was born at Palais near Nantz, in Britany; and died in the priory of Marcellus at Chalons, April 21, 1142, aged ſixty-three. His corpſe was ſent to Heloiſe, who buried it in the Paraclet. He left ſeveral works: the moſt celebrated of which are thoſe tender letters that paſſed between him and Heloiſe.

ABELIANS, ABEOLITES, or ABELONIANS, in church hiſtory, a ſect of hereticks mentioned by St. Auſtin. Thoſe of this ſect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence: and, to keep up the ſect, when a man and woman entered into this ſociety, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the ſame terms.

ABELMOLUCH, a ſpecies of the *ricinus*, or *Palma Chriſti*.

ABELMOSCH, the muſk ſeed; a ſmall odoriferous ſeed uſed as a perfume. It is ſometimes brought from Egypt, but is likewiſe imported from Martinico.

ABEL-TREE, a ſpecies of poplar with large leaves. It is very ſuitable for boggy land where other trees will not thrive.

ABENAS, a town in Languedoc; E. Long. 4. 43. Lat. 44. 40.

ABENEL CAUBY, a fixed ſtar of the ſecond or third magnitude, on the ſouth ſcale of the conſtellation LIBRA.

ABENSPERG, a ſmall town in the duchy of Bavaria; E. Long. 11. 38. Lat. 48. 45.

ABERAVON, a borough town of Glamorganſhire, ſeated at the mouth of the river Avon, 194 miles weſt of London; W. Long. 3. 21. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, ſituated in the county of Angus, about 40 miles N. N. E. of Edinburgh; its W. Long. being 2. 29. and N. Lat. 56. 36.

ABERCONWAY, or CONWAY, Caernarvonſhire, a handſome town, 229 miles from London; W. Long. 3. 47. N. Lat. 53. 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Town*, ſituated on the German Ocean, in W. Long. 1. 40. and N. Lat. 57. 19.

The Old Town lies about a mile to the north of the New, at the mouth of the river Don, over which is a fine Gothic bridge, of a ſingle arch, greatly admired, which reſts at both ends on two rocks. The New Town is the capital of the ſhire of Aberdeen. For largeneſs, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or riſing ground, and lies on a ſmall bay formed by the Dee, deep enough for a ſhip of 200 tons, and above two miles in circumference. Aberdeen, including the Old Town, is ſuppoſed to contain 25,000 people. Its trade is conſiderable, but might be greatly extended by an attention to the white fiſheries. King's College, and the Mariſchal College, in the New Town, form one Univerſity, called the *Univerſity of King Charles*.

ABERFORD, a market town in the weſt riding of Yorkſhire, 181 miles north-by-weſt from London; W. Lon. 2. 45. Lat. 55. 52.

ABERGAVENNY, a populous town in Monmouthſhire, 142 miles diſtant from London; W. Long. 2. 45. Lat. 51. 50.

ABERRATION, in aſtronomy, a ſmall apparent motion of the fixed ſtars diſcovered by the late Dr. Bradley.

ABERRATION, in optics, that error or deviation of the rays of light, when inflected by a lens or ſpeculum, whereby they are hindered from meeting or uniting in the ſame point. There are two ſpecies of the aberrations of rays, diſtinguiſhed by their different cauſes; one ariſing from the figure of the glaſs or ſpeculum, the other from the unequal refrangibility of the rays of light. This laſt ſpecies is ſometimes called the Newtonian, from the name of its diſcoverer. See OPTICS.

ABERYSTWITH, a market town of Cardiganſhire, in Wales, diſtant from London 199 miles weſt ſouth-weſt; W. Long. 4. 15. Lat. 52. 30.

ABESAMON, dirt or clay.

ABESTA, the name of one of the ſacred books of the Perſian magi, which they aſcribe to their great founder Zoroaſter. The abeſta is a commentary on two other of their religious books called *Zend* and *Pazend*; the three together including the whole ſyſtem of the Ignicold or worſhippers of fire.

ABETTOR, a law-term, implying one who encourages another to ſome criminal action, or who is art and part in the performance itſelf. Treaſon is the only crime in which abettors are excluded by law, every individual concerned being conſidered as a principal. It is the ſame with *Art-and-part* in the Scots law.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea.

ABEYANCE, in law, the expectancy of an eſtate. Thus if lands be leaſed to one perſon for life, with reverſion to another for years, the remainder for years is an abeyance till the death of the leſſee.

ABGILLUS (John), ſurnamed Preſter-John, was ſon to a King of the Friſcii; and, from the auſterity of his life, obtained the name of *Preſter*, or Prieſt.

ABHEL, in Botany, a name given to the ſhrub called *Savin*.

ABIB, ſignifying an ear of corn, a name given by the Jews to the firſt month of their eccleſiaſtical year, afterwards called *Niſan*. It anſwered to the latter part of our March and beginning of April.

ABIES, the FIR-TREE. See PINUS.

ABIGEAT, an old law term, denoting the crime of ſtealing cattle by droves or herds.

ABINGDON, a market-town in Berkſhire, ſeated on a branch of the Thames. It is ſix miles and a half ſouth of Oxford, 47 eaſt of Glouceſter, and 55 weſt of London; Long. 1. 20. Lat. 51.

ABINTESTATE, in the civil law, is applied to a perſon who inherits the right of one who died inteſtate or without making a will. See INTESTATE.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the diſtrict of *Chaks* in Paraguay.

ABJURATION, in our ancient cuſtoms, implied an oath, taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the kingdom for ever. It is now uſed to ſignify the renouncing, diſclaiming, and denying upon oath, the Pretender to have any kind of right to the crown of theſe kingdoms.

ABJURATION of Hereſy, the ſolemn recantation of any doctrine as falſe and wicked.

ABLACTATION, or weaning a child from the breaſt: See WEANING.

ABLACTATION, among the ancient gardeners, the ſame with what is called *GRAFTING by approach*.

ABLAI, a country of Great Tartary, the inhabitants of which, called *Buchars* or *Buchares*, are ſubject to Ruſſia, but that only for protection. It lies eaſtward of the river Irtis, and extended five hundred leagues along the ſouthern frontiers of Siberia.

ABLAQUEATION, an old term in gardening, ſignifies the operations of removing the earth and baring the roots of trees in winter, to expoſe them more freely to the air, rain, ſnows, &c.

ABLATIVE, in grammar, the ſixth caſe of Latin nouns.

The ABLATIVE is oppoſite to the DATIVE; the firſt expreſſing the action of taking away, and the latter that of giving.

In Engliſh, French, &c. there is no preciſe mark whereby to diſtinguiſh the ablative from other caſes; and we only uſe the term in analogy to the Latin. Thus, in the two phraſes, *the magnitude of the city*, and *he ſpoke much of the city*; we ſay, that *of the city* in the firſt is *genitive*, and in the latter *ablative*; becauſe it would be ſo, if the two phraſes were expreſſed in Latin.

The queſtion concerning the Greek ablative has been the ſubject of a famous literary war between two great grammarians, Friſchlin and Cruſius; the former of whom maintained, and the latter oppoſed, the reality of it. The diſpute ſtill ſubſiſts among their reſpective followers.

ABLATIVE ABSOLUTE, in grammar, a word or phraſe detached or independent of the reſt of the diſcourſe: neither governing, nor being governed of, any other thing.

ABLECTI, in Roman antiquity, a ſelect body of ſoldiers choſen from among thoſe called EXTRAORDINARII.

ABLEGMINA, in Roman antiquity, thoſe choice parts of the entrails of victims which were offered in ſacrifice to the

gods. They were ſprinkled with flour, and burnt upon the altar; the prieſts pouring ſome wine on them.

ABLET, or ALBLEN, a name by which ſome call the common *bleak*, a ſmall freſh-water fiſh, properly a ſpecies of *Cyprinus*.

ABLUENTS, in medicine, the ſame with DILUENTS.

ABLUTION, in a religious ſenſe, a ceremony in uſe among the ancients, and ſtill practiſed in ſeveral parts of the world: it conſiſted in waſhing the body, which was always done before ſacrificing, or even entering their houſes. The Egyptian prieſts had their diurnal and nocturnal ablutions; the Grecians their ſprinklings; the Romans their luſtrations and lavations; the Jews their waſhing of hands and feet, beſide their baptiſms. The ancient Chriſtians had their ablutions before communion; which the Romiſh church ſtill retain before their maſs, ſometimes after: the Syrians, Cophts, &c. have their ſolemn waſhings on Good-Friday: the Turks their greater and leſſer ablutions; their Ghaſt and Wodou, their Aman, Taharat, &c.

ABNOBA, now ABENOW, a long range of mountains in Germany. Thoſe about the river Maine, are called the *Oden* or *Ottenwald;* between Heſſe and Franconia, the *Speſſart;* and about the duchy of Wirtemberg, where the Danube takes its riſe, the *Baar*.

ABO, a maritime town in Sweden; E. Long. 21. 28. Lat. 60. 50.

ABOARD, the inſide of a ſhip. Hence any perſon who enters a ſhip is ſaid to *go aboard*.

ABOLITION, implies the act of annulling, deſtroying, making void, or reducing to nothing. In law, it ſignifies the repealing any law or ſtatute.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp. There ſeem to have been different kinds of Abollas, fitted to different occaſions. Even kings appear to have uſed them: Caligula was affronted at king Ptolemy for appearing at the ſhews in a purple abolla, and by the eclat thereof turning the eyes of the ſpectators from the emperor upon himſelf.

ABOMASUS, ABOMASUM, or ABOMASIUS, names of the fourth ſtomach of ruminating animals. It is in the abomaſus of calves and lambs that the runnet or earning is formed wherewith milk is curdled. See COMPARATIVE *Anatomy*.

ABORIGINES, originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. Whence this people came by the appellation, is much diſputed. St. Jerom ſays, they were ſo called, as being, *abſque origine*, the primitive planters of the country after the Flood. Dion of Halicarnaſſus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them ſo called, as being originally Arcadians, who claimed to be earth-born, and not deſcended from any people. Aurelius Victor ſuggeſts another opinion, viz. that they were called *Aborigines*, q. d. *Aberrigines*, from *ab* "from," and *errare* "to wander:" as having been before, a wandering people. Pauſanias rather thinks they were thus called απο ορων, from "mountains;" which opinion ſeems confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of this people, ſays,

Is genus indocile ac diſpenſum montibus altis
Compoſuit, legeſque dedit.——

They were either the original inhabitants of the country, ſettled there by Janus, as ſome imagine; or by Saturn, or Cham, as others: not long after the diſperſion, or even, as ſome think, before it. Or they were a colony ſent from ſome other nation; who expelling the ancient inhabitants the Siculi, ſettled in their place. The term *Aborigines*, though ſo famous in antiquity, is uſed in modern geography only occaſionally as an appellative. It is given to the primitive inhabitants of a country, in contradiſtinction to colonies, or new races of people.

ABORTION, in midwifery, the excluſion of a fœtus before it has acquired a ſufficient degree of perfection, to enable it to perform reſpiration and the other vital functions. See MIDWIFERY. The practice of procuring abortions was prohibited by the ancient Greek legiſlators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viſceribus vim inferre*, was frequent enough: but whether there was any penalty on it before the emperors Severus and Antonine, is a queſtion.

The infamous practice of artificial abortion is chiefly in the hands of women and nurſes. Phyſicians, in ſome countries, are not admitted to the profeſſion without abjuring it.—Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus;* though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. It may, however, be obſerved, that often all the powers of art prove ineffectual, and no leſs often do the attempts prove the means of puniſhment by the fatal conſequences which they produce.

ABORTIVE *Corn*, a diſtemper of corn mentioned by M. Gillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity of the ſtalk, the leaves, the ear, and even the grain.

ABORTIVE Vellum, is made of the ſkin of an abortive calf.

ABOUKIR, a ſmall town of Egypt, ſituate in the deſert between Alexandria and Roſetta.

ABOUT, the ſituation of a ſhip immediately after ſhe has tacked. *About ſhip!* the order to the ſhip's crew for tacking.

ABOUTIGE, a town in Upper Egypt, near the Nile; N. Lat. 26. 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about one ſhilling.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contains letters, omitting the laſt letter of the former every time, and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhipped by the Syrians.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Alſo the name of another ſect of heretics who had adopted the errors of Paulus. See PAULICIANS.

ABRANTES, a town of Portugal; W. Long. 7. 18. Lat. 39. 13.

ABRASAX, or ABRAXAS, the ſupreme god of the Baſilidian heretics. It is a myſtical word, compoſed of the Greek numerals α, β, ρ, α, ξ, α, ς, which together make up the number CCCLXV. For Baſilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels likewiſe was created by the angel next above it; thus aſcending by a ſcale to the Supreme being, or firſt Creator.—The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

ABRASION, the effect of ſharp corroſive medicines or humours in wearing away the natural mucus which covers the ſkin. The word is compoſed of the Latin *ab* and *rado*, *to ſhave* or *ſcrape off*.

ABRAUM, in natural hiſtory, a name given by ſome writers to a ſpecies of red clay, uſed in England by the cabinet-makers, &c. to give a red colour to new mahogany wood.—We have it from the Iſle of Wight, but it is alſo found in Germany and Italy.

ABRAXAS, an antique ſtone with the word *abraxas* engraven on it. They are of various ſizes, and moſt of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as poſſible, has been deſired by ſeveral. There is a fine one in the abbey of St. Genevieve, which has occaſioned much ſpeculation. Moſt of them ſeem to have come from Egypt; whence they are of ſome uſe in explaining the antiquities of that country. Sometimes they have no other inſcription beſides the word: but others have the names of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes there is a repreſentation of Iſis ſitting on a lobes, or apis, ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalli and Ithyfalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern taſte than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetrurian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxas*.

ABREAST, a ſea term, ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. When the line is formed abreaſt, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centres of their reſpective ſquadrons.

ABRIDGEMENT, in literature, a term ſignifying the reduction of a book into a ſmaller compaſs. The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few trite thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect.—An abridger, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by Profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down *verbatim*, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all our univerſities.

ABROGATION, the act of aboliſhing a law.

Abrogation ſtands oppoſed to *rogation*: it is diſtinguiſhed from *derogation*, which implies the taking away only ſome part of a law; from *ſubrogation*, which denotes the adding a clauſe to it; from *obrogation*, which implies the limiting or reſtraining it; from *diſpenſation*, which only ſets it aſide in a particular inſtance; and from *antiquation*, which is the refuſing to paſs a law.

ABROHANI, or Mallemolli, a kind of muſlin, from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROKUS, in botany, a name uſed by ſome of the Latin writers, for the *bromus* or *avena ſterilis*, the wild oat; and by others, for the *orobus*, or bitter vetch.

ABROLKOS, the name of certain ſhelves, or banks of ſand, about 20 leagues from the coaſt of Brazil.

ABRONO, in botany, a name given by ſome authors to the heart-peaſe, which have been alſo called *abrugi*.

ABROTANUM, in botany. See Artemisia and Santolina.

ABRUS, in botany, the trivial name of the Glycine.

ABRUZZO, a province in Naples.

ABSCESS, in ſurgery; from *abſcedo*, to depart. A cavity containing pus; or, a gathering of matter in a part; ſo called, becauſe the parts which were joined are now ſeparated; one part recedes from another, to make way for the collected matter. See Surgery.

ABSCISSE, in conics, a part of the diameter or tranſverſe axis of a conic ſection intercepted between the vertex or ſome other fixed point and a ſemiordinate. See *Conic Sections*.

ABSCONSA, a dark lantern uſed by the monks at the ceremony of burying their dead.

ABSINTHIATED, any thing tinged or impregnated with abſinthium or wormwood. Bartholin mentions a woman whoſe milk was become abſinthiated, and rendered as bitter as gall, by the too liberal uſe of wormwood.

ABSINTHIUM, in botany, the trivial name of the common wormwood. See the article Artemisia.

ABSIS, in aſtronomy. See Apsis.

ABSOLUTE, in metaphyſics, is more particularly underſtood of a being or thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe; in which ſenſe, God alone is *abſolute*. *Abſolute*, in this ſenſe, is ſynonymous with *independent*, and ſtands oppoſed to *dependent*.

Absolute alſo denotes a thing's being free from conditions or limitations; in which ſenſe, the word is ſynonymous with *unconditional*.

Absolute Government, that wherein the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

Absolute Equation, in aſtronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion ariſing from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform.

Absolute Number, in algebra, is any pure number ſtanding in any equation without the conjunction of literal characters; as $2x + 36 = 48$; where 36 and 48 are abſolute numbers, but 2 is not, as being joined with the letter x.

ABSOLUTION, in civil law, is a ſentence whereby the

party accuſed is declared innocent of the crime laid to his charge.

ABSOLUTION, in the canon law, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.—The Romaniſts hold abſolution a part of the ſacrament of penance.

ABSOLUTION is chiefly uſed among Proteſtants for a ſentence whereby a perſon who ſtands excommunicated is releaſed or freed from that puniſhment.

ABSORBENT, in general, any thing poſſeſſing the faculty of *abſorbing*, or ſwallowing up another.

ABSORBENT Medicines, teſtaceous powders, as chalk, crab-eyes, &c. which are taken inwardly for drying up or abſorbing any acid in the ſtomach or inteſtines.

ABSORBENT Veſſels, a name given promiſcuouſly to the lacteal veſſels, lymphatics, and inhalant arteries. See ANATOMY.—Naturaliſts ſpeak of the like abſorbents in plants, the fibrous or hairy roots of which are as a kind of vaſa abſorbentia, which attract and imbibe the nutritious juices from the earth.

ABSORBING, the ſwallowing up, ſucking up, or imbibing any thing: thus black bodies are ſaid to abſorb the rays of light; luxuriant branches, to abſorb or waſte the nutritious juices which ſhould feed the fruit of trees, &c.

ABSORPTION, in the animal œconomy, is the power whereby the abſorbent veſſels imbibe.

ABSORPTIONS of the Earth, a term uſed by Kircher for the ſinking in of large tracts of land. Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city Tantalis in Magneſia, and after it of the mountain Sypelus, both thus abſorbed by a violent opening of the earth.

ABSORUS, APSORUS, ABSYRTIS, ABSYRTIDES, APSYRTIDES, APSYRTIS, and ABSYRTIUM; iſlands in the Adriatic, in the gulf of Carnero.

ABSTEMII, in church hiſtory, a name given to ſuch perſons as could not partake of the cup of the euchariſt on account of their natural averſion to wine.

ABSTEMIOUS, is properly underſtood of a perſon who refrains abſolutely from all uſe of wine.—The hiſtory of Mr. Wood, in the Medic. Tranſ. vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a ſtrict courſe of abſtemiouſneſs.—The Roman ladies, in the firſt ages of the republic, were all enjoined to be abſtemious; and that it might appear, by their breath, whether or not they kept up to the injunction, it was one of the laws of the Roman civility, that they ſhould kiſs their friends and relations whenever they accoſted them.

ABSTENTUS, among Civilians, an heir withheld by his tutor from an inheritance. By eccleſiaſtical writers, it is applied to a perſon excommunicated.

ABSTERGENT MEDICINES, thoſe employed for reſolving concretions, &c. ſuch as ſoap, &c.

ABSTINENCE. Among the Jews, various kinds of abſtinence were ordained by their law. Among the primitive Chriſtians, ſome denied themſelves the uſe of ſuch meats as were prohibited by that law, others looked upon this abſtinence with contempt. As preſcribed by the goſpel, it is intended to mortify and reſtrain the paſſions, to humble our vicious natures; and by that means raiſe our minds to a due ſenſe of devotion. But there is another ſort of abſtinence, which may be called *ritual*, and conſiſts in abſtaining from particular meats at certain times and ſeaſons. In England, abſtinence from fleſh has been enjoined by ſtatute even ſince the Reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *faſh-days*. The like injunctions were renewed under Q. Elizabeth: but at the ſame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats; but in favour of the conſumption of fiſh, and to multiply the number of fiſhermen and mariners, as well as ſpare the ſtock of ſheep.

ABSTINENCE is more particularly uſed for a uſe of food below the ordinary ſtandard of nature. Phyſicians relate wonders of the effects of abſtinence in the cure of many diſorders, and protracting the term of life. The noble Venetian, Cornaro, after all imaginable means had proved vain, ſo that his life was deſpaired of at 40, recovered, and lived to near 100, by mere dint of abſtinence. Abſtinence, however, is to be recommended only as it means a proper regimen; for in general it muſt have bad conſequences when obſerved without a due regard to conſtitution, age, ſtrength, &c. Among the brute creation, we ſee extraordinary inſtances of long abſtinence. The ſerpent-kind, in particular, bear abſtinence to a wonderful degree. We have ſeen rattleſnakes that had ſubſiſted many months without any food, yet ſtill retained their vigour and fierceneſs. Dr. Shaw ſpeaks of a couple of ceraſtes (a ſort of Egyptian ſerpents), which had been kept five years in a bottle cloſe corked, without any ſort of food, unleſs a ſmall quantity of ſand wherein they coiled themſelves up in the bottom of the veſſel may be reckoned as ſuch: yet when he ſaw them, they had newly caſt their ſkins, and were as briſk and lively as if juſt taken. But it is even natural for divers ſpecies to paſs four, five, or ſix months every year, without either eating or drinking. And theſe animals are found as fat and fleſhy after ſome months abſtinence as before.—Sir G. Ent weighed a tortoiſe ſeveral years ſucceſſively, at its going to earth in October, and coming out again in March; and found that, of four pounds four ounces, it only uſed to loſe about one ounce.—Indeed, we have inſtances of men paſſing ſeveral months as ſtrictly abſtinent as other creatures.

ABSTINENTS, or ABSTINENTES, a ſet of heretics that oppoſed marriage, condemned the uſe of fleſh meat, and placed the Holy Ghoſt in the claſs of created beings.

ABSTRACT, *Idea*, in metaphyſics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aſide or abſtracting from the reſt. See ABSTRACTION.

ABSTRACT Terms, words that are uſed to expreſs abſtract ideas. Thus beauty, uglineſs, &c. are abſtract terms.

ABSTRACT Numbers, are aſſemblages of units, conſidered in themſelves without denoting any determined particulars. Thus 6 is an abſtract number, when not applied to any thing; but, if we ſay 6 feet, 6 becomes a concrete number. See the article NUMBER.

ABSTRACT Mathematics, otherwiſe called *Pure Mathematics*, is that which treats of magnitude or quantity, abſolutely and generally conſidered, without reſtriction to any ſpecies of particular magnitude; ſuch are Arithmetic and Geometry.

ABSTRACT, in literature, a compendious view of any large work; ſhorter and more ſuperficial than an abridgment.

ABSTRACTI, a name given to a ſect among the Lutherans.

ABSTRACTION, in metaphyſics, is chiefly employed theſe three ways. Firſt, When the mind conſiders any one part of a thing, in ſome reſpect diſtinct from the whole; as a man's arm, without the conſideration of the reſt of the body. Secondly, When we conſider the *mode* of any ſubſtance, omitting the ſubſtance itſelf; or when we ſeparately conſider ſeveral modes which ſubſiſt together in one ſubject. This abſtraction the geometricians make uſe of when they conſider the length of a body ſeparately, which they call *a line*, omitting the conſideration of its breadth and thickneſs.

Thirdly, It is by abſtraction that the mind forms general or univerſal ideas; omitting the modes and relations of the particular objects whence they are formed. Thus, when we would underſtand a thinking being in general, we gather from our ſelf-conſciouſneſs what it is to think; and omitting thoſe things which have a particular relation to our own minds, or to the human mind, conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abſtract ideas*, become general repreſentatives of all objects of the ſame kind; and their names applicable to whatever exiſts conformable to ſuch ideas. Thus the idea of colour that we receive from chalk, ſnow, milk, &c. is a repreſentative of all of that kind; and has a name given it, *whiteneſs*, which ſignifies the ſame quality wherever found or imagined.

ABSYRTUS, in the Heathen mythology, the ſon of Æta and Hypſea, and the brother of Medea.

ABTHANES, a title of honour uſed by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon ſignifies *king's miniſters*; and of theſe the higher rank were ſtyled *abthanes*, and thoſe of the lower *under thanes*.

ABUCCO, Abocco, or Abocchi, a weight uſed in the kingdom of Pegu.

ABUKESO, in commerce, the ſame with Aslan.

ABUNA, the title given to the archbiſhop or metropolitan of Abyſſinia.

ABUNDANT number, in arithmetic, is a number, the ſum of whoſe aliquot parts is greater than the number itſelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppoſed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whoſe aliquot parts are, 1, 2, and 7, which make no more than 10: and to a *perfect* number, or one to which its aliquot parts are equal; as 6, whoſe aliquot parts are 1, 2, and 3.

ABUNDANTIA, a Heathen divinity, repreſented in ancient monuments under the figure of a woman with a pleaſing aſpect, crowned with garlands of flowers, pouring all ſorts of fruit out of a horn which ſhe holds in her right hand, and ſcattering grain with her left, taken promiſcuouſly from a ſheaf of corn. On a medal of Trajan, ſhe is repreſented with two cornucopiæ.

ABUSE, in grammar, to apply a word *abuſively*, or in an *abuſive* ſenſe, is to pervert its meaning.—A permutation of benefices, without the conſent of the biſhop, is termed *abuſive*, and conſequently null.

ABUTILON, in botany, the trivial name of ſeveral ſpecies of the ſida. See Sida.

ABUTTALS, among lawyers, the buttings or boundings of a piece of land. In Coke, the plaintiff is ſaid to "fail in his *abuttals*," i. e. in ſhewing how the land is bounded.

ABYLA, one of Hercules's pillars on the African ſide, called by the Spaniards *Sierra de las Monas*, over againſt Calpe in Spain, the other pillar.

ABYSS, denotes a deep maſs or fund of waters. In this ſenſe, the word is particularly uſed, in the Septuagint.

It is alſo uſed for an immenſe cavern in the earth, wherein God is ſuppoſed to have collected all thoſe waters on the third day; which, in our verſion, is rendered the *ſeas*, and elſewhere the *great deep*. Dr. Woodward, in his Natural Hiſtory of the Earth, aſſerts, That there is a mighty collection of waters incloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtrial ſtrata to be expanded. This, according to him, is what Moſes calls *the great deep*, and what moſt authors render *the great abyſs*.

The exiſtence of an abyſs, or receptacle of ſubterraneous waters, is controverted by Camerarius; and defended by Dr. Woodward chiefly by two arguments: the firſt drawn from the vaſt quantity of water which covered the earth in the time of the deluge; the ſecond, from the conſideration of earthquakes, which he endeavours to ſhow are occaſioned by the violence of the waters. To this abyſs has been attributed the origin of ſprings and rivers; the level maintained in the ſurfaces of different ſeas; and their not overflowing their banks. To the effluvia emitted from it, ſome even attribute all the diverſities of weather and change in our atmoſphere.

After all, however, this amazing theory of a central abyſs is far from being demonſtrated: it will perhaps in ſeveral reſpects appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it ſeems abſurd to ſuppoſe, that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell.

Abyss is alſo uſed to denote hell; in which ſenſe the word is ſynonimous with what is otherwiſe called *Barathrum*, *Erebus*, and *Tartarus*.

Abyss is more particularly uſed in antiquity, to denote the temple of Proſerpine. It was thus called on account of the immenſe riches depoſited there.

Abyss is alſo uſed in heraldry. A thing is ſaid to be bore in abyſs, *en abyſme*, when placed in the middle of the ſhield, clear from any other bearing.

ABYSSINIA, by ſome called *Higher Ethiopia*, and by the Arabians *Al Habaſh*, is bounded on the north by Nubia; on the eaſt, by the Arabic Gulph or Red Sea, and the kingdom of Adel; on the ſouth, by the kingdoms of Ajan, Alabo, and Gingiro; and on the weſt, by the kingdom of Goram, and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its ſource in this country; and the moſt conſiderable lake that of Dambea, which diſcharges itſelf into the Nile, is about 700 miles in length, and 90 in breadth. Mr. Bruce has given an entertaining account of this country, and the cuſtoms of its inhabitants. Among many other wonderful particulars, he aſſerts, "that the Abyſſinians cut *ſlices* from the *living* ox, eſteeming it one of their greateſt delicacies."

ABYSSINIAN, in eccleſiaſtical hiſtory, is uſed as the name of a ſect, or hereſy, in the Chriſtian church, eſtabliſhed in the empire of Abyſſinia. The Abyſſinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jeſus Chriſt, and rejecting the council of Chalcedon: whence they are alſo called Eutychians, and ſtand oppoſed to the Melchites. The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and Superſtition. They practiſe circumciſion; and are ſaid to extend the practice to the females as well as males: They obſerve both Saturday and Sunday ſabbaths: they eat no meats prohibited by the law of Moſes: women are obliged to the legal purifications: and brothers marry their brothers wives, &c. On the other hand, they celebrate the epiphany with peculiar feſtivity, in memory of Chriſt's baptiſm; when they plunge and ſport in ponds and rivers; which has occaſioned ſome to affirm that they were baptized anew every year. Among the ſaints-days is one conſecrated to Pilate and his wife; by reaſon Pilate waſhed his hands before he pronounced ſentence on Chriſt, and his wife deſired him to have nothing to do with the blood of that juſt perſon. They have

four lents: the great one commences ten days earlier than ours, and is obſerved with much ſeverity, many abſtaining therein even from fiſh, becauſe St. Paul ſays there is one kind of fleſh of men, and another of fiſhes. They allow of divorce, which is eaſily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itſelf. They have at leaſt as many miracles and legends of ſaints as the Romiſh church. They pray for the dead, and invoke ſaints and angels; have ſo great a veneration for the Virgin, that they charged the Jeſuits with not rendering her honour enough. Images in painting they venerate; but abhor all thoſe in relievo, except the Croſs. They hold that the ſoul of man is not created; becauſe, ſay they, God finiſhed all his work on the ſixth day. They admit the apocryphal books, and the canons of the apoſtles, as well as the apoſtolical conſtitutions, for genuine. Their liturgy is given by Alvarez, and in Engliſh by Pagit.

ACA, ACE, or ACON, a town of Phœnicia, on the Mediterranean; afterwards called *Ptolemais;* now *Acre*. See ACRE.

ACACALOTL, the Braſilian name of a bird called by ſome *corvus aquaticus*, or the water raven; properly, the pelicanus carbo, or corvorant. See PELICANUS.

ACACIA, EGYPTIAN THORN, or BINDING BEANTREE, in botany, a ſpecies of Mimoſa, according to Linnæus; though other botaniſts make it a diſtinct genus. See MIMOSA. The flowers of a ſpecies of the acacia are uſed by the Chineſe in making that yellow which we ſee bears waſhing in their ſilks and ſtuffs, and appears with ſo much elegance in their painting on paper. They gather the flowers before they are fully open; theſe they put into a clean earthen veſſel over a gentle heat, and ſtir them continually about, as they do the tea leaves, till they become dryiſh and of a yellow colour; then to half a pound of the flowers they add three ſpoonfuls of fair water, and after that a little more, till there is juſt enough to hold the flowers incorporated together: they boil this for ſome time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and ſtrain it through a piece of coarſe ſilk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyſter-ſhells reduced to a fine powder. All is then well mixed together; and this is the fine laſting yellow they have ſo long uſed. The dyers of large pieces uſe the flowers and ſeeds of the acacia for dyeing three different ſorts of yellow. By different admixtures of theſe, they give the different ſhades of colour; only for the deepeſt of all they give a ſmall mixture of Brazil wood.

Falſe ACACIA. See ROBINIA.

Three-thorned ACACIA, or *Honey-locuſt*. See GLEDISTIA.

ACACIA, in the materia medica, the inſpiſſated juice of the unripe fruit of the MIMOSA *Nilotica*. This juice is brought to us from Egypt, in roundiſh maſſes, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddiſh or yellowiſh brown; of a firm conſiſtence, but not very dry. It is a mild aſtringent medicine.

German ACACIA, the juice of unripe ſloes inſpiſſated nearly to dryneſs over a gentle fire, care being taken to prevent its burning. It is given in diſorders where ſtyptic medicines are indicated.

ACACIA, among antiquaries, ſomething reſembling a roll or bag, ſeen on medals, as in the hands of ſeveral conſuls and emperors.

ACACIANS, in eccleſiaſtical hiſtory, the name of ſeveral ſects of heretics; ſome of which maintained, that the Son was only a ſimilar, not the ſame, ſubſtance with the Father; and others, that he was not only a diſtinct, but a diſſimilar ſubſtance. Two of theſe ſects had their denomination from Acacias biſhop of Cæſarea, who lived in the fourth century, and changed his opinions, ſo as, at different times, to be head of both. Another was named from Acacius patriarch of Conſtantinople, who lived in the cloſe of the fifth century.

ACADEMICS, or ACADEMISTS, a denomination given to the cultivators of a ſpecies of philoſophy originally derived from Socrates, and afterwards illuſtrated and enforced by Plato, who taught in a grove near Athens, conſecrated to the memory of Academus, an Athenian hero; from which circumſtance this philoſophy received the name of *academical*. Before the days of Plato, philoſophy had in a great meaſure fallen into contempt. The contradictory ſyſtems and hypotheſes which had ſucceſsfully been urged upon the world were become ſo numerous, that, from a view of this inconſtancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehenſion. Abſolute and univerſal ſcepticiſm was the natural conſequence of this concluſion. In order to remedy this abuſe of philoſophy and of the human faculties, Plato laid hold of and refuted the principles of the academical philoſophy.

Of the ſceptics of our own country, Berkeley and Hume are the moſt conſiderable. Berkeley denied the exiſtence of every thing, excepting his own ideas. Mr. Hume has gone a ſtep further, and queſtioned even the exiſtence of ideas; but at the ſame time has not heſitated to give determined opinions with regard to eternity, providence, and a future ſtate, miraculous interpoſitions of the Deity, &c. ſubjects far above the reach of our faculties. In his eſſay on the academical or ſceptical philoſophy, he has confounded two very oppoſite ſpecies of philoſophy. After the days of Plato, indeed, the principles of the firſt academy were groſsly corrupted by Arceſilas, Carneades, &c. This might lead Mr. Hume into the notion that the *academical* and *ſceptical* philoſophy were ſynonymous terms. But no principles can be of a more oppoſite nature than thoſe which were inculcated by the old academy of Socrates and Plato, and the ſceptical notions which were propagated by Arceſilas, Carneades, and the other diſciples of the ſucceeding academies.

ACADEMY, in antiquity, a garden, villa, or grove, ſituated within a mile of Athens, where Plato and his followers held their philoſophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnaſium. He lived in the time of Theſeus; and, after his death, it retained his name, and was conſecrated to his memory. Cimon embelliſhed it with fountains, trees, and walks; but Sylla, during the ſiege of Athens, employed theſe very trees in making battering engines againſt the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he alſo named an *academy*, where he compoſed his *Academical Queſtions*, and his book *De Natura Deorum*.

ACADEMY, among the moderns, is moſt commonly uſed to ſignify a SOCIETY of learned men, eſtabliſhed for the improvement of any art or ſcience, and generally under the protection of a prince. The firſt Academy we read of was eſtabliſhed by Charlemagne, at the inſtigation of ALCUIN; but moſt nations have now their academies. Italy, perhaps, has the greateſt number.—The French have many flouriſhing academies, moſt of which were eſtabliſhed by Louis XIV.—We have but few in Britain; and thoſe of chiefeſt note go by a different name.

ACADEMY is alſo a term for ſeminaries of learning among the Jews, where their rabbins and doctors inſtructed their youth in the Hebrew language, and explained to them the Talmud and the ſecrets of the Cabbala: Thoſe of Tiberias and Babylon have been the moſt noted.

The Romans had a kind of military academies, eſtabliſhed in

all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beſides academies of this kind, had military profeſſors called *Tactici*, who taught all the higher offices of war, &c. &c.

ACADEMY is often uſed with us to denote a kind of collegiate ſeminary, where youth are inſtructed in arts and ſciences.—There is one at Portſmouth, for teaching navigation, drawing, &c.; another at Woolwich, for fortification, gunnery, &c.—Beſides theſe, there are numerous *petty ſchools*, which are called academies, eſpecially in London.

ACADEMY is likewiſe a name given to a riding-ſchool, where young gentlemen are taught to ride the great horſe, &c. and the ground allotted is uſually called the *Manege*.

Academy Figure, a drawing of a naked man or woman, taken from the life; which is uſually done on paper with red or black chalk, and ſometimes with paſtils or crayons.

ACADIE, or ACADY, in geography, a name formerly given to Nova Scotia. See *Nova Scotia*.

ACÆNA, in antiquity, a Grecian decemped or ten feet rod, uſed in meaſuring their lands.

ACÆNA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants, the characters of which are theſe: The *calyx* is a perianthium conſiſting of four leaves, which are ovate, concave, equal, and perſiſtent; there is no *corolla*: The *ſtamina* conſiſts of four equal middle-ſized filaments oppoſite to the calyx; the antheræ are quadrangular, twin, erect: The *piſtillum* has an inverſely-ovate hiſped germ; the ſtylus is ſmall, and inflected on one ſide; and the ſtigma is a ſmall thickiſh coloured membrane, divided into many ſegments: The *pericarpium* is an inverſely-ovated dry one-celled berry covered with prickles bent backwards: The *ſeed* is ſingle. There is only one ſpecies, a native of Mexico.

ACAJOU, or CASHEW-NUT-TREE. See ANACARDIUM.

ACALANDRUS, a river falling into the bay of Tarentum, now *Fiume de Roſeto*.

ACALCUM, tin.

ACALEPTIC, in ancient proſody, a complete verſe.

ACALYPHA, the THREE-SEEDED MERCURY; a genus of plants belonging to the monœcia monadelphia claſs. The characters of this genus are the following: *Male flowers* crowded above the female ones: The *calyx* is a three or four-leaved perianthium, the leaflets roundiſh, concave, and equal: The *corolla* is wanting: The *ſtamina* have from 6 to 18 filaments, which are ſhort, crowded, and connected at the baſe; the antheræ are roundiſh.—*Female flowers* fewer, placed beneath, and received into a large divided involucrum: The *calyx* is a perianthium, conſiſting of three leaflets, which are concave, converging, ſmall, and perſiſtent: No *corolla*: The *piſtillum* has a roundiſh germen; the ſtyli are three, branchy, oftener tripartite, and long; the ſtigmata are ſimple: The *pericarpium* has a roundiſh, triſulcated trilocular capſule, the valvulets gaping two ways: The *ſeeds* are ſolitary, roundiſh, and large.—This genus ranks in the 38th natural order, *Tricoccæ*. There are five ſpecies, all natives of Virginia.

ACANACEOUS PLANTS, ſuch as are armed with prickles.

ACANGIS, that is, *Ravagers* or *Adventurers*; a name which the Turks give their huſſars or light-troops.

ACANTHA, in botany, the prickle of any plant; in zoology, a term for the ſpine or prickly fins of fiſhes.

ACANTHABOLUS, in ſurgery, an inſtrument for pulling thorns, or the like, out of the ſkin.

ACANTHINE, any thing reſembling the herb acanthus. Acanthine garments, among the ancients, are ſaid to be made of the down of thiſtles.

ACANTHOPTERYGIOUS FISHES, a term uſed by Linnæus and others for thoſe fiſhes whoſe back-fins are hard oſſeous, and prickly.

ACANTHOS, a town of Egypt, near Memphis, now *Biſalta*. Alſo a maritime town of Macedonia, to the weſt of mount Athos, now *Eriſſo*.

ACANTHUS, BEAR'S-BREECH, or *Brank-urſine*, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and ranking in the 40th natural order, *Perſonatæ*. The general characters are: The *calyx* is a perianthium with leaflets of three alternate pairs unequal and perſiſtent: The *corolla* is one petal'd and unequal; the tubus very ſhort, cloſed with a beard; no upper-lip, the under one very large, flat, ſtraight, very broad, three-lobed, and obtuſe: The *ſtamina* have four ſubulated filaments ſhorter than the corolla; the two ſuperior rather longer, recurvate, and incurved at the top; the antheræ are oblong, compreſſed, obtuſe, lateral, parallel, and villous before: The *piſtillum* has a conic germen; a filiform ſtylus, the length of the ſtamina; and two acute lateral ſtigmata: The *perianthium* is an acutely-ovated bilocular capſule, with a lateral partition: The *ſeeds* one or two, fleſhy and gibbous. All the parts of it have a ſoft ſweetiſh taſte, and abound with a mucilaginous juice: its virtues do not ſeem to differ from thoſe of althæa and other mucilaginous plants.

ACANTHUS, in architecture, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders.

ACAPULCO, a conſiderable town and port in Mexico, on the South Sea. It has a fine harbour, from whence a ſhip annually ſails to Manilla in the Philippine iſlands, near the coaſt of China in Aſia; and another returns annually from thence with all the treaſures of the Eaſt Indies. On the arrival of the galleons, traders flock here from all the provinces of Mexico, to exchange European toys, their own cochineal, and about ten millions of ſilver (437,500l ſterling), for ſpices, muſlins, printed linens, ſilk, perfumes, and the gold works of Aſia; W. Long. 102. 29. N. Lat. 17. 30.

ACARAI, a town of Paraguay in South America; Long. 116. 40. S. Lat. 26.

ACARAUNA, a ſmall American fiſh, called by our ſailors *the old-wife*. See LABRUS.

ACARON, or ACCARON, a town of Paleſtine, called *Ekron* in Scripture.

ACARUS, the TICK or MITE, a genus of inſects belonging to the order of aptera, or ſuch as have no wings. The acarus has eight legs; two eyes, one on each ſide of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 ſpecies; of which ſome are inhabitants of the earth, ſome of waters; ſome live on trees, others among ſtones, and others on the bodies of other animals, and even under the ſkin. The deſcription of the *ſiro*, or cheeſe-mite, which is a very minute ſpecies, will ſuffice. To the naked eye, theſe mites appear like moving particles of duſt; but the microſcope diſcovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly, as creatures that exceed them many times in bulk. The principal parts of them are the head, the neck and the body. The head is ſmall in proportion to the body; and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quick-ſighted; and when they have been once touched with a pin, you will eaſily perceive how cunningly they avoid a ſecond touch. Their legs are each furniſhed at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there iſſue out a few exceeding long hairs. Other parts of the body are alſo beſet with thin and long hairs. The males and females

are eaſily diſtinguiſhed in theſe little animals. The females are oviparous, like the louſe and ſpider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute; and, in their growing to their full ſize, they caſt their ſkins ſeveral times. Theſe little creatures may be kept alive many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen *in coitu*, conjoined tail to tail; and this is performed by an incredibly ſwift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhows, that 90 millions of them are not ſo large as a common pigeon's egg. They are very voracious animals, and have often been ſeen to eat one another. Their manner of eating is by thruſting alternately one jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding, they ſeem to chew the cud.—There are ſeveral varieties of this ſpecies found in different ſubſtances beſides cheeſe; as in malt-duſt, flour, oatmeal, &c. Thoſe in malt-duſt and oatmeal are much nimbler than the cheeſe-mites, and have more and longer hairs. There are alſo a ſort of wandering mites, which range wherever there is any thing they can feed on: They are often ſeen in the form of a white duſt, and are not ſuſpected to be living creatures.—The mite is called by authors ſimply, *Acarus*. It is an animal very tenacious of life, and will live months without food. Mr. Lewenhoek had one which lived 11 weeks on the point of a pin, on which he had fixed it for examining by his microſcope.

ACATALECTIC, a term, in the ancient poetry, for ſuch verſes as have all their feet or ſyllables, in contradiſtinction to thoſe that have a ſyllable too few.

ACATALEPSY, ſignifies the impoſſibility of comprehending ſomething.—The diſtinguiſhing tenet of the Pyrrhoniſts was their aſſerting an abſolute acatalepſy in regard to every thing.

ACATERY, or ACCATRY, anciently an officer of the king's houſehold, deſigned for a check betwixt the clerks of the kitchen and the purveyors.

ACATHARSIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, a ſolemn hymn anciently ſung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Conſtantinople from the invaſions of the barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace uſed for military purpoſes. Strabo deſcribes it as a privateer or pirate ſloop.

ACAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicle or ſtalk to ſupport them, but reſt immediately on the ground, ſuch as the cardine thiſtle, &c.

ACCALIA, in Roman antiquity, ſolemn feſtivals held in honour of Acca Laurentia, Romulus's nurſe: they were otherwiſe called LAURENTALIA.

ACCAPITARE, in law, the act of becoming vaſſal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM, ſignifies the money paid by a vaſſal upon his admiſſion to a feud. It likewiſe, in our ancient law, was uſed to expreſs the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the Engliſh law, a writ lying, where a man has received, or fears, falſe judgment in an inferior court. It lies alſo for juſtice delayed, and is a ſpecies of the writ RECORDARE.

ACCELERATION, in mechanics, the increaſe of velocity in a moving body. Accelerated motion is that which continually receives freſh acceſſions of velocity. Acceleration ſtands directly oppoſed to *retardation*, which denotes a diminution of velocity.

ACCELERATION is chiefly uſed in phyſics, in reſpect of falling bodies, *i. e.* of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their deſcent, is evident from various conſiderations, both *à priori* and *poſteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impreſſion it makes, the more vehemently does it ſtrike the ſubject plane, or other obſtacle.

Suppoſe a body let fall from on high: the primary cauſe of its beginning to deſcend is doubtleſs the power of gravity; but when once the deſcent is commenced, that ſtate becomes in ſome meaſure natural to the body; ſo that if left to itſelf, it would perſevere in it for ever, even though the firſt cauſe ſhould ceaſe: as we ſee in a ſtone caſt with the hand, which continues to move after it is left by the cauſe that gave it motion. But, beſide the propenſity to deſcend impreſſed by the firſt cauſe, and which of itſelf were ſufficient to continue the ſame degree of motion, once begun, *in infinitum*; there is a conſtant acceſſion of ſubſequent efforts of the ſame principle, gravity, which continues to act on the body already in motion, in the ſame manner as if it were at reſt. Here, then, being a double cauſe of motion; and both acting in the ſame direction, viz. directly towards the centre of the earth; the motion they jointly produce muſt neceſſarily be greater than that of any one of them.—And the velocity thus increaſed having the ſame cauſe of increaſe ſtill perſiſting, the deſcent muſt neceſſarily be continually accelerated.

ACCELERATION *of Bodies on inclined Planes*. The ſame general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion ſlower; but the inclination being every where equal, the retardation ariſing therefrom will proceed equally in all parts, at the beginning and the ending of the motion. See MECHANICS.

ACCELERATION *of the Motion of Pendulums*.—The motion of pendulous bodies is accelerated in their deſcent; but in a leſs ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION *of the Motion of Projectiles*. See PROJECTILE.

ACCELERATION is alſo applied, in the ancient aſtronomy, in reſpect of the fixed ſtars.—This acceleration was the difference between the revolution of the *primum mobile* and the ſolar revolution; which was computed at three minutes and 56 ſeconds.

ACCELERATION *of the Moon*, a term uſed to expreſs the increaſe of the moon's mean motion from the ſun, compared with the diurnal motion of the earth; ſo that it is now a little ſwifter than it was formerly. Dr. Halley was the firſt who made this diſcovery, and he was led to it by comparing the ancient eclipſes obſerved at Babylon with thoſe obſerved by Albatennius in the ninth century, and ſome of his own time. He was not able to aſcertain the quantity of this acceleration, becauſe the longitudes of Bagdad, Alexandria, and Aleppo, where the obſervations were made, had not been accurately determined. But ſince his time the longitude of Alexandria has been aſcertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50′ eaſt from Alexandria. From theſe *data*, Mr. Dunthorne compared ſeveral ancient and modern eclipſes, with the calculations of them, by his own tables, and hereby verified Dr. Halley's opinion; for he found that the ſame tables repreſent the moon's place more backward than her true place in ancient eclipſes, and more forward than her true place in later eclipſes; and thence juſtly inferred, that her motion in ancient times was ſlower, in later times quicker, than the tables give it. But he did not content himſelf with merely aſcertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the moſt ancient eclipſe of which any authentic account remains, obſerved at

Babylon in the year before Chriſt 721, he concluded, that the obſerved beginning of this eclipſe was not above an hour and three-quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50′ of a degree at that time.—Admitting the acceleration to be uniform, and the aggregate of it as the ſquare of the time, it will be at the rate of about 10′ in 100 years.

ACCELERATOR, in anatomy, the name of a muſcle of the penis, which aſſiſts in ejecting the urine or ſemen. See ANATOMY.

ACCENDENTES, a lower order of miniſters in the Romiſh church, whoſe office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whoſe office was to excite and animate the combatants during the engagement.

ACCENSI, in the Roman armies, certain ſupernumerary ſoldiers, deſigned to ſupply the places of thoſe who ſhould be killed or anywiſe diſabled. They were thus denominated, *quia accenſebantur*, or *ad cenſum adjiciebantur*.

ACCENSI, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magiſtrates, ſomewhat in the manner of uſhers, ſerjeants, or tipſtaves among us. They were thus called from *accire*, to ſend for; one part of their office being to call aſſemblies of the people, ſummon parties to appear and anſwer before the judges, &c.

ACCENSI was alſo an appellation given to a kind of adjutants, appointed by the tribune to aſſiſt each centurion and decurion. In which ſenſe, *accenſus* is ſynonymous with *optio*. In an ancient inſcription, given by à Torre, we meet ACCENSUS EQUITUM ROMANORUM; an office no where elſe heard of. That author ſuſpects it is a corruption; and inſtead thereof reads, *A cenſibus*.

ACCENSION, the action of ſetting a body on fire: thus the accenſion of tinder is effected by ſtriking fire with flint and ſteel.

ACCENT, in reading or ſpeaking, an inflection of the voice, which gives to each ſyllable of a word its due pitch in reſpect of height or lowneſs. Among grammarians, it is a certain mark or character placed over a ſyllable, to direct the ſtreſs of its pronunciation. We generally reckon three grammatical accents in ordinary uſe, all borrowed from the Greeks, viz. the *acute accent* (′), which ſhows when the tone of the voice is to be raiſed. The *grave accent* (`), when the note or tone of the voice is to be depreſſed. The *circumflex accent* (˜ or ^), is compoſed of both the acute and the grave, and points out a kind of undulation of the voice. The Latins have made the ſame uſe of theſe three accents.

The Hebrews have a grammatical, a rhetorical, and muſical accent; though the firſt and laſt ſeem, in effect, to be the ſame; both being compriſed under the general name of *tonic accents*, becauſe they give the proper tone to ſyllables; as the rhetorical accents are ſaid to be euphonic, becauſe they tend to make the pronunciation more ſweet and agreeable. There are four euphonic accents, and 25 tonic: of which ſome are placed above, and others below the ſyllables; the Hebrew accents ſerving not only to regulate the riſings and fallings of the voice, but alſo to diſtinguiſh the ſections, periods, and numbers of periods, in a diſcourſe; and to anſwer the ſame purpoſes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, *&c.* each bearing a title anſwerable to the importance of the diſtinction it makes. Their emperor rules over a whole phraſe, and terminates the ſenſe completely; anſwering to our point. Their king anſwers to our colon; and their duke to our comma: The king, however, occaſionally becomes a duke, and the duke a king, as the phraſes are more or leſs ſhort.

As to the Greek accents, now ſeen both in manuſcripts and printed books, there has been no leſs diſpute about their antiquity and uſe than about thoſe of the Hebrews. Iſaac Voſſius endeavours to prove them of modern invention; aſſerting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Ariſtophanes the grammarian, about the time of Ptolemy Philopater; and that theſe were of muſical, rather than grammatical uſe, ſerving as aids in the ſinging of their poems, and very different from thoſe introduced afterwards. He alſo ſhows from ſeveral ancient grammarians, that the manner of writing the Greek accents in theſe days was quite different from that which appears in our books.

The uſe of accents, to prevent ambiguities, is moſt remarkably perceived in ſome eaſtern languages, particularly the Siameſe and Chineſe. Among the people of China, every word, or (which is the ſame thing) ſyllable, admits of five accents, as ſpoken more acutely or remiſsly; and thus ſtands for many different things. The ſame ſound *ya*, according to the accent affixed to it, ſignifies *God*, a *wall*, *excellent*, *ſtupidity*, and a *gooſe*. The Chineſe have but 330 ſpoken words in their language; but theſe being multiplied by the different accents or tones, which affect the vowels, furniſh a language tolerably copious. By means hereof, their 330 ſimple ſounds come to denote 1650 things; but this being hardly ſufficient, they are increaſed further by aſpirates added to each word to double the number. The Chineſe only reckon four *accents*; for which the miſſionaries uſe the following marks, *aá*, *â*, *à*, *ä*; to which they have added a fifth, thus, *ã*. They make a kind of modulation; wherein prolonging the duration of the ſound of the vowel, they vary the tone, raiſing and ſinking it by a certain pitch of voice: ſo that their talking is a ſort of muſic or ſinging. Attempts have been made to determine the quantity of the riſe or fall in each accent by means of muſical notes; but this is hard to effect, as being different in different perſons. Hence the great difficulty of the language to foreigners; they are forced to ſing moſt ſcrupulouſly: if they deviate ever ſo little from the accent, they ſay quite a different thing from what was intended. Thus, meaning to compliment the perſon you are talking to with the title *Sir*, you call him a beaſt with the ſame word, only a little varied in the tone.

ACCENT, in muſic, is a certain enforcement of particular ſounds, whether by the voice or inſtruments, generally uſed at the beginning of bars.

ACCEPTANCE, in law, a perſon's agreeing to offers made in bargaining, by which the bargain is concluded.

ACCEPTANCE, in the church of Rome, is put for receiving the pope's conſtitutions.

ACCEPTANCE, in commerce, is the ſubſcribing, ſigning, and making one's ſelf debtor for the ſum contained in a bill of exchange or other obligation.

ACCEPTATION, in grammar, the ſenſe or meaning wherein any word is taken.

ACCEPTER, or ACCEPTOR, the perſon who accepts a BILL of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or diſcharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, ſomething that may be approached, or that acceſs may be had to. Thus we ſay, Such a place is acceſſible on one ſide, &c.

ACCESSION, in law, is a method of acquiring property, by which, in things that have a cloſe connection or dependence upon one another, the property of the principal thing draws after it the property of the acceſſory: Thus, the owner of a cow becomes likewiſe the owner of the calf. It ſometimes likewiſe ſignifies conſent or acquieſcence.

Accession, among phyſicians, is uſed for a paroxyſm of a diſeaſe; among politicians, it ſignifies a prince's ſucceeding to the government upon the death of his predeceſſor.

ACCESSORY, or Accessary, in common law, is chiefly uſed for a perſon guilty of a felonious offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of *acceſſories: before* the fact, and *after* it.—The *firſt* is he who commands, or procures another to commit felony, and is not preſent himſelf; for if he be preſent, he is a principal. The *ſecond* is he who receives, aſſiſts, or comforts any man that has done murder, or felony, whereof he has knowledge. A man may alſo be acceſſory to an acceſſory, by aiding, receiving, &c. an acceſſory in felony.

In the loweſt and higheſt offences there are no acceſſories, but all are principals: as in riots, routs, forcible entries, and other treſpaſſes, which are the loweſt offences. So alſo in the higheſt offence, which is, according to the Engliſh law, high treaſon, there are no acceſſories.

Acceſſories, in petty treaſon, murder, and in felonies of ſeveral kinds, are not to have their clergy. There can be no acceſſory before the fact in manſlaughter; becauſe that is ſudden and unprepenſed.

Accessory *Nerves*, in anatomy, a pair of nerves, which ariſing from the medulla in the vertebræ of the neck, aſcend, and enter the ſkull, and paſſing out of it again with the par vagum, are diſtributed to the neck and ſhoulders.

Accessory, among painters, ſuch parts of an hiſtory-piece as ſerve for ornament, and might have been left out: ſuch as vaſes, armour, &c.

ACCIDENT, among logicians, is, 1. Whatever does not eſſentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any ſubject as are not eſſential to it; thus whiteneſs in paper is an accidental quality. 3. In oppoſition to ſubſtance, all qualities whatever are called accidents; as ſweetneſs, ſoftneſs, &c.

Accident, in grammar, implies a property attached to a word, without entering into its eſſential definition; for every word, notwithſtanding its ſignification, will be either primitive, derivative, ſimple, or compound, which are the accidents of words. Beſides theſe accidents, which are common to all ſorts of words, each particular ſpecies has its accidents; thus the accidents of the noun ſubſtantive are the gender, declenſion, and number; and the adjective has another accident, namely, the compariſon. See the article Grammar and Language.

Accident, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the eſſence of the armour; ſuch as, abatement, difference, and tincture.

ACCIDENTAL, in philoſophy, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of being ſubject, to general laws or regular returns.

Accidental *Point*, in perſpective, is that point in the horizontal line where the projections of two lines parallel to each other meet the perſpective plane.

Accidental *Colours*, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly at a particular colour are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. Mr. Buffon has endeavoured to trace the connections which theſe accidental colours have with ſuch as are natural, in a variety of inſtances.

ACCIPENSER, in ichthyology, a genus of fiſhes belonging to the Amphibia Nantes of Linnæus. The accipenſer has a ſingle linear noſtril: the mouth is in the under part of the head, and contains no teeth; the cirri are below the ſnout, and before the mouth. There are three ſpecies of this genus.

The ruthenus has 4 cirri, and 15 ſquamous protuberances. It is a native of Ruſſia.

The huſo has 4 cirri; the body is naked, *i. e.* has no prickles or protuberances. The ichthyocollo, or isinglass of the ſhops, famous as an agglutinant, and uſed alſo for the fining of wines, is made from its ſound or ſcales.

The ſturio, or ſturgeon, with 4 cirri and 11 ſquamous protuberances on the back. This fiſh annually aſcends our rivers, but in no great numbers, and is taken by accident in the ſalmon-nets. It ſeems a ſpiritleſs fiſh, making no manner of reſiſtance when entangled, but is drawn out of the water like a lifeleſs lump. Some naturaliſts have been undetermined whether the ſturio or ſturgeon were the ſame fiſh with the accipenſer; but there is little doubt of the fact being ſo.

ACCIPITER, the name of Linnæus's firſt order of birds. See Zoology.

Among the Romans, the term *accipiter* ſignified a hawk; and which, from its being very carnivorous, they conſidered as a bird of bad omen.

ACCISMUS, denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. Cromwell's refuſal of the crown of England may be brought as an inſtance of an Acciſmus.

Accismus is more particularly uſed, in rhetoric, as a ſpecies of irony.

ACCLAMATION, in a proper ſenſe, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone ſomewhat reſembling a ſong, frequent in the ancient aſſemblies.

Acclamations are of various kinds; eccleſiaſtical, military, nuptial, ſenatorial, ſynodical, ſcholaſtic, theatrical, &c. We meet with loud acclamations, muſical, and rythmical acclamations; acclamations of joy and reſpect, and even of reproach and contumely.

Acclamations were not unknown on the theatres in the earlieſt ages of the Roman commonwealth; but they were artleſs then, and little other than confuſed ſhouts. Afterwards they became a ſort of regular concerts. That mentioned by Phædrus, *lætare incolumis Roma ſalvo principe*, which was made for Auguſtus, and proved the occaſion of a pleaſant miſtake of a flute-player called *Princeps*, plainly ſhows that muſical acclamations were in uſe in that emperor's reign.

To theatrical acclamations, may be added thoſe of the ſoldiery and the people in time of triumph. The victorious army accompanied their general to the capitol; and among the verſes they ſung in his praiſes, frequently repeated Io Triumphe! which the people anſwered in the ſame ſtrain. It was alſo in the way of acclamation that the ſoldiers gave their general the title of *Imperator* after ſome notable victory; a title which he only kept till the time of his triumph.

Acclamations made alſo a part of the ceremony of marriage. They were uſed for the omen's ſake; being the *Læta Omina*, ſometimes ſpoken of before marriage in Roman writers.

Acclamation, at firſt practiſed in the theatre, and paſſing thence to the ſenate, &c. was in proceſs of time received into the acts of councils, and the ordinary aſſemblies of the church. The people expreſſed their approbation of the

preacher variouſly; the more uſual forms were, *Orthodox! Third Apoſtle!* &c. Theſe acclamations being ſometimes carried to exceſs, and often miſplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in ſome uſe as low as the time of St. Bernard.

ACCLAMATION *Medals*, among antiquaries, ſuch as repreſent the people expreſſing their joy in the poſture of acclamation.

ACCLIVITY, the riſe or aſcent of a hill, in oppoſition to the declivity or deſcent of it. Some writers in fortification uſe it for the talus of a rampart.

ACCOLA, among the Romans, ſignified a perſon who lived *near* ſome place; in which ſenſe, it differed from *incola*, the *inhabitant* of ſuch a place.

ACCOLADE, a ceremony anciently uſed in the conferring of knighthood, and ſuppoſed to be the embrace, or kiſs which princes anciently gave the new knight, as a token of their affection: whence the word *accolade; q. d.* a claſping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the ſame occaſion.

ACCOLEE, ſometimes ſynonymous with ACCOLADE. It is alſo uſed in various ſenſes in heraldry: ſometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms; and, laſtly, to kews, battons, maces, ſwords, &c. placed ſalterwiſe behind the ſhield.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a ſimilar thing referred thereto.

A prophecy of Scripture is ſaid to be fulfilled various ways; properly, as when a thing foretold comes to paſs; and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out ſome time before to another.

The primitive church *accommodated* multitudes of Jewiſh, and even heathen ceremonies and practices, to Chriſtian purpoſes; but the Jews had before done the ſame by the Gentiles: ſome will even have circumciſion, the tabernacle, brazen ſerpent, &c. to have been originally of Egyptian uſe, and only *accommodated* by Moſes to the purpoſes of Judaiſm.

ACCOMPANIMENT, in muſic, denotes the inſtruments which accompany a voice, in order to ſuſtain it, as well as to make the muſic more full. The accompaniment is uſed in recitative as well as in ſong; on the ſtage, as well as in the choir, &c. The antients had likewiſe their accompaniments on the theatre; they had even different kinds of inſtruments to accompany the chorus, from thoſe which accompanied the actors in the recitation.—The accompaniment among the moderns, is frequently a different part or melody from the ſong it accompanies. It is diſputed whether it was ſo among the ancients.

ACCOMPANIMENT, in painting, denotes ſuch objects as are added, either by way of ornament or probability; as dogs, guns, game, &c. in a hunting-piece.

ACCOMPANIMENT, in heraldry, any thing added to a ſhield by way of ornament; as the belt, mantling, ſupporters, &c. It is alſo applied to ſeveral bearings about a principal one; as a ſaltier, bend, feſs, chevron, &c.

ACCOMPLICE, one that has a hand in a buſineſs, or is privy in, the ſame deſign or crime with another. See ACCESSORY. By the law of Scotland, the *accomplice* can only be proſecuted after the conviction of the *principal* offender.

ACCOMPLISHMENT, is principally uſed in ſpeaking of events foretold by the Jewiſh prophets in the Old Teſtament, and fulfilled under the New. Accompliſhment is alſo uſed for any mental or perſonal endowment.

ACCORD, in painting, is the harmony that reigns among the lights and ſhades of a picture; in muſic, the ſame as *concord*; in law, a verbal agreement between two at the leaſt, to ſatisfy an offence that the one hath committed againſt the other, whether it be a treſpaſs or the like; for which the one agrees to make, and the other to accept, a certain ſatisfaction.

ACCOUNT, or ACCOMPT, collectively, is uſed to expreſs the books which merchants, traders, bankers, &c. uſe for recording their tranſactions in buſineſs. See BOOK-KEEPING.

Chamber of ACCOUNTS, in the French polity; a ſovereign court of great antiquity, which took cogniſance of and regiſtered the accounts of the king's revenue: the ſame nearly with the Engliſh *Court of Exchequer*.

ACCOUNT is taken ſometimes in a particular ſenſe, for the computation of time: thus we ſay, the Julian Account, the Gregorian Account, &c. in which ſenſe it is equivalent to ſtyle.

ACCOUNTANT, or ACCOMPTANT; a perſon or officer appointed to keep the accounts of a public company or office; as the South-Sea, the India-Company, the Bank, the Exciſe, &c.

ACCOUNTANT-GENERAL, an officer in the court of Chancery who receives all moneys lodged in the court, and conveys the ſame to the bank of England.

ACCOUTREMENT, an old term applied to the furniture of a ſoldier, knight, or gentleman.

ACCRETION, in phyſics, the increaſe or growth of an organical body, by the acceſſion of new parts.

ACCRETION, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two perſons, one of whom dies before the teſtator, the legacy devolves to the ſurvivor by right of accretion.

ACCROCHE, in heraldry, denotes a thing's being hooked with another.

ACCUBATION, a poſture of the body, between ſitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table-poſture of the Greeks and Romans. There were uſually three perſons on each bed; to crowd more, was eſteemed ſordid. In eating, they lay down on their left ſides, with their heads reſting on the pillows, or rather on their elbows. One lay at the head of the bed, with his feet extended behind the back of the ſecond; another lay with the back of his head towards the navel of the firſt, only ſeparated by a pillow, his feet behind the back of the third; and ſo of the third, or fourth. The middle place was eſteemed the moſt honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatorii veſtis*, the dining garment; and pulled off their ſhoes to prevent fouling the couch.

ACCUBITOR, an ancient officer of the emperors of Conſtantinople, whoſe buſineſs was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the *cubicularis* and *procubitor* under him.

ACCUMULATION, among lawyers, is uſed in ſpeaking of the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances to the ſame proof.

ACCUMULATION *of Degrees*, in an univerſity, is the taking ſeveral of them together, or at ſmaller intervals than uſual, or than is allowed by the rules of the univerſity.

ACCURSED, in the Jewiſh idiom, *accurſed* and *crucified* were ſynonymous. Among them, every one was accounted *accurſed* who died on a tree.

ACCUSATION, the charging any perſon with a cri-

minal action, either in one's own name, or in that of the public. Nothing, according to Machiavel, tends more to the preſervation of a ſtate, than frequent accuſations of perſons truſted with the adminiſtration of public affairs. This, accordingly, was ſtrictly obſerved by the Romans, in the inſtances of Camillus, accuſed of corruption by Manlius Capitolinus, &c. By the *Roman* law, there was no public accuſer for public crimes; every private perſon, whether intereſted in the crime or not, might accuſe and proſecute the accuſed to puniſhment, or abſolution.

The ancient Roman lawyers diſtinguiſhed between *poſtulatio*, *delatio*, and *accuſatio*. For, firſt, leave was deſired to bring a charge againſt one, which was called *poſtulare*: then he againſt whom the charge was laid, was brought before the judge; which was called *deferre*, or *nominis delatio*: laſtly, the charge was drawn up and preſented, which was properly the *accuſatio*. The accuſation properly commenced, according to Pædianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime, and ſubſcribed his name to the *delatio* made by his opponent.

ACCUSATIVE, in the Latin grammar, is the fourth caſe of nouns, and ſignifies the relation of the noun on which the action implied in the verb terminates; and hence, in ſuch languages as have caſes, theſe nouns have a particular termination, called *accuſative*: as *Auguſtus vicit Antonium*, Auguſtus vanquiſhed Antony. Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, muſt have the accuſative termination. In the Engliſh language there are no caſes, except the genitive; the relation of the noun being ſhown by the aſſiſtance of prepoſitions, as *of*, *to*, *from*, &c.

ACE, among gameſters, a card or die marked only with one point.

ACENTETUM, or ACANTETA, in natural hiſtory, a name given by the ancients to the pureſt and fineſt kind of rock-cryſtal: they uſed the cryſtal in many ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in value to the *vaſa murrhina* of thoſe times.

ACEPHALI, or ACEPHALITÆ, a term applied to ſeveral ſects who refuſed to follow ſome noted leader. The levellers in the reign of king Henry I. who acknowledged no head or ſuperior, were alſo called by this name.

ACEPHALOUS, or ACEPHALUS, is uſed in ſpeaking of certain nations, or people, repreſented by ancient naturaliſts and coſmographers, as well as by ſome modern travellers, as formed without heads; their eyes, mouths, &c. being placed in other parts. But though the exiſtence of a nation of *Acephali* be ill-warranted, naturaliſts furniſh ſeveral inſtances of individuals born without heads, by ſome luſus or aberration of nature. Wepfer gives a catalogue of ſuch acephalous births, from Schenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

ACEPHALUS, an obſolete term for the tænia or tape-worm, which was long ſuppoſed to be acephalous. See TÆNIA. The firſt who gave it a head was Tulpius; and after him, Fehr: the former even makes it *biceps*, or two-headed.

ACEPHALUS, in poetry, is alſo uſed to expreſs a verſe defective in the beginning.

ACER, the MAPLE or SYCAMORE TREE: a genus of the monœcia order, belonging to the polygamia claſs of plants; and ranking under the 23d Natural Order, *Tribilatæ*.—The generic characters, both natural and eſſential, are: The HERMAPHRODITE *calyx* is an acute, coloured, one-leav'd perianthium, divided into five ſegments, flat and entire at the baſe, and perſiſtent: The *corolla* is five-petal'd, ovate, and expanding: The *ſtamina* conſiſt of eight ſubulated ſhort filaments; the antheræ ſimple, the duſt cruciform: The *piſtillum* has a compreſſed germen, immerſed in the receptacle, which is convex, perforated, and large; the ſtylus is filiform; the ſtigmata are two, pointed, ſlender, and reflex: The *pericarpium* conſiſts of two or three capſulæ uniting at the baſe, roundiſh, compreſſed, each terminated with a large membranous wing: The *ſeeds* are ſolitary and roundiſh. The MALE *calyx*, *corolla*, and *ſtamina*, are the ſame as in the hermaphrodite: The *piſtillum* has no germen nor ſtylus; the ſtigma is bifid.

The *Species* are, 1. The pſeudo-platanus, or ſycamore; a very large and beautiful tree, with broad leaves, divided into five lobes ſerrated in their edges; of a dark-green colour on the upper ſide, but paler and ſomewhat hoary underneath; the flowers are very ſmall, and of a greeniſh white colour. There are two varieties, one with broad leaves and large keys, the other with variegated leaves. 2. The campeſtris, or common maple, which is too well known to need any particular deſcription, as it grows very frequently in hedge-rows in moſt parts of Britain. 3. The negundo, or Virginian aſh-leaved maple, a very ſtrong ſhooting tree; and in Virginia, where it is a native, one of the largeſt trees of this kind. Its leaves are of a pale green, and well adapted to give a variety of tint. 4. The platanoides, or Norway maple, which grows naturally in Norway, Sweden, and other northern countries of Europe. It riſes to a good height, and is well furniſhed with branches with ſmooth leaves, of a ſhining green colour, and beautifully indented. Theſe have an acrid milky juice, which prevents them from being preyed upon by inſects as the ſycamore is; and as this ſpecies reſiſts the ſpray of the ſea equally with the firſt, it is preferred in plantations ſituated near the ſea. 5. The rubrum, or Virginian ſcarlet flowering maple; a native of that country, and never grows to a large ſize in Britain. It is, however, cultivated in gardens for the beauty of its flowers, which appear in the beginning of April, in roundiſh bunches, at the bottom of the footſtalks of the leaves. 6. The ſaccharinum, or ſugar maple; a large growing tree; will arrive at the height of 40 feet; and has broad thin leaves, divided into five principal parts; which are again indented or cut at the edges into ſeveral acute ſegments. Their ſurface is ſmooth, of a light green colour, whitiſh underneath; and they grow on pretty long footſtalks. The flowers come out in the ſpring, about the time of the Norway maple; and they are ſucceeded by long keys, which ſometimes ripen in England. 7. The Pennſylvanicum, or American mountain maple, which very much reſembles the ſugar maple, only its leaves are more pointed. 8. The opalus, or Italian maple; very common in moſt parts of Italy, particularly about Rome; but in Britain very rarely to be met with, though hardy enough to bear the open air. 9. The monſpeſulanum, or Montpelier maple, common in the ſouth of France, and in Italy; but hardly met with in Britain. The leaves reſemble thoſe of the common maple; but are of a much thicker ſubſtance, a ſhining green colour, and not ſo large. 10. The creticum, or Cretan maple, which grows naturally in the Levant: it ſomewhat reſembles the laſt ſpecies; but its leaves are of a much thinner texture, and their footſtalks covered with a ſoft hairy down; whereas thoſe of the other are ſmooth and ſoft.

Propagation and culture.]—1. By *ſeeds*. The firſt four pecies are eaſily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after ſown, about an inch and an half deep, in beds of common mould. In ſpring the plants will appear, and make a ſhoot of about a foot and an half by the autumn following, if the ground of the ſeminary be tolerably good, and they are kept free from weeds. The ſpring after they come up they ſhould be planted in the nurſery in rows two feet and an half aſunder, and their diſtance in rows muſt be one foot and an half. Here they

may remain till they are big enough to plant out finally, with no further trouble than taking off unſightly ſide-branches, and ſuch as have a tendency to make the tree forked, except digging between the rows, which muſt always be done every winter.—For the other ſpecies, their ſeeds, as they do not ripen in this country, ought to be procured from the places where they naturally grow. Trees raiſed from ſeeds will grow faſter, and arrive at greater height, than thoſe raiſed from layers: but they will not produce ſuch quantities of flowers; which makes the latter method more eligible for thoſe who want theſe plants for a low ſhrubbery.

2. By *layers*. All the ſpecies may be propagated by this method; though it is never practiſed for the common maple and the ſycamore. The young ſhoots may be laid down in the autumn, winter, or early in the ſpring. By the autumn following, they will have become good plants; and may be ſet out in the places where they are to remain.

3. By *cuttings*. This method, however, is chiefly practiſed on the aſh-leaved and Norway maples, which more readily take root this way. The cuttings ſhould be the bottom parts of the laſt year's ſhoots: They ſhould be taken off early in October, and planted in rows in a moiſt ſhady place. By the autumn they will be fit to remove into the nurſery.

4. By *budding*, *grafting*, and *inarching*. Theſe methods are only practiſed for the variegated ſorts and the large broad-leaved kind. The latter is to be continued no otherwiſe than by budding it on ſtocks of the common ſycamore; for, from the ſeeds, though ſo large themſelves, only the common ſycamore is produced.

In order to propagate theſe varieties by budding, let ſome plants of the common ſycamore, one year old, be taken out of the ſeminary, and ſet in the nurſery in rows a yard aſunder, and the plants about a foot and a half diſtance from each other in the rows. Let the ground be kept clean from weeds all ſummer, and *turned in* in the winter; and the ſummer following the ſtocks will be of a proper ſize to receive the buds, which ſhould be taken from the moſt beautifully-ſtriped branches. The beſt time for this work is the middle or latter end of Auguſt. Having then budded your ſtocks with the eyes or buds fronting the north, early in October, cut off the ſtock juſt above the bud, and dig the ground between the rows. The ſummer following, keep the ground clean from weeds; cut off all natural ſide buds from the ſtock; and by autumn, if the land is good, the buds will have formed themſelves into trees five or ſix feet high. They may be then removed into the places where they are deſigned to remain. Variegated plants in general muſt be planted in poor, hungry, gravelly, or ſandy ſoils, to feed the diſeaſe which occaſions theſe beautiful ſtripes, and cauſe it to be more powerful. But theſe trees ſhow their ſtripes in greater perfection in a good ſoil.

ACERB, a ſour rough aſtringency of taſte, ſuch as that of unripe fruit.

ACERNO, a town of Italy, with a biſhop's ſee. E. Long. 15. 46. N. Lat. 40. 50.

ACERINA, in ichthyology, a name given by Pliny and other of the old naturaliſts, to the fiſh we at this time call the *ruffe*. See PERCA.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a perſon deceaſed, on which his friends daily offered incenſe till his burial.—The real intention probably was to overcome any offenſive ſmell that might ariſe about the corpſe. The Chineſe have ſtill a cuſtom like this.

The *Acerra* alſo ſignified a little pot wherein were put the incenſe and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the ſame with what was otherwiſe called *thuribulum*, and *pyxis*.

We find mention of *Acerræ* in the ancient church. The Jews had alſo their *Acerræ*, in our verſion rendered *cenſers*; and the Romaniſts ſtill retain them under the name of *incenſe-pots*.

ACERRA, a town of Italy, ſeated on the river Agno. E. Long. 15. 10. N. Lat. 40. 55.

ACESCENT, a word uſed to denote any thing which is turning ſour, or which is ſlightly acid. It is only applied properly to the former of theſe two meanings. The ſecond may be expreſſed by either of two words, *acidulous* or *ſub-acid*.

ACESTRIDES, a name uſed among the Greeks for female phyſicians or midwives.

ACETABULUM, in antiquity, a meaſure uſed by the ancients, equal to one eighth of our pint. It ſeems to have acquired its name from a veſſel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another.

ACETABULUM, in botany, the trivial name of a ſpecies of the peziza, or cup-peziza, a genus belonging to the crypto gamia fungi of Linnæus. It has got the name of *acetabulum*, from the reſemblance its leaves bear to a cup. See PEZIZA.

ACETARY, a pulpy ſubſtance in certain fruits, *e. g.* the pear, which is incloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*. See RUMEX.

ACETOSELLA, in botany, a ſpecies of OXALIS.

ACETOUS, an epithet applied to ſuch ſubſtances as are ſour or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemiſts. See VINEGAR.

ACHALALACTLI, in ornithology, a ſpecies of king's-fiſher. See ALCEDO.

ACHANE, an ancient Perſian corn meaſure, containing 45 Attic midimni.

ACHAT, in law, implies a purchaſe or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, in natural hiſtory. See AGATE.

ACHEEN, ACHE', or ACHEN, a kingdom of Sumatra in the Eaſt Indies, ſituated on the north-weſtern part of the iſland.

A conſiderable fabric of a thick ſpecies of cotton cloth, and of ſtuff for the ſhort drawers worn both by Malays and Acheneſe, is eſtabliſhed here, and ſupplies an extenſive demand. They weave alſo very handſome ſilk pieces, of a particular form, for that part of the dreſs which is called by the Malays *cayen ſarrong*.

Achen was viſited by the Portugueſe in 1509, only 12 years after they had diſcovered the paſſage to the Eaſt-Indies by the Cape of Good Hope. They made various attempts to eſtabliſh themſelves in the country, but were expelled with diſgrace. See SUMATRA.

ACHERNER, or ACHARNER, a ſtar of the firſt magnitude in the ſouthern extremity of the conſtellation ERIDANUS, but inviſible in our latitude.

ACHERSET, an ancient meaſure of corn, conjectured to be the ſame as our quarter, or eight buſhels.

ACHIAR, is a Malayan word, which ſignifies all ſorts of fruits and roots pickled with vinegar and ſpice. The Dutch import from Batavia all ſorts of achiar, but particularly that of BAMBOO (See ARUNDO), a kind of cane, extremely thick, which grows in the Eaſt Indies. It is preſerved there whilſt

it is ſtill green, with very ſtrong vinegar and ſpice; and is called *bamboo-achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is uſed to expreſs the *fornix tholus*, or *ſudatorium* of the ancient baths: which was a hot room where they uſed to ſweat. It is alſo called *architholus*.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th *Compoſitæ diſcoides*.

The characters are: The common *calyx* ovate and imbricated, with ovate, acute, converging ſcales. The *compound corolla* is rayed; the hermaphrodite corollets are tubular in the diſc, the feminine linguiform and from 5 to 10 in the rays: The *proper corolla* of the hermaphrodites is funnel-ſhaped, expanded, and divided into 5 ſegments; that of the females, tongue-ſhaped, inverſely cordated, expanding, and of 3 ſegments. The *ſtamina* in the hermaphrodites conſiſt of 5 very ſhort capiliary filaments; the antheræ are cylindric and tubular. The *piſtillum* in the hermaphodites has a ſmall germen; the ſtylus is filiform, the length of the ſtamina; the ſtigma is obtuſe and end-notched: in the females, the germen is ſmall; the ſtylus is filiform; the ſtigmata are 2, obtuſe and reflected. The *pericarpium* is wanting; the calyx ſcarcely changed; the receptacle filiform, elongated at the diſc of the ſeeds, ovate, and twice as long as the calyx. The *ſeeds* are ſolitary, ovate, and furniſhed with a lock of wool; no pappus. The *receptaculum* is chaffy and elevated.

There are 20 ſpecies, all of which are eaſily propagated by ſeeds, ſown either in the ſpring or autumn, upon a bed of common earth. When the plants come up, and are ſtrong enough for tranſplanting, they ſhould be planted in beds in the nurſery, where they may continue till autumn, when they ſhould be tranſplanted to the places where they are to remain.

ACHILLEID, Achilleis, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of that hero.

ACHILLES, one of the greateſt heroes of ancient Greece, was the ſon of Peleus and Thetis, and a native of Phthia, in Theſſaly. He is ſuppoſed to have died 1183 years before the Chriſtian æra.

Tendo Achillis, in anatomy, is a ſtrong tendinous cord formed by the tendons of ſeveral muſcles, and inſerted into the os calcis. It has its name from the fatal wound Achilles is ſaid to have received in that part from Paris the ſon of Priam.

ACHIOTTE, or Achiotl, a foreign drug, uſed in dyeing, and in the preparation of chocolate. It is the ſame with the ſubſtance more uſually known by the name of Arnotto; which ſee.

ACHIROPŒTOS, a name given by ancient writers to certain miraculous pictures of Chriſt and the Virgin, ſuppoſed to have been made without hands.—The moſt celebrated of theſe is the picture of Chriſt, preſerved in the church of St. John Lateran at Rome; ſaid to have been begun by St. Luke, but finiſhed by the miniſtry of angels.

ACHMETSCHET, a town of the peninſula of the Crimea. Long. 51. 20. Lat. 45. 0.

ACHMIM, a large town of Upper Egypt, ſituated on the eaſtern bank of the Nile. Mr. Savary tells us of a ſerpent which is worſhipped here, and is the wonder of the country.

ACHONRY, a ſmall town of Ireland, in the county of Sligo, ſeated on the river Shannon.

ACHOR, in medicine, a ſpecies of Herpes.

Achor, in mythology, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene ſacrificed, in order to obtain deliverance from thoſe inſects and the diſorders occaſioned by them.

ACHRAS, or Sapota: a genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the 43d natural order, *Dumoſæ*.

The characters are: The *calyx* a perianthium, conſiſting of ſix ovate concave erect leaflets, the exterior ones broader and ſhorter, the interior ones coloured. The *corolla* is compoſed of one ovate petal, the height of the calyx; the border divided into ſix ſegments. The *ſtamina* have ſix ſhort ſubulated filaments at the throat of the corolla; and the antheræ are acute. The *piſtillum* has a roundiſh depreſſed germen; the ſtylus is ſubulated, and longer than the corolla; the ſtigma is obtuſe. The *pericarpium* is a globular twelve-celled pomum, with very ſoft fleſh. The ſeeds are ſolitary, ovate, and gloſſy. There are four ſpecies, all natives of the Weſt Indies.

ACHROMATIC, an epithet expreſſing want of colour. The word is Greek, being compounded of *α* privative, and *χρωμα colour*.

Achromatic *Teleſcopes*, are teleſcopes contrived to remedy the aberrations in colours; ſee Aberration.—A particular account of the invention and conſtruction of theſe inſtruments will be found under Optics.

ACHTELING, a meaſure for liquids, uſed in Germany. Thirty-two *achtelings* make a *beemer*; four *ſciltins* or *ſciltins*, make an *achteling*.

ACHYR, a ſtrong town and caſtle of the Ukrain, 127 miles W. of Kiow. Long. 36. 0. Lat. 49. 32.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia claſs of plants, and aſſociating with the *Miſcellaneæ*, in the 54th natural order.

The characters are: The *calyx* a double perianthium; the exterior one conſiſting of three lanced acute leaves, which are perſiſtent; the interior of five leaves, alſo perſiſtent. No *corolla*: The nectarium is five-valved, ſurrounding the germen, bearded at the top, concave, and falling off. The *ſtamina* conſiſt of five filaments the length of the corolla, the antheræ are ovate and incumbent. The *piſtillum* has a top-ſhaped germen; the ſtylus is filiform, and the length of the ſtamina; the ſtigma is villous, and divided into two ſegments. The *perianthium* is a roundiſh one-celled capſule, not gaping. The *ſeed* is ſingle and oblong.

Of this genus eight ſpecies are enumerated; but the character of the genus does not agree in them all.—The ſpecies are all natives of the Indies. Only one of them, the amaranthus, is commonly cultivated in botanical gardens, and that more for the ſake of variety than beauty.

ACICANTHERA, in botany, the trivial name of a ſpecies of Rhexia.

ACICULÆ, the ſmall pikes or prickles of the hedge-hog, echinus-marinus, &c.

ACIDOTON, in botany, the trivial name of a ſpecies of Adelia.

ACIDS, in chemiſtry, the name by which one of the general claſſes of ſalts are diſtinguiſhed. The characteriſtic marks of them are, 1. The peculiar taſte which we call ſour; though this does not hold univerſally: for the acid of arſenic has not this ſour taſte; nor are the volatile ſulphureous acids, or thoſe of *tungſten* and *molybdena*, very diſtinguiſhable in this way. 2. With water they combine into a fluid, the ſpecific gravity of which is not a medium betwixt the water and acid ſeparately taken. 3. With ſpirit of wine, they unite into a very volatile and inflammable ſubſtance, called *ether*. This however muſt be underſtood only of the ſtrong mineral acids, or of the acetous when concentrated. 4. They change the blue colour of

vegetables to red, and heighten the colour of thoſe which are already red. 5. They unite with all kinds of earths excepting the ſiliceous, with fixed and volatile alkalis, and with metals, ſo as to form compounds which cannot be ſeparated without ſome difficulty. This is their moſt univerſal and diſtinguiſhing mark. 6. When mixed with any fermentable liquor, they prevent that proceſs, or check it if already begun. This alſo muſt be underſtood only of the ſtronger acids. 7. They cannot be frozen but in cold below the freezing point. This property is alſo confined to the ſtronger acids.

The nature of acids has long been a matter of ſpeculation, and of late has engaged the attention of philoſophers very conſiderably. Some have ſuppoſed them to be ſimple chemical elements, while others imagined them to be compoſed of water and earth. But the late diſcoveries concerning air of different kinds have ſuggeſted a new theory, firſt publiſhed by M. Lavoiſier, and ſtrenuouſly maintained by the French chemiſts, *viz.* That the acid principle is contained in the air; which, according as it combines itſelf with different ſubſtances, forms acids of different denominations.

This theory he conſiders eſtabliſhed by indiſputable experiments; and his concluſions from the whole are, That "*dephlogiſticated air* enters as a conſtituent part into the compoſition of ſeveral acids, particularly the phoſphoric, vitriolic, and nitrous; that this pure and highly reſpirable air is the conſtitutive principle of acidity common to all acids; and that the difference by which they are diſtinguiſhed from each other is produced by the union of one or more principles beſides this air, ſo as to conſtitute the particular form under which each acid appears." To dephlogiſticated air in its ſtate of fixity, therefore, he gives the title of the *acidifying* or *oxygenous* principle; and concludes farther from his experiments, 1. "That, when combined with the matter of fire, heat, and light, this principle produces dephlogiſticated air; though he conſiders this poſition as not capable of abſolute demonſtration. It muſt not, therefore, be confounded with the following; which he ſays, are ſupported by experiment and poſitive proofs. 2. That the ſame acidifying principle, combined with phlogiſtic ſubſtances or charcoal, forms fixed air. 3. That with ſulphur it forms vitriolic acid. 4. That with nitrous air it forms nitrous acid. 5. That with Kunckel's phoſphorus it forms the phoſphoric acid. 6. With ſugar it forms the acid of ſugar, &c.

The opinion of Mr. Lavoiſier has in part been adopted by Mr. Kirwan; whoſe treatiſe in 1787, informs us, "that dephlogiſticated air becomes an eſſential conſtituent part of acids. All acids (he adds) conſiſt of two principles: one peculiar to each, which, in the opinion of the antiphlogiſtians, has not as yet been decompoſed, and conſequently muſt be looked upon, relatively to the preſent ſtate of our knowledge, as a ſimple ſubſtance: the other, *pure air*, in a concrete ſtate; that is, deprived of the greater part of its ſpecific heat, and condenſed into a ſmaller volume. The firſt they call the *acid baſis*; the laſt, the *oxygenous principle*: thus the vitriolic acid, according to them, conſiſts of ſulphur as its baſis, and pure air in a concrete ſtate as its acidifying or oxygenous principle. This doctrine has been admitted by ſome of the ableſt defenders of phlogiſton, and particularly by M. de Morveau, with this ſingle modification, that the baſes of acids contain phlogiſton, which they loſe on uniting to pure air: yet it ſeems very difficult to conceive how pure air can unite to phlogiſton, a ſubſtance to which it has the greateſt affinity, without forming a new compound endowed with very different properties from thoſe which it poſſeſſed before ſuch union. It ſeems therefore more reaſonable to conclude, either that it forms water as Mr. Cavendiſh thinks; or fixed air," as Mr. Kirwan afterwards endeavours to prove.

With regard to the nitrous acid, the experiments of Mr. Cavendiſh, as well as of the French chemiſts, leave no room to doubt that it is produced during the deflagration of dephlogiſticated and inflammable air. Mr. Cavendiſh has ſhown, that the nitrous acid may be formed by taking the electric ſpark in a mixture of three meaſures of phlogiſticated air and ſeven of dephlogiſticated air, or, in weight, one part of the former and about 2.6 of the latter. Mr. Kirwan is of opinion, that 100 grains of pure, dry, and colourleſs nitrous acid contain 38.17 grains of fixed air as its acidifying principle, 57.06 of nitrous baſis, and 4.77 of phlogiſton united to the nitrous baſis. With regard to the nitrous baſis itſelf, he ſays that one third of its weight is phlogiſticated and two thirds dephlogiſticated air, both in a concrete ſtate.

"Nitrous baſis (ſays Mr. Kirwan), ſaturated with phlogiſton, conſtitutes nitrous air: 100 grains of this baſis take up nearly 22 of phlogiſton. Hence the conſtituent principles of nitrous acid are fixed air, dephlogiſticated air, phlogiſticated air, and inflammable air, all in their concrete ſtate.

"Red, yellow, green, and blue nitrous acids, when thoſe colours are intenſe, owe their origin to the abſorption of nitrous air; and conſequently the proportion of their principles is variable, though all have the dephlogiſticated acid for their ground. From Dr. Prieſtley's experiments it appears, that nitrous vapour conſiſts of nitrous acid united to three or four times its weight of nitrous air and a little water."

To ſhow that nitrous air is not a conſtituent principle of the nitrous acid, but that fixed air is, Mr. Kirwan obſerves, that pure nitrous acid enters without decompoſition, into fixed alkalis, and forms nitre. Now if nitre be diſtilled in a good earthen retort, it will be wholly decompoſed; and ſo alſo will the acid itſelf, except a few drops which paſs in the beginning of the diſtillation, and nothing but dephlogiſticated air, more or leſs pure, and conſequently intermixed with phlogiſticated air and a ſlight proportion of fixed air, will be found: theſe, therefore, are its true conſtituent parts when diſengaged from ſubſtances that cannot communicate phlogiſton to it in any remarkable quantity, ſuch as alkalis and earths; but if it be ſeparated from ſubſtances that contain phlogiſton, ſuch as metals, it will then indeed be reſolved into nitrous air, and dephlogiſticated air more or leſs pure, the phlogiſton of the fixed air being detained by the metal. Mr. Berthollet, who ſeems to have made the experiment with the greateſt exactneſs, produced 714 cubic inches of dephlogiſticated air from a Troy ounce of nitre. This, however, was far from being of the pureſt kind; and Dr. Prieſtley, Mr. Berthollet, and Mr. Succow, obſerved, that the air which firſt paſſes contains fixed air, and renders lime-water turbid. Here then we have three of the conſtituent parts of the nitrous acid, with ſcarce any nitrous air; which the antiphlogiſtians ſuppoſe to be one of the conſtituent parts of the acid, and to make two-thirds of its bulk when exhibited in an aerial form."

To obviate an objection that the quantity of fixed air thus obtained is too ſmall to deſerve to be ranked among the conſtituent parts of the nitrous acid, Mr. Kirwan firſt enquires in what proportion it ought to exiſt there; and though this is variable, according to the different ſtates of the nitrous acid with reſpect to phlogiſtication, he reckons it at one third of the acid as exiſting in the nitre; and from the decompoſition of this fixed air, and the phlogiſton emitted by it of conſequence, he attributes the phlogiſtication and redneſs of the nitrous acid when expoſed to more heat. As a proof that fixed air may be decompoſed in this manner, he adduces two experiments of Dr. Prieſtley. In one of theſe, dephlogiſticated air was obtained by means of acetous acid in that concentrated ſtate in which it is called *radical vinegar*. Having mixed half an ounce of the acid with two ounces of calcined whiting, he ob-

tained from it 350 ounce measures of air; of which about one-third was fixed more in the first portions, and less in the last. The standard of the residuum in the first portions was 1.66, in the second 1.42, and in the third 1.38; which is very near the goodness of common air. The whiting then weighed 760 grains. On adding a quarter of an ounce more of radical vinegar, and repeating the operation, 120 ounce-measures of air were obtained, and the whiting was reduced to 730 grains. A third operation, in which another quarter of an ounce of vinegar was added, reduced the matter to 489 grains; but the last portion of air extracted had no fixed air, and was considerably better than that of the atmosphere.—The other experiment was made with lime-stone alone; from four ounces of the *white crystals* of which were obtained 830 ounce-measures of air, the first portion of which had only one-fourth of fixed air, and the standard of the residuum was never better than 1.56, nor worse than 1.66; so that it was nearly of the goodness of common air.

After detailing many other experiments, he says: "Here then are several ways of decomposing the nitrous acid; and in one only it is resolved into nitrous and dephlogisticated air; and in this way it may, at least, be strongly suspected to receive an addition of another principle. Why then should these be regarded as its constituent principles? And as in the two simplest methods of decomposition, in which the reaction of no foreign substance can be suspected, it appears in the form of dephlogisticated, phlogisticated, and fixed air (the former always containing a portion of the two last), why then should not these be accounted its true constituent parts?——This theory is further confirmed by reflecting on the manner in which nitrous acid is generated by nature. Mr. Thouvenel found that this acid is constantly produced when chalk is exposed to a mixture of putrid air and common air, or putrid and dephlogisticated air; but if the putrid air be passed through lime-water, it is never generated; and that it is rarely produced by the exposure of quick-lime or fixed alkalis to these airs. The reason that alkalis, though aërated, are not so proper, is, that they do not combine with phlogisticated air as calcareous earths do. Mr. Cavendish, indeed, produced nitrous acid without any apparent mixture of fixed air; but the atom of it necessary for the formation of the small quantity of nitrous acid he produced (about one-third of a grain), might well be contained in the phlogisticated air he employed, or perhaps formed in the operation."

We shall now notice some experiments made by Mr. Watt, in order to determine whether the dephlogisticated air produced from nitre really proceeds from a decomposition of the acid, or what quantity of the latter is required to constitute a determinate quantity of the former. To ascertain this, 240 grains of mercury were put into a glass retort with 480 grains of diluted dephlogisticated nitrous acid, which was the quantity necessary to dissolve the whole of the mercury; and as soon as the common air was expelled, a proper vessel was applied to receive the air produced in the operation. Sixteen ounce-measures of nitrous air came over during the solution, and on changing the receiver, a quantity of dilute, but highly phlogisticated nitrous acid, was obtained. The air receiver being again applied, four ounce-measures of strong and pure nitrous air were obtained, which, by the dephlogisticated air that arose immediately after, were reduced to half an ounce-measure. The production of dephlogisticated air continued very rapid, the mercury being all the while revived, until the operation was ended by the distillation or sublimation of the whole of the mercury. Two hundred and eighteen grains of the metal were obtained in its running form, and 22 remained in the form of an orange-coloured sublimate in the upper part of the retort. The 16 ounce-measures of nitrous air, first obtained, were then converted into nitrous acid by the gradual admission of common air, and then added to the water in the bason in which the receiver had been inverted; the whole quantity being about two quarts, and very acid to the taste, sparkling at the same time with nitrous air. To determine the quantity of acid thus recovered, as well as that which remained in the sublimate, a solution of alkali of tartar was made; and by experiment it was found, that 120 grains of the acid, originally employed in dissolving the mercury, saturated 352 grains of this solution; the orange-coloured sublimate and all the acid liquor recovered being saturated by 1395 grains of the same. Hence it appears, by the rule of proportion, that out of 480 grains of nitrous acid originally employed, only five were lost; "a smaller quantity (as Mr. Watt justly observes) than what might reasonably be supposed to be lost in the process by the extreme volatility of the nitrous acid." His conclusion therefore is, that "the nitrous acid does not enter into the composition of dephlogisticated air: it seems only to serve to absorb phlogiston from the watery part of the mercurial nitre."

This experiment was repeated with cubic nitre, and only 30 ounce-measures of air distilled from an ounce of the mineral alkali exactly saturated with nitrous acid. The water through which the air passed was acid, and the residuum in the retort alkaline; but on mixing the two together, the solution was found to be exactly neutral by every possible test.

Not satisfied with these experiments, Mr. Watt engaged in others which appeared to be still more decisive, but to which, as well as the foregoing, Mr. Kirwan replies—"This opinion is exposed to insurmountable difficulties. For, in the first place, nitre affords dephlogisticated air at the rate of 146.125 cubic inches for every 100 grains of nitre, which by the proper allowances for phlogisticated air, should weigh 46.77 grains; but then dephlogisticated air is only one of the constituent parts of water, for it contains 13 per cent. of inflammable air, that is to say, 87 grains of dephlogisticated air: to form 100 grains of water requires an addition of 13 grains of inflammable air; consequently 46.77 grains of dephlogisticated air require nearly 7 of inflammable air, and would then form 53.77 grains of water, which exceeds half the weight of the nitre; a quantity of water, as Mr. Watt owns, certainly inadmissible. Mr. Watt found, that the water over which the air proceeding from the decomposition of 960 grains of nitre had been received, contained only the acid belonging to 120 grains of nitre; and even this small quantity he inferred only from my experiments. But my experiments are totally inapplicable in this case; for I used only the dephlogisticated nitrous acid: and alkalis are saturable by a much smaller quantity of phlogisticated than of dephlogisticated acids, as is evident in the case of the *dephlogisticated marine* acid, as Stahl long ago observed; for he says, that the volatile acid of sulphur saturates ten times as much alkali as the fixed. Mr. Bergman and Mr. Scheele observe, that melted nitre is still neutral, though it be phlogisticated; therefore it is air, and not water, which it wants. Accordingly Dr. Priestley found it to injure common air by attracting its dephlogisticated part: but if it be kept in fusion for some time, it loses its acid, and becomes alkaline; and the air it receives must surely be deemed rather to recompose the acid than to form water; of whose formation, in the temperature of the atmosphere, we have no sort of proof. On the contrary, the impossibility of accounting for the loss of acid in this case is an evident proof of the fallacy of that hypothesis.—By Mr. Lavoisier's analysis, 100 grains of nitre contain 57 of caustic alkali; by Mr. Bergman's, 49; by Mr. Wenzel's, 52; by Mr. Wiegleb's, 46½; by mine, 63: the mean of all which is, 53½; which leaves 46.5 for acid and water, which is very nearly the weight of the air ex-

pelled. The different quantity of acid aſſigned by different perſons to nitre, is in part owing to its degree of phlogiſtication in nitre. I believe at preſent, that 100 grains of nitre contain 34 of acid and about 12 of water, including the water in the acid and that of cryſtallization."

Mr. Kirwan next proceeds to conſider the compoſition of the other acids.—The marine acid, according to him, conſiſts of a peculiar baſis united to phlogiſton, and a certain quantity of fixed air; to both of which the baſis ſeems to have a ſtrong affinity.

Mr. Lavoiſier, and other philoſophers, who deny the exiſtence of phlogiſton, are of opinion, that the common marine acid conſiſts of a peculiar baſis united to a ſmall proportion of pure air, or oxygenous principle, and the dephlogiſticated marine acid differs from it only by containing an exceſs of this principle.—This opinion they are chiefly induced to maintain, becauſe the acid in its dephlogiſticated ſtate is procured by diſtilling common marine acid from manganeſe; and the manganeſe, if diſtilled by itſelf, before the acid is diſtilled from it, affords dephlogiſticated air; but after the acid is diſtilled from it, it yields none.—"This experiment, however (ſays Mr. Kirwan), proves no more but that the manganeſe contains ſome air which is dephlogiſticated during the calcination. And that this air is fixed air, appears from the following conſiderations: The black calx of manganeſe almoſt always gives out fixed air at firſt, before any dephlogiſticated air appears; whence it is natural to think, that the dephlogiſticated air proceeds from the dephlogiſtication of the fixed. And hence, if it be diſtilled with filings of iron, or in a gun-barrel, it ſcarce gives out any other than fixed air; if at any time it gives out dephlogiſticated air with little or no mixture of fixed air, this is owing to a very perfect dephlogiſtication of the calx, and to its containing very little moiſture. Thus Dr. Prieſtley, having paſſed the ſteam of boiling water through manganeſe heated in an earthen tube, obtained a very large quantity of fixed air, and ſcarce any other; though on repeating this experiment with manganeſe well freed from calcareous earth, I obtained a large portion of dephlogiſticated air; but I believe much depends on the degree of heat to which the tube is ſubjected. But having diſtilled manganeſe, which yielded of itſelf ſome fixed air with common ſpirit of ſalt, I obtained dephlogiſticated marine acid, and not a particle of fixed air; which ſhows that this laſt combined with the dephlogiſticated baſis, and formed the dephlogiſticated acid."

Several other experiments are related by Mr. Kirwan, which the limits of this article will not allow us to inſert; but the following, he is of opinion, fully confirms his hypotheſis, and ſubverts that of the antiphlogiſtians. "Six cubic inches of inflammable air were mixed with as much dephlogiſticated marine air over lime-water. In about ten minutes after the greater part of the diminution had taken place, a white cloud appeared on the ſurface of the lime-water, and by agitation it became ſtill more turbid. As it was poſſible that the manganeſe might be mixed with calcareous earth, ſome dephlogiſticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly abſorbed, without forming the leaſt cloud, though there was lime enough; for, on adding aërated water, a cloud appeared."

The other acids particularly treated of by Mr. Kirwan are the phoſphoric and ſaccharine. In his treatiſe on the former, he adopts the analyſis of Mr. Lavoiſier, changing only his acid principle of dephlogiſticated for fixed air. From this it appears, that the phoſphoric acid conſiſts of a peculiar baſis united to 2.265 of its weight of the acid principle; or, in other words, 100 grains of dry phoſphoric acid contain about 69 of fixed air and 31 of its peculiar baſis: 100 grains of the phoſphoric baſis take up 226.5 of fixed air, or 32.9 of phlogiſton when it becomes phoſphorus; and 100 grains of phoſphorus contain 75.24 of baſis and 24.76 of phlogiſton.—The baſis of this acid is the only one that can be procured free, both from the phlogiſton and the acidifying principle; it is called, though improperly, as it is not ſoluble in water, the *glacial phoſphoric* acid. Mr. Lavoiſier and others are of opinion, that phoſphorus is a ſimple ſubſtance containing no phlogiſton, and that the acid conſiſts of the oxygenous principle united to it.

With regard to the acid of ſugar, Mr. Kirwan obſerves, that ſugar itſelf is a compound of fixed air with a much larger proportion of inflammable air, and ſome water, all condenſed to a degree of which we are ignorant, but retaining, upon the whole, much more ſpecific heat than either oil or charcoal; though he ſeems inclined to the hypotheſis of Mr. Morveau, that this ſubſtance has for its baſis a fine ethereal oil, to which a large proportion of condenſed inflammable air is ſuperadded. The acid of ſugar, then, according to him, conſiſts of this peculiar baſis deprived of its ſuperfluous phlogiſton, and united to a great quantity of fixed air in a concrete ſtate. He is alſo of opinion, that it does not exiſt ready formed in the ſugar, but is produced in the operations that ſubſtance undergoes: that it derives moſt of its acid principle from the nitrous acid employed; the nitrous baſis taking up the phlogiſton, and the fixed air of the nitrous acid combining with the ſaccharine baſis. He conteſts ſtrongly an opinion of Mr. Lavoiſier, that ſugar is a ſort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decompoſes it, ſets looſe the nitrous air, and forms the ſaccharine acid; and that, towards the end of the operation, the ſaccharine acid itſelf is decompoſed; the conſequence of which is the production of fixed air, which, according to him, is only the oxygenous principle combined with charcoal. Among other objections, Mr. Kirwan ſays, "If the acid of ſugar be diſtilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogiſticated air is found in it. It is not therefore reaſonable to look on either of them as its conſtituent principles; but as fixed air alone can be extracted from all vegetable acids, it ſeems to be the true acidifiable principle."

Having given a view of the preſent opinions relative to the original formation of acids, it remains to treat a little more particularly of each of the different kinds. They are divided into three different claſſes, expreſſive of their origin, viz. the Mineral, Vegetable, and Animal. The mineral acids are, thoſe of vitriol, nitre, ſea-ſalt, borax, amber, fluor, arſenic, tungſten, molybdena, &c. The vegetable are, thoſe of vinegar, tartar, ſugar, benzoin, apples, citrons, lemons, tamarinds, ſorrel, cork, &c. The animal acids are, the microcoſmic or acid of urine, and that of bones, both of which are alſo called the *phoſphoric*, though this might be accounted a vegetable acid, as it is procured by diſtilling muſtard and ſome other vegetables by a violent fire. Beſides theſe, there are the acids of ants, waſps, bees, ſilk-worms, milk, &c. It has alſo been diſcovered, that the human calculus is formed for the moſt part of a peculiar acid, which has received the name of *lithiaſic* acid. Laſtly, As an acid diſtinct from all theſe, we may now add *fixed air*, by ſome called the *aerial*, and by others the *cretaceous* acid: the latter appellation it derives from *creta*, chalk, becauſe it is found in that ſubſtance in great quantity. See AEROLOGY.

The general properties of acids have already been enumerated; the moſt remarkable of which is their attraction for alkaline ſalts, earths, and metals. Though this is common to all, yet very conſiderable differences are obſerved among them in this reſpect, and on thoſe differences depend almoſt all the phenomena of that part of CHEMISTRY which treats of

ſalts. As theſe phenomena are particularly conſidered under that article, we ſhall here only in general take notice, that the three acids, named the *vitriolic*, *nitrous*, and *marine*, are the ſtrongeſt of them all; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of the three acids juſt mentioned. Neither are theſe equal in power among themſelves; for the vitriolic is ſtronger than the nitrous, and the nitrous ſtronger than the marine. The rule, however, is liable to certain exceptions and variations, depending chiefly on the circumſtances of heat or cold, moiſture or dryneſs, and particularly on the ſtate of the marine acid with regard to its being in the form of an aqueous fluid or reduced to a dry vapour. In this laſt caſe it ſeems ſtronger than either the vitriolic or nitrous; and even when in an aqueous ſtate, both the nitrous and marine acids, when added in great quantity, ſeem to oppreſs and overwhelm the ſtronger vitriolic acid, ſo that they will partly expel it from an alkaline ſalt. This does not depend on the mere quantity of acidity they poſſeſs: for the acetous acid may be concentrated to ſuch a degree as to become ſtronger in this reſpect than ſpirit of ſalt; yet it will always be inferior in point of real ſtrength, when tried with an alkali in competition with the latter. The aerial acid is the weakeſt of all; and may be expelled not only by vinegar, but by the acid juices of fruits, tartar, and the acids of tungſten and molybdena.

Some acids have the property of reſiſting the fire, and melting into a kind of glaſs, ſuch as that of borax and phoſphorus. This circumſtance gives them an advantage over the ſtronger acids which are volatile; and thus the two juſt mentioned, as well as thoſe of arſenic and tungſten, will, in a very ſtrong heat, expel the acid of vitriol itſelf, though the latter will, in the cold, expel any one of them with great eaſe.

Both the vitriolic and nitrous acids have a very ſtrong attraction for phlogiſton; and unite with certain oily and inflammable matter ſo vehemently as to occaſion great heat, and ſometimes even violent and unextinguiſhable flame. This is particularly the caſe with the nitrous acid, or with a mixture of the two; and indeed the nitrous acid, though weaker than the vitriolic, ſhows itſelf in every inſtance to be far more active, and to perform all its operations with vaſtly greater rapidity, than the other. All theſe however fall under the articles CHEMISTRY, &c.

ACIDULOUS denotes a thing that is ſlightly *acid*; it is ſynonymous with the word *ſub-acid*.

ACIDULÆ. Mineral waters that contain a briſk ſpirit, when unaccompanied with heat, are thus named; but if they are hot alſo they are called THERMÆ. See MINERAL WATERS.

ACIDULATED, a name given to medicines that have an acid in their compoſition.

ACIDUM AEREUM, the ſame with *Fixed* AIR.

ACIDUM *pingue*, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalis, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their fixed air.

ACINACES, in antiquity, a kind of ſcymetar or cutlaſs uſed among the Perſians.

ACINODENDRUM, in botany, the trivial name of a ſpecies of MELASTOMA.

ACINOS, in botany, the trivial name of a ſpecies of THYMUS.

ACINUS, or ACINI, the ſmall protuberances of mulberries, ſtrawberries, &c. and by ſome applied to grapes. Generally it is uſed for thoſe ſmall grains growing in bunches, after the manner of grapes, as *Liguſtrum*, &c.

ACKNOWLEDGMENT-MONEY, a certain ſum paid by tenants, in ſeveral parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of miſſive weapon, with a thong affixed to it, whereby to draw it back. Moſt authors deſcribe it as a ſort of dart or javelin; but Scaliger makes it roundiſh or globular, and full of ſpikes, with a ſlender wooden ſtem to poiſe it by.

ACLOWA, in botany, a barbarous name of a ſpecies of COLUTEA. It is uſed by the natives of Guinea to cure the itch.

ACME, is uſually applied to the maturity of an animal juſt before it begins to decline; and phyſicians have uſed it to expreſs the criſis of a diſeaſe.

ACMELLA, in botany, the trivial name of a ſpecies of SPILANTHUS.

ACNIDA, VIRGINIAN HEMP, in botany, a genus of the diœcia pentandria claſs of plants, and, in the Natural Order, aſſociating with the *Scabridæ*. (53.) The characters are: In the *male*, the *calyx* is a perianthium conſiſting of five leaves, ovate, concave, acute, and membranous on the margin. No *corolla*. The *ſtamina* conſiſt of five very ſhort capillary filaments; the antheræ are verſatile, two-celled, and forked at both ends.—*Female* on a ſeparate plant; of which the *calyx* conſiſts of an involucrum many-leaved, linear, and deciduous; and a perianthium two-leaved, very ſmall, and perſiſtent. No *corolla*. The *piſtillum* has an ovate germen; the ſtyli are five, long, reflected, and downy; the ſtigmata are ſimple. The *pericarpium* is an egg-ſhaped fruit, compreſſed, many-angled, ſulcated, and covered with a ſucculent calyx. The *ſeed* is ſolitary, round, and compreſſed. There is only one ſpecies of it, viz. the acnida cannabina. It is a native of Virginia; but rarely cultivated in Europe.

ACNUA, in Roman antiquity, ſignified a certain meaſure of land, near about the Engliſh rood, or fourth part of an acre.

ACOEMETÆ, or ACOEMETI, in church-hiſtory, a ſet of monks who chanted the divine ſervice night and day in their places of worſhip. They divided themſelves into three bodies, who alternately ſucceeded one another, ſo that their churches were never ſilent. This practice they founded upon the precept, *Pray without ceaſing*. They flouriſhed in the Eaſt about the middle of the 5th century.

ACOLUTHI, or ACOLUTHISTS, in antiquity, was an appellation given to thoſe perſons who were ſteady and immoveable in their reſolutions; and hence the ſtoics, becauſe they would not forſake their principles, acquired the title of Acoluthi. The word is Greek, and compounded of α priv. and κολεύθω, way; as never turning from the original courſe.

ACOLUTHI, among the ancient Chriſtians, implied a peculiar order of the inferior clergy in the Latin church. At their ordination, a taper was given them, thereby to underſtand, that they were appointed to light the candles of the church: as alſo an empty pitcher, to imply that they were to furniſh wine for the euchariſt. Some think they had another office, that of attending the biſhop wherever he went.

ACOLYTHIA, denotes the office or order of divine ſervice; or the prayers, ceremonies, hymns, &c. of the Greek church.

ACOMA, a town of North America, in New Mexico. W. Long. 104. 15. Lat. 35. 0.

ACOMAC, the name of a county in Virginia. It is on the eaſtern ſide of the Cheſapeak bay, on a ſlip of land, by the Virginians called the *eaſtern ſhore*.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great eſteem among the natives for its virtues in the ſmall-pox. The leaves are opake;

as ſtiff as thoſe of the philyrea; grow in pairs, and ſtand on ſhort foot-ſtalks. They are ſmall at each end; broad in the middle; and the largeſt of them are about three inches in length, and an inch and quarter in breadth in the middle. Like thoſe of our *bay*, they are of a duſky colour on the upper ſide, and of a pale green underneath.

ACONITE. See ACONITUM.

Winter ACONITE. See HELLEBORUS.

ACONITI, in antiquity, an appellation given to ſome of the ATHLETÆ, but differently interpreted. Mercurialis underſtands it of thoſe who only anointed their bodies with oil, but did not ſmear themſelves over with duſt, as was the uſual practice.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD; a genus of the trigynia order, belonging to the polyandria claſs of plants. In the natural order, it aſſociates with the *Multiſiliquæ*, 26. The characters are: There is no *calyx*: The *corolla* conſiſts of five unequal petals oppoſite in pairs; the higheſt helmet-tubed, inverted, and obtuſe; the two lateral ones, broad, roundiſh, oppoſite, and converging; the two loweſt, oblong, and looking downwards: The *nectaria* are two, piped, nodding, and ſitting on long ſubulated peduncles, and concealed under the higheſt petal: The ſcales are ſix, very ſhort, coloured, and in an orb with the nectaria: The *ſtamina* conſiſt of numerous ſmall ſubulated filaments; the antheræ are erect and ſmall: The *piſtillum* has three [five] oblong germens, ending in ſtyli the length of the ſtamina; the ſtigmata are ſimple and reflected: The *pericarpium* has three or five univalve capſules gaping inward: The *ſeeds* are numerous, angular, and wrinkled.

Species. 1. The lycoctonum, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the ſeaſon is not warm will continue in flower till Auguſt. 2. The altiſſimum, or greateſt yellow wolfsbane, grows upwards of four feet high, and the ſpikes of its flower are much longer in this ſort than the former. 3. The variegatum, or leſſer wolfsbane, ſeldom grows more than two feet high; it carries blue flowers, and the ſpikes of them are much ſhorter than either of the two laſt. 4. The anthora, or wholeſome wolfsbane, flowers in the middle of Auguſt, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful ſulphur-yellow colour. 5. The napellus, bears large blue flowers, which appear in Auguſt, and make a pretty appearance. 6. The pyramidale, or common blue monkſhood, bears a long ſpike of blue flowers, which appear ſooner than any of the other ſorts, being ſo early as June, or ſometimes even May. The ſpikes of flowers are upwards of two feet long, ſo that it makes a pretty appearance: the ſeeds are ripe in September. 7. The alpinum, or large-flowered monkſhood, flowers in Auguſt, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each ſpike. 8. The pyreniacum, or Pyrenean monkſhood, flowers in July. It grows about four feet high, and carries a long ſpike of yellow flowers. 9. The cammarum, grows about four feet high, and flowers in the beginning of July. 10. The orientale, or eaſtern monkſhood, grows ſometimes more than ſix feet high, and bears a white flower.

Culture. All theſe ſpecies, except the laſt, being natives of the Alps, the mountains of Germany, Auſtria, and Tartary; require a cool ſhady ſituation, except the wholeſome wolfsbane, which muſt have an open expoſure. They thrive better in a moiſt than dry ſoil: but the ground muſt not be ſo wet as to have the water ſtanding near their roots in the winter-time. They may all be propagated by ſowing their ſeeds in autumn, upon a north border, where they are ſcreened from the ſun.

Qualities. An extract prepared from this plant, has been employed in medicine, for thoſe diſeaſes in which hemlock is ſaid to be of ſervice. Its effects indeed are a good deal ſimilar, and the precautions in adminiſtering it by very gradual and increaſing doſes, are exactly the ſame. Many properties have been attributed to this plant which are idle and fabulous, and therefore not worth enumerating. Since the time of Theophraſtus, moſt of the ſpecies of monkſhood have been reckoned deadly poiſon both to men and brutes; and Miller aſſerts that the huntſmen of the wolves and other wild beaſts on the Alps, dip their arrows into the juice, which renders the wounds made by them deadly.

That the *anthora* is an antidote to the poiſon of the reſt of the ſpecies, is not ſufficiently eſtabliſhed. Of the effects of vegetable poiſons, medical writers give but a confuſed account. In general, thoſe which do not excite violent vomiting and purging, produce their pernicious effects by their narcotic action on the ſtomach. The proper cure is evacuation by vomit: but this is not to be obtained in general, becauſe of an inſenſibility in the ſtomach, which no emetics at preſent known will overcome. On account of the poiſonous qualities of monkſhood, no ſpecies of it ſhould be planted where children have acceſs, leſt they ſhould ſuffer by putting the leaves or flowers in their mouths.

ACONTIAS, in zoology, an obſolete name of the anguis jaculis, or dart-ſnake, belonging to the order of amphibia ſerpentes. See ANGUIS.

ACONTIUM, ἀκόντιον, in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACORN, the fruit of the oak-tree. See QUERCUS.

ACORN, in ſea-language, a little ornamental cone, fixed above the vane, on the maſt-head. It is uſed to keep the vane from being blown off.

ACORUS, CALAMUS AROMATICUS, SWEET FLAG, or SWEET RUSH: a genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the ſecond natural order, *Piperitæ*. The characters are: The *calyx* is a cylindric ſimple ſpadix covered with florets: There is no *ſpatha*, nor *perianthium*: The *corolla* is compoſed of ſix obtuſe, concave, looſe petals: The *ſtamina* conſiſt of ſix thickiſh filaments, ſomewhat longer than the corolla; the antheræ are thickiſh and didymous: The *piſtillum* has a gibbous oblong germen the length of the ſtamina; no ſtylus; the ſtigma a prominent point: The *pericarpium* is a ſhort triangular, obtuſe, three-celled capſule, attenuated at both ends: The *ſeeds* are numerous, and of an oblong egg-ſhape.

There is but one ſpecies, the acorus calamus. It grows plentifully in marſhy places about Norwich and other parts of this iſland; in the canals of Holland, in Switzerland, and in other countries of Europe. The leaves are ſometimes two feet long, narrow, compreſſed, ſmooth, and of a bright green, terminating in a point; the root is pretty long, of a whitiſh, reddiſh, and partly greeniſh colour. Among the leaves there ariſes a ſingle one, thicker and more robuſt than the reſt, furrowed on the ſurface, and of a paler green. On this grow frequently two ſpikes of flowers, by many writers called *juli*. Theſe are of a brown colour, having a checquered ſurface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It has a warm, pungent, bitteriſh taſte; and is frequently uſed as an ingredient in bitters.

The acorus never flowers unleſs it grows in water, and in an open ſituation. The flowers appear the latter end of June, and continue till Auguſt.

ACORUS, in the materia medica, a name ſometimes given to the great galangal. See KEMPFERIA.

ACORUS, a blue coral, very ſcarce; ſometimes fiſhed on the coaſts of Africa. This coral is part of the merchandiſe which the Dutch trade for with the Camarones.

ACOSTAN, a mountainous iſland in the north ſeas between Aſia and America, obſerved by Captain Cook.

ACOUSMATICI, ſometimes alſo called *Acouſtici*, in Grecian antiquity, ſuch of the diſciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, or the doctrine of ſounds.

ACOUSTIC *Duct*, in anatomy, the external paſſage of the ear. See ANATOMY.

ACOUSTIC *Inſtrument*, an auricular tube or other mechanical contrivance to aſſiſt the hearing. See ACOUSTICS.

ACOUSTIC *Veſſels*, in the ancient theatres, were a kind of veſſels made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of theatres, which were even 400 feet in diameter.

ACOUSTIC *Diſciples*, among the ancient Pythagoreans, thoſe more commonly called ACOUSMATICI.

ACOUSTICS,

AS as a ſcience, inſtructs us in the nature of ſound. As no ſounds can be heard in *vacuo*, it is evident, that air is a vehicle for ſound. However, we muſt not aſſert, that it is the only vehicle; for water, metals, and almoſt all ſubſtances of any denſity of texture, will not only tranſmit ſound, but even convey it more readily and perfectly than air, which is by no means a good vehicle. Fiſhes have a ſtrong perception of ſounds, even at the bottom of deep rivers. From hence, it would ſeem not to be very material in the propagation of ſounds, whether the fluid which conveys them be elaſtic or otherwiſe. One thing however is certain, that whether the medium be elaſtic or not, whatever ſound we hear is produced by a ſtroke, which the ſounding body makes againſt the fluid, whether air or water. The fluid being ſtruck upon, carries the impreſſion forward to the ear, and there produces its ſenſation. But the manner in which this conveyance is made, is ſtill diſputed: Whether the ſound be diffuſed into the air, in circle beyond circle, like the waves of water when we diſturb the ſmoothneſs of its ſurface by dropping in a ſtone; or whether it travels along, like rays diffuſed from a centre, ſomewhat in the ſwift manner that electricity runs along a rod of iron; are queſtions which greatly have divided the learned.

Newton was of the firſt opinion. He has explained the progreſſion of ſound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of ſome inſects, we ſhall have a tolerable notion of the progreſſion of ſound upon this hypotheſis. The worm for inſtance, in its motion, firſt carries its contractions from the hinder part, in order to throw its fore part to the proper diſtance, then it carries its contractions from the fore part to the hinder to bring that forward. Something ſimilar to this is the motion of the air when ſtruck upon by a ſounding body, as the ſtring of an harpſichord ſcrewed to a proper pitch, and made to vibrate by a ſtroke of the finger. From an impreſſion thus made, there will be an alternate condenſation and relaxation of the air during the time of one vibration; and as the air going forward ſtrikes any oppoſing body with greater force than upon retiring, ſo each of theſe accelerated progreſſions has been called by Newton a *pulſe* of ſound. Theſe pulſes will move every way; for all motion impreſſed upon fluids in any direction whatſoever, operates all around in a ſphere: ſo that ſounds will be driven in all directions, and will go on ſucceeding each other, one on the outſide of the other, like circles in diſturbed water; or rather, they will lie one without the other, like the coats of an onion.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of theſe pulſes of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. And it muſt be obſerved, that as each of theſe pulſes is formed by a ſingle vibration of the ſtring, they muſt be equal to each other; for the vibrations of the ſtring are known to be ſo.

The velocity with which ſounds travel, Newton determines to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. He proves that each little part moves backward and forward like a pendulum; and demonſtrates, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth, a pendulum, that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of the velocity with which ſounds travel. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute; a proportion which experience had eſtabliſhed nearly before.

Various objections, however, have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward through water, which is not elaſtic. To explain their progreſs therefore through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to true philoſophy and the ſimplicity of nature. It is further urged, that this ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience that it is almoſt 13 miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means, we ſhould hear nothing but a medley of diſcord and broken articulations. Theſe objections have given riſe to the following theory:

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon the fluid in one direction, is diffuſed upon its ſurface into all directions; ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere, and is heard on every ſide. Now, as to the pulſes, which a ſounding body is known to make, each pulſe (ſay the ſupporters of this theory) is itſelf a diſtinct and perfect ſound, and the interval between every two pulſes is profoundly ſilent. Continuity of ſound from the ſame body is only a deception of the hearing; for as each diſtinct ſound ſucceeds at very ſmall intervals, the organ has no time to

tranſmit its images with equal ſwiftneſs to the mind, and the interval is thus loſt to ſenſe: juſt as when children run with their ſticks along a rail, a continuing ſound is thus repreſented, though the ſtroke againſt each is perfectly diſtinct.

According to this theory, therefore, the pulſes are nothing more than diſtinct ſounds repeated by the ſame body, the firſt ſtroke or vibration being ever the loudeſt, and travelling farther than thoſe that follow; while each ſucceeding vibration gives a new ſound, but with diminiſhed force, till at laſt the pulſes decay away totally, as the force decays that gives them exiſtence.

Some bodies wanting elaſticity, give back no repetition of ſound; the noiſe is at once begotten and dies: while other bodies, more elaſtic and capable of vibration, give back a ſound, and repeat it ſeveral times ſucceſſively. Theſe laſt are ſaid to have a *tone*. This tone of the elaſtic ſtring, or bell, is notwithſtanding nothing more than a ſimilar ſound of what the former bodies produced, but with the difference of being many times repeated. So that, if we would give the former bodies a tone, it will be neceſſary to make them repeat their ſound, by repeating our blows ſwiftly upon them.

Let us now ſuppoſe, that by ſwift and continued ſtrokes we give a non elaſtic body its tone: it is very obvious, that no alterations will be made in this tone by the quickneſs of the ſtrokes, though repeated ever ſo faſt. Theſe will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be ſmall, for the tones of inflexible bodies are capable but of ſmall variation; however, there will certainly be a difference. The table on which we write, for inſtance, will return a different ſound when ſtruck with a club, from what it did when ſtruck only with a ſwitch. Thus non-elaſtic bodies return a difference of tone, not in proportion to the ſwiftneſs with which their ſound is repeated, but in proportion to the greatneſs of the blow which produces it: for in two equal non-elaſtic bodies, that body produces the deepeſt tone which is ſtruck by the greateſt blow.

We now then come to a critical queſtion: What is it that produces the difference of tone in two elaſtic ſounding bells or ſtrings? Or what makes one deep and the other ſhrill? This queſtion has been anſwered by ſaying, that the depth or height of the note proceeded from the ſlowneſs or ſwiftneſs of the times of the vibrations. The ſloweſt vibrations, it has been ſaid, are qualified for producing the deepeſt tones, while the ſwifteſt vibrations produce the higheſt tones. In this caſe an effect has been given for a cauſe. It is in fact the force with which the ſounding ſtring ſtrikes the air when ſtruck upon, that makes the true diſtinction in the tones of ſounds. It is this force, with greater or leſs impreſſions, reſembling the greater or leſs force of the blows upon a non-elaſtic body, which produces correſpondent affections of ſound. The greateſt forces produce the deepeſt ſound: the high notes are the effect of ſmall efforts. In the ſame manner a bell, wide at the mouth, gives a grave ſound; but if it be very maſſy withal, that will render it ſtill graver; but if maſſy, wide, and long or high, that will make the tone deepeſt of all.

Thus then will elaſtic bodies give the deepeſt ſound, in proportion to the force with which they ſtrike the air; but if we ſhould attempt to increaſe their force by giving them a ſtronger blow, this will be in vain; they will ſtill return the ſame tone; for ſuch is their formation, that they are ſonorous only becauſe they are elaſtic, and the force of this elaſticity is not increaſed by our ſtrength, as the greatneſs of a pendulum's vibration will not be increaſed by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepeſt tones, it has been found, from the nature of elaſtic ſtrings, that the longeſt ſtrings have the wideſt vibrations, and conſequently go backward and forward ſloweſt; while, on the contrary, the ſhorteſt ſtrings vibrate the quickeſt, or come and go in the ſhorteſt intervals. From hence thoſe who have treated of ſounds, have aſſerted, as was ſaid before, that the tone of the ſtring depended upon the length or the ſhortneſs of the vibrations. This, however, is not the caſe. One and the ſame ſtring, when ſtruck, muſt always, like the ſame pendulum, return preciſely ſimilar vibrations; but it is well known, that one and the ſame ſtring, when ſtruck upon, does not always return preciſely the ſame tone: ſo that in this caſe the vibrations follow one rule, and the tone another. The vibrations muſt be invariably the ſame in the ſame ſtring, which does not return the ſame tone invariably, as is well known to performers on the violin, who can alter the tone of a ſtring an octave, by a ſofter method of drawing the bow; and theſe are called *flute-notes*. The only reaſon, it has been alleged, that can be aſſigned for this, muſt certainly be the different force of the ſtrokes made upon the air. In one caſe, it has double the tone of the other; becauſe upon the ſoft touches of the bow, only half its elaſticity is put into vibration.

This being underſtood (continue the authors of this theory), we ſhall be able clearly to account for many things relating to ſound that have hitherto been inexplicable. From hence alſo we may account for the cauſe of thoſe charming, melancholy gradations of ſound in the Eolian lyre; an inſtrument eaſily made, being nothing more than a long narrow box of thin deal, about 30 inches long, 5 inches broad, and $1\frac{1}{4}$ inches deep, with a circle in the middle of the upper ſide or belly about $1\frac{1}{2}$ inch diameter, pierced with ſmall holes. On this ſide are from ſeven to fifteen ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up with ſcrew-pins (Pl. 1. Fig. 1.) The ſtrings are all tuned to the ſame note; and the inſtrument is placed in ſome current of air, ſuch as a window with the ſaſh juſt raiſed. The air bruſhing the ſtrings, will excite different tones of ſound, and ſometimes bring out all the tones in full concert, ſo as to occaſion very pleaſing gradations of ſound.

It remains, laſtly, to conſider (by this theory) what the muſicians call the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſs catches the ſtring at very ſmall intervals, and excites its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant: to remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

By the ſame theory (it is alleged) may all the phenomena of muſical ſounds be eaſily explained.—Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral

hammers of different weights or forees. The hammer, which is double that of another, upon ſtriking the anvil will produce a ſound double that of the other: this double ſound muſicians have agreed to call an Octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore very readily compared. Suppoſe that an hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, ſuppoſe that an hammer four times leſs than the firſt ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes, and ſo alſo of the ſeventh, inſomuch that the ear cannot always readily and at once determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds happineſs in exact and ſtriking, and eaſily made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the differences of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and two, than of two ſounds which are as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite; but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition.

Let us now then ſuppoſe a ſtringed inſtrument fitted up in the order mentioned above. For inſtance: Let the firſt ſtring be twice as long as the ſecond; let the third ſtring be three times ſhorter than the firſt; let the fourth be four times, the fifth ſtring five times, and the ſixth ſix times as ſhort as the firſt. Such an inſtrument would probably give us a repreſentation of the lyre as it came firſt from the hand of the inventor. This inſtrument will give us all the ſeven notes following each other, in the order in which any two of them will accord together moſt pleaſingly; but yet it will be a very inconvenient and a very diſagreeable inſtrument: inconvenient, for in a compaſs of ſeven ſtrings only, the firſt muſt be ſeven times as long as the laſt; and diſagreeable, becauſe this firſt ſtring will be ſeven times as loud alſo; ſo that when the tones are to be played in a different order, loud and ſoft ſounds would be intermixed with moſt diſguſting alternations. In order to improve the firſt inſtrument, therefore, ſucceeding muſicians very judiciouſly threw in all the other ſtrings between the two firſt, or, in other words, between the two octaves, giving to each, however, the ſame proportion to what it would have had in the firſt natural inſtrument. This made the inſtrument more portable, and the ſounds more even and pleaſing. They therefore diſpoſed the ſounds between the octave in their natural order, and gave each its own proportional dimenſions. Of theſe ſounds, where the proportion between any two of them is moſt obvious, the concord between them will be moſt pleaſing. Thus octaves, which are as two to one, have a moſt harmonious effect; the fourth and fifth alſo ſound ſweetly together, and they will be found, upon calculation, to bear the ſame proportion to each other that octaves do. Let us then ceaſe to aſſign the coincidences of vibrations as the cauſe of harmony, ſince theſe coincidences in two ſtrings vibrating at different intervals, muſt at beſt be but fortuitous; whereas concord is always pleaſing.

But there is another property in the vibration of a muſical ſtring not yet taken notice of, and which is alleged to confirm the foregoing theory. If we ſtrike the ſtring of an harpſichord, or any other claſtic ſounding chord whatever, it returns a continuing ſound. This till of late was conſidered as one ſimple uniform tone; but all muſicians now confeſs, that inſtead of one tone it actually returns four tones, and that conſtantly. The notes are, beſide the fundamental tone, an octave above, a twelfth above, and a ſeventeenth. One of the baſs-notes of an harpſichord has been diſſected in this manner by Rameau, and the actual exiſtence of theſe tones proved beyond a poſſibility of being controverted.

In the whole theory of ſounds, nothing has given greater room for ſpeculation, conjecture, and diſappointment, than this amazing property in elaſtic ſtrings. The whole ſtring is univerſally acknowledged to be in vibration in all its parts, yet this ſingle vibration returns no leſs than four different ſounds. They who account for the tones of ſtrings by the number of their vibrations, are here at the greateſt loſs; yet if we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an eaſy ſolution. Theſe ſounds, though they ſeem to exiſt together in the ſtring, actually follow each other in ſucceſſion: while the vibration has greateſt force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almoſt only inſtantaneouſly; to this ſucceeds, with diminiſhed force, the twelfth; and, laſtly, the ſeventeenth is heard to vibrate with great diſtinctneſs, while the three other tones are always ſilent. Theſe ſounds, thus excited, are all of them the harmonic tones, whoſe differences from the fundamental tone are, as was ſaid, ſtrong, and diſtinct. On the other hand, the diſcordant tones cannot be heard. Their differences being but very ſmall, they are overpowered, and in a manner drowned in the tones of ſuperior difference: yet not always neither; for Daniel Bernouilli has been able, from the ſame ſtroke, to make the ſame ſtring bring out its harmonic and its diſcordant tones alſo. So that from hence we may juſtly infer, that every note whatſoever is only a ſucceſſion of tones; and that thoſe are moſt diſtinctly heard, whoſe differences are moſt eaſily perceivable.

To this theory, however, though it has a plauſible appearance, there are ſtrong and indeed inſuperable objections. The very fundamental principle of it is falſe. No body whatever, whether claſtic or non-elaſtic, yields a graver ſound by being ſtruck with a larger inſtrument, unleſs either the ſounding body, or that part of it which emits the ſound, is enlarged. In this caſe, the largeſt bodies always return the graveſt ſounds.

In ſpeaking of elaſtic and non-elaſtic bodies in a muſical ſenſe, we are not to puſh the diſtinction ſo far as when we ſpeak of them philoſophically. A body is *muſically* elaſtic, all of whoſe parts are thrown into vibrations ſo as to emit a ſound when only part of their ſurface is ſtruck. Of this kind are bells, muſical ſtrings, and all bodies whatever that are conſiderably hollow.—Muſical non-elaſtics are ſuch bodies as emit a ſound only from that particular place which is ſtruck: thus, a table, a plate of iron nailed on wood, a bell ſunk in the earth, are all of them non-elaſties in a muſical ſenſe, though not philoſophically ſo. When a ſolid body, ſuch as a log of wood, is ſtruck with a ſwitch, only that part of it emits a ſound which comes in contact with the ſwitch; the note is acute and loud, but would be no leſs ſo though the adjacent parts of the log were removed. If, inſtead of the ſwitch, a heavier or larger inſtrument is made uſe of, a larger portion of its ſurface then returns a ſound, and the note is

conſequently more grave; but it would not be ſo, if the large inſtrument ſtruck with a ſharp edge, or a ſurface only equal to that of the ſmall one.

In ſounds of this kind, where there is only a ſingle thwack, without any repetition, the immediate cauſe of the gravity or acuteneſs ſeems to be the quantity of air diſplaced by the ſounding body; a large quantity of air diſplaced, produces a grave ſound, and a ſmaller quantity a more acute one, the force wherewith the air is diſplaced ſignifying very little.—What we here advance is confirmed by ſome experiments made by Dr. Prieſtley, concerning the *muſical tone* of electrical diſcharges. Theſe ſhow how much the gravity or acuteneſs of ſounds depends on the quantity of air put in agitation by the ſounding body. We know that the noiſe of the electric exploſion ariſes from the return of the air into the vacuum produced by the electric flaſh. The larger the vacuum, the deeper is the note: for the ſame reaſon, the diſcharge of a muſket produces a more acute note than that of a cannon; and thunder is deeper than either.

Beſides this, however, other circumſtances concur to produce different degrees of gravity or acuteneſs in ſounds. The ſound of a table ſtruck upon with a piece of wood, will not be the ſame with that produced from a plate of iron ſtruck by the ſame piece of wood, even if the blows ſhould be exactly equal, and the iron perfectly kept from vibrating.—Here the ſounds are generally ſaid to differ in their degrees of acuteneſs, according to the ſpecific gravities or denſities of the ſubſtances which emit them. Thus gold, which is the moſt denſe of all metals, returns a much graver ſound than ſilver; and metalline wires, which are more denſe than therms, return a proportionably greater ſound.—But neither does this appear to be a general rule in which we can put confidence.

In bodies muſically elaſtic, the whole ſubſtance vibrates with the ſlighteſt ſtroke, and therefore they always give the ſame note whether they are ſtruck with a large or with a ſmall inſtrument; ſo that ſtriking a part of the ſurface of any body muſically elaſtic is equivalent, in it, to ſtriking the whole ſurface of a non-elaſtic one. If the whole ſurface of a table was ſtruck with another table, the note produced would be neither more nor leſs acute whatever force was employed; the ſound would indeed be louder in proportion to the force employed, but the gravity would remain the ſame. In like manner, when a bell, or muſical ſtring, is ſtruck, the whole ſubſtance vibrates, and a greater ſtroke cannot increaſe the ſubſtance.—Hence we ſee the fallacy of what is ſaid concerning the Pythagorean anvils.

Laſtly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonies of the note to which the ſtring is tuned. The *flute notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, though at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge.

Though theſe objections ſeem ſufficiently to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin than when faſtened to a plain board, &c.—In the ſound of a bell we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly; the ſound would indeed become more ſimple, but would ſtill preſerve the ſame tone.—In muſical ſtrings the reverberations are vaſtly more quick than in bells; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes, the vibrations muſt be inconceivably quicker than in any bell, or ſtringed inſtrument: and hence they are of all others the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt.—As far as we can judge, quickneſs of vibration contributes to the uniformity, or ſimplicity, but not to the acuteneſs, nor to the loudneſs, of a muſical note.

It may here be objected, that each of the different pulſes, of which we obſerve the ſound of a bell to be compoſed, is of a very perceptible length, and far from being inſtantaneous; ſo that it is not fair to infer that the ſound of a bell is only a repetition of a ſingle inſtantaneous ſtroke, ſeeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable ſound which is produced by ſtriking a bell in a non-elaſtic ſtate, is the very ſame which, being firſt propagated round the bell, forms one of theſe ſhort pulſes that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impoſſible that the quickneſs of repetition of any ſound can either increaſe or diminiſh its gravity.

The ſubject next to be conſidered in the order of the preſent work, is the propagation of ſound; but as the doctrine of Sir Iſaac Newton is very generally known and acknowledged, we refer to the clear, explanatory, and able defence of his 47th propoſition, by Mr. Young, of Trinity College, Dublin.

Of the Velocity, &c. of Sound. Axioms.

Experience has taught us, that ſound travels at about the rate of 1142 feet in a ſecond, or near 13 miles in a minute; nor do any obſtacles hinder its progreſs, a contrary wind only a ſmall matter diminiſhing its velocity. The method of calculating its progreſs is eaſily underſtood. When a gun is diſcharged at a diſtance we ſee the fire long before we hear the ſound. If then we know the diſtance of the place, and know the time of the interval between our firſt ſeeing the fire and hearing the report, it will ſhow us exactly the time the ſound has been in travelling to us—Again, by the above axiom, we are enabled to find the diſtance between objects that would be otherwiſe immeaſurable. For example, ſuppoſe you ſee the flaſh of a gun in the night at ſea, and tell ſeven ſeconds before you hear the report, it follows therefore, that the diſtance is ſeven times 1142 feet, that is 24 yards more than a mile and a-half. In like manner, if you obſerve the number of ſeconds between the lightning and the report of thunder, you know the diſtance of the cloud from whence it proceeds.

Derham has proved, by experiment, that all ſounds whatever travel at the ſame rate. The ſound of a gun, and the ſtriking of a hammer, are equally ſwift in their motions; the ſofteſt whiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following:—Smooth and clear ſounds proceed from bodies that are homogeneous, and of an uniform figure; and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

The velocity of ſound is to that of a briſk wind as fifty to one.

The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rareſied.

Every point againſt which the pulſes of ſound ſtrike, becomes a centre from which a new ſeries of pulſes are propagated in every direction.

Sound deſcribes equal ſpaces in equal times.

Of Reverberated Sounds.

Sound, like light, after it has been reflected from ſeveral places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whiſpering gallery is conſtructed.

The form of this gallery muſt be that of a concave hemiſphere, as ABC; (Pl. 1. Fig. 2.) and if a low ſound or whiſper be uttered at A, the vibrations expanding themſelves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at laſt they all meet in C, where, as we have ſaid, the ſound will be the moſt diſtinctly heard.

The augmentation of ſound by means of ſpeaking-trumpets, is uſually illuſtrated in the following manner: Let ABC (Pl. 1. Fig. 3.) be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident, when a perſon ſpeaks at B in the trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube.

But it is obvious, notwithſtanding, that the confinement of the voice can have little effect in increaſing the ſtrength of ſound, as this ſtrength depends on the velocity with which the particles move.

Kircher has ſuggeſted, that "the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity." Newton alſo ſeems to have conſidered this as the principal cauſe, in the ſcholium of prop. 50. B. 2. Princip. when he ſays, "we hence ſee why ſounds are ſo much increaſed in ſtentorophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe."

Farther, when we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points: thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequently the ſound increaſed. The confinement too of the voice may have an effect, though not ſuch as is aſcribed to it by ſome; for the condenſed pulſes produced by the naked voice freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles, and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

If the tube be laid on any non-elaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth-piece, becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe proportionally. The ſeveral cauſes, therefore, of the increaſe of ſound in theſe tubes, Mr. Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity.

An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs: but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in Flanders. If a perſon ſung, he only heard his own voice, without any repetition: on the contrary, thoſe who ſtood at ſome diſtance, heard the echo but not the voice; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near, then more diſtant. There is an account in the Memoires of the French Academy, of a ſimilar echo near Rouen.

As it is plain, that every point againſt which the pulſes of ſound ſtrike becomes the centre of a new ſeries of pulſes, and ſound deſcribes equal diſtances in equal times; therefore, when any ſound is propagated from a centre, (Pl. 1. Fig. 4.) and its pulſes ſtrike againſt a variety of obſtacles, if the ſum of the right lines drawn from that point to each of the obſtacles, and from each obſtacle to a ſecond point, be equal, then will the latter be a point in which an echo will be heard. All the points of the obſtacles which produce an echo, muſt lie in the ſurface of the oblong ſphæroid, generated by the revolution of this ellipſe round its major axis; but as there may be ſeveral ſphæroids of different magnitudes, ſo there may be ſeveral different echoes of the ſame original ſound. And as there may happen to be a greater number of reflecting points in the ſurface of an exterior ſphæroid than in that of an interior, a ſecond or a third echo may be much more powerful than the firſt, provided that the ſuperior number of reflecting points, that is, the ſuperior number of reflected pulſes propagated to the ear, be more than ſufficient to compenſate for the decay of ſound which ariſes from its being propagated through a greater ſpace. This is finely illuſtrated in the celebrated echoes at the lake of Killarney in Kerry, where the firſt return of the ſound is much inferior in ſtrength to thoſe which immediately ſucceed it.

From what has been laid down it appears, that for the moſt powerful echo, the ſounding body ſhould be in one focus of the ellipſe which is the ſection of the echoing ſphæroid, and the hearer in the other. However, an echo may be heard in other ſituations, though not ſo favourably; as ſuch a number of reflected pulſes may arrive at the ſame time at the ear as may be ſufficient to excite a diſtinct perception. Thus

a perſon often hears the echo of his own voice; but for this purpoſe he ſhould ſtand at leaſt 63 or 64 feet from the reflecting obſtacle, according to what has been ſaid before. In churches we never hear a diſtinct echo of the voice, but a confuſed ſound when the ſpeaker utters his words too rapidly; becauſe the greateſt difference of diſtance between the direct and reflected courſes of ſuch a number of pulſes as would produce a diſtinct ſound, is never in any church equal to 127 feet, the limit of echoes.

But though the firſt reflected pulſes may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting ſurface may be ſo formed, as that the pulſes which come to the ear after two reflections or more may, after having deſcribed 127 feet or more, arrive at the ear in ſufficient numbers, and alſo ſo nearly at the ſame inſtant, as to produce an echo, though the diſtance of the reflecting ſurface from the ear be leſs than the limit of echoes. This is confirmed by a ſingular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Caſtlecomber, in the county of Kilkenny. As you enter the cave, and continue ſpeaking loud, no return of the voice is perceived; but on your arriving at a certain point, which is not above 14 or 15 feet from the reflecting ſurface, a very diſtinct echo is heard. Now this echo cannot ariſe from the firſt courſe of pulſes that are reflected to the ear, becauſe the breadth of the cave is ſo ſmall, that they would return too quickly to produce a diſtinct ſenſation from that of the original ſound: it therefore is produced by thoſe pulſes, which, after having been reflected ſeveral times from one ſide of the grotto to the other, and having run over a greater ſpace than 127 feet, arrive at the ear in conſiderable numbers, and not more diſtant from each other, in point of time, than the ninth part of a ſecond.

The various phænomena of ſound have been farther illuſtrated by authors in a variety of entertaining deceptions, ſuch as the converſive ſtatue, a very ancient invention aſcribed to the Marquis of Worceſter; the communicative buſt, the oracular head, the ſolar ſonata, &c. &c. accounts of which may be found in different treatiſes on Acouſtics, but which are too pueril for inſertion in this place.

ACR

ACQS, a town at the foot of the Pyrenæan mountains. E. long. 1. 40. lat. 43. 0.

ACQUAPENDENTE, a pretty large town of Italy, ten miles W. of Orvietto, and 57 N. by W. of Rome. E. long. 11. 53. lat. 42. 43.

ACQUARIA, a ſmall town of Italy, in Frigana, a diſtrict of Modena. E. long. 11. 17. lat. 44. 24.

ACQUEST, or Acquist, in law, ſignifies goods got by purchaſe or donation. See Conquest.

ACQUI, a town of Italy, ſeated on the river Bornio, 25 miles N. W. of Genoa. E. long. 8. 30. lat. 44. 40.

ACQUISITION, among lawyers, is uſed for the right or title to an eſtate got by purchaſe or donation.

ACQUITTAL, a diſcharge, or ſetting of a perſon free from the guilt or ſuſpicion of an offence.

ACQUITTANCE, a diſcharge in writing for a ſum of money that the party has paid.—No man is obliged to pay a ſum of money if the demandant refuſes to give an acquittance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRA, a town of Africa, on the coaſt of Guinea.

ACRASIA, among phyſicians, implies the predominancy of one quality above another, either with regard to mixtures, or the humours of the body.

ACRE, or Acra, a ſea port town in Syria, which underwent ſeveral ſieges both by the Chriſtians and Saracens. It is 20 miles S. of Tyre, and 37 N. of Jeruſalem. E. long. 39. 25. lat. 32. 40.

Acre, in the Mogul's dominions, the ſame with lack, and ſignifies the ſum of 100,000 rupees; the pound Sterling is about eight rupees.

Acre, the univerſal meaſure of land in Britain. An acre contains four ſquare roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by ſtatute. Yet this meaſure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *cuſtomary meaſure*, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is alſo divided into 10 ſquare chains, of 22 yards each, that is, 4840 ſquare yards. An acre in Scotland contains four ſquare roods; one ſquare rood is 40 ſquare falls; one ſquare fall, 36 ſquare ells; one ſquare ell, nine ſquare feet and 73 ſquare inches; one ſquare foot, 144 ſquare inches. The Scots acre is alſo divided into 10 ſquare chains; the meaſuring chain ſhould be 24 ells in length, divided into 100 links, each link $8\frac{85}{1000}$ inches; ſo that one ſquare chain will contain 10,000 ſquare links. The Engliſh ſtatute-acre is about three roods and ſix falls ſtandard-meaſure of Scotland.

The French acre, *arpent*, contains $1\frac{1}{4}$ Engliſh acre. The Welch acre contains commonly two Engliſh ones. The Iriſh acre is equal to one acre two roods and 19 perches $\frac{27}{121}$, Engliſh.

Dr. Grew attempts to aſcertain the number of acres in England, which, according to him, amounts to 46 millions and 80,000. The United Provinces are ſaid to contain 4,382,000 acres: the province of Holland but one million of acres. The territory of the United States of America, according to calculations lately made by order of Congreſs, contains 589 millions of acres, excluſive of water, which is computed at 51 millions more.

Acre-*Tax*, a tax laid on land at ſo much per acre. In ſome places this is alſo called *acre-ſhot*. Impoſitions on lands in the great level are to be raiſed by a proportionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, is enacted 13 Geo. I. cap. 18.

ACRID, a name for any thing that has a ſharp or pungent taſte. See Materia Medica.

ACRIDOPHAGI, an Ethiopian people, repreſented to have fed on locuſts. This their name imports; the word being compounded of the Greek *ακρις locuſt*, and *φαγω to eat*. We have an account of them by Diodorus Siculus.

ACROAMATIC, or Acroatic, in general, denotes a thing ſublime, profound, or abſtruſe.

ACROAMATICI, a denomination given the diſciples or followers of Ariſtotle, &c. who were admitted into the ſecrets of the inner or acroamatic philoſophy.

ACROATIC. Ariſtotle's lectures to his diſciples were of two kinds, *exoteric* and *acroatic*. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations.

ACROBATICA, or Acrobaticum, from *ακρος high*,

and βατεω, or βαινω, *I go*; an ancient engine, whereby people were raiſed aloft, that they might ſee more conveniently about them. The *acrobatica* among the Greeks amounted to the ſame with what they call *ſcanſorium* among the Latins. Authors are divided as to the office of this engine.

ACROCHERISMUS, among the Greeks, a ſort of gymnaſtic exerciſe, in which the two combatants contended with their hands and fingers only, without cloſing or engaging the other parts of the body.

ACROMION, the upper part of the ſcapula or ſhoulder-blade. See ANATOMY.

ACROMONOGRAMMATICUM, a kind of poem, wherein every ſubſequent verſe begins with the letter wherewith the immediately preceding one terminates.

ACRON, a territory on the gold-coaſt of Guinea, in Africa, bordering on the Fantynean country.

ACRONICAL, ACHRONYCAL, or ACHRONICAL, in aſtronomy, is a term applied to the riſing of a ſtar, when the ſun is ſet in the evening; but has been promiſcuouſly uſed to expreſs a ſtar's riſing at ſun-ſet, or ſetting at ſun-riſe.

ACROSPIRE, a vulgar term for what botaniſts call the *plume*. See the article PLANTS.

ACROSPIRED, in malt-making, is the grain's ſhooting both at the root and blade end.

ACROSTIC, a kind of poetical compoſition, diſpoſed in ſuch a manner, that the initial letters of each line form the name of ſome perſon, kingdom, &c.

ACROSTICHIUM, RUSTYBACK, WALL-RUE, or FORK-FERN, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior ſurface of the frond, ſo that they every where cover it. Twenty-nine ſpecies are deſcribed by Linnæus.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament uſed on the prows of their ſhips, which was ſometimes in the ſhape of a buckler, helmet, animal, &c.; but more frequently circular, or ſpiral. It was uſual to tear them from the prows of vanquiſhed veſſels, and fix them to the conquerors, as a ſignal of victory.

ACROTELEUTIC, among eccleſiaſtic writers, an appellation given to any thing added to the end of a pſalm; as the Gloria Patri, or Doxology.

ACROTERIA, in architecture, ſmall pedeſtals, uſually without baſes, anciently placed at the middle or two extremes of pediments or frontiſpieces, ſerving to ſupport the ſtatues, &c. It alſo ſignifies the figures placed as ornaments on the tops of churches, and the ſharp pinnacles that ſtand in ranges about flat buildings with rails and balluſters.

Among ancient phyſicians, it ſignified the larger extremities of the body, as the head, hands, and feet. It has alſo been uſed for the tips of the fingers, and ſometimes for the eminences or proceſſes of bones.

ACROTHYMION, from ακρος *extreme*, and θυμος *thyme*. A ſort of wart deſcribed by Celſus as hard and rough, with a narrow baſis and broad top. This tumour is alſo called *thymus*.

ACT, in logic, is particularly underſtood of an operation of the human mind. Thus to diſcern and examine are acts of the underſtanding; to judge and affirm, are acts of the will. There are voluntary and ſpontaneous acts; the former are operations of the ſoul, the latter without its privity or participation.

ACT, in the univerſities, ſignifies a theſis maintained in public by a candidate for a degree; or to ſhew the capacity and proficiency of a ſtudent. At Oxford, the time when maſters or doctors complete their degrees is alſo called the *act*; which is held with great ſolemnity. At Cambridge they call it the *commencement*.

ACT *of Faith*, *Auto da Fe*, in the Romiſh church, the laſt act of the inquiſitorial tragedy. It is a kind of gaol-delivery, appointed as oft as a competent number of priſoners in the inquiſition are convicted of hereſy, either by their own voluntary, or extorted confeſſion, or on the evidence of certain witneſſes. The proceſs is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the proceſſion. The proceſſion is led up by dominican friars; after which come the penitents, ſome with ſan-benitoes, and ſome without, according to the nature of their crimes; being all in black coats without ſleeves, and bare-footed, with a wax candle in their hands. Theſe are followed by the penitents who have narrowly eſcaped being burnt, who over their black coats have flames painted with their points turned downwards, *Feugo revolto*. Next come the negative, and relapſed, who are to be burnt, having flames on their habits pointing upwards. After theſe come ſuch as profeſs doctrines contrary to the faith of Rome, who, beſides flames pointing upwards, have each their picture painted on their breaſts, with dogs, ſerpents, and devils, all open-mouthed, about it. After ſentence is paſſed by the civil magiſtrate, they are immediately carried to the Ribera, the place of execution; where there are as many ſtakes ſet up as there are priſoners to be burnt, with a quantity of dry furze about them. The ſtakes of the profeſſed, that is, ſuch as perſiſt in their hereſy, are about four yards high, having a ſmall board towards the top for the priſoner to be ſeated on. The negative and relapſed being firſt ſtrangled and burnt, the profeſſed mount their ſtakes by a ladder; and the Jeſuits, after ſeveral repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is ſtanding at their elbow to receive their ſouls, and carry them into the flames of hell. On this a great ſhout is raiſed; and the cry is, Let the dogs' *beards be made*; which is done by thruſting flaming furzes faſtened to long poles againſt their faces, till their faces are burnt to a coal, which is accompanied with the loudeſt acclamations of joy. At laſt fire is ſet to the furze at the bottom of the ſtake, over which the profeſſed are chained ſo high, that the top of the flame ſeldom reaches higher than the ſeat they ſit on; ſo that they rather ſeem roaſted than burnt. There cannot be a more lamentable ſpectacle; the ſufferers continually cry out, while they are able, *Miſericordia per amor de Dios*, "Pity for the love of God!" yet is this horrid ſcene beheld by all ſexes, and ages, with tranſports of joy and ſatisfaction.

ACT, in dramatic poetry, ſignifies a certain diviſion, or part, of a play, deſigned to give ſome reſpite both to the actors and ſpectators. The Romans were the firſt who divided their theatrical pieces into acts; and in the time of Horace, all regular and finiſhed pieces were divided into five.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience, by carrying the fable into execution; the third, to raiſe obſtacles and difficulties; the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary; but may be varied according to the humour of the author, or the nature of the ſubject. *See* POETRY.

ACT *of Grace*. See GRACE.

ACT, among lawyers, is an inſtrument in writing for declaring or juſtifying the truth of any thing. In which ſenſe, records, decrees, ſentences, reports, certificates, &c. are called *acts*.

ACTS alſo denote the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c.

ACTA *Conſiſtorii*, the edicts or declarations of the council

of ſtate of the emperors. The ſenate and ſoldiers often ſwore either through abject flattery or by compulſion, upon the *edicts* of the emperor, as we do upon the *bible*.

Acta *Diurna*, a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome.

Acta *Populi*, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c. of illuſtrious perſons, and the like. Theſe were otherwiſe called *Acta Publica* and *Acta Diurna*, or ſimply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were recorded in the latter, whilſt thoſe of leſs note appeared in the former.

Acta *Senatus*, among the Romans, were minutes of what paſſed and was debated in the ſenate houſe. Theſe were alſo called *Commentarii*, and by a Greek name υπομνηαλα.

Public Acts. The knowledge of public acts forms part of a peculiar ſcience, called the Diplomatic, of great importance to an hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries. The ſtyle of acts is generally barbarous Latin. The chief of the Engliſh acts, or public records, are publiſhed by Rymer, under the title of *Fœdera*, and continued by Saunderſon; an extract whereof has been given in French by Rapin, and tranſlated into Engliſh under the title of *Acta Regia*.

Acts *of the Apoſtles*, one of the ſacred books of the New Teſtament, containing the hiſtory of the infant-church, during the ſpace of 29 or 30 years from the aſcenſion of our Lord to the year of Chriſt 63.—It was written by St. Luke; and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his goſpel.

Act *of Parliament* is a poſitive law, conſiſting of two parts, the words of the act, and its true ſenſe and meaning; which being joined, make the law. The words of acts of parliament ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the act; and ſome acts extend by equity to things not mentioned therein. See Parliament.

ACTÆA, Aconitum Racemosum, Herb Christopher, or Bane-berries; a genus of the monogynia order, belonging to the polyandria claſs of plants. The characters are: The *calyx* a perianthium conſiſting of four roundiſh, obtuſe, concave leaves, which fall off. The *corolla* conſiſts of four petals, larger than the calyx, pointed at both ends, and falling off. The *ſtamina* conſiſt of numerous capillary filaments; the antheræ are roundiſh, erect, and didymous. The *piſtillum* has an ovate germen; no ſtylus; the ſtigma thickiſh and obliquely depreſſed. The *pericarpium* is an oval ſmooth one-furrow'd one-cell'd berry. The *ſeeds* are very numerous, ſemiorbicular, and incumbent in a double order.—This genus is aſſociated with the *Multiſiliquæ*, the 26th natural order. There are four

Species. 1. The ſpicata, or common herb-chriſtopher, which is a native in ſeveral parts of Britain, and grows to the height of about two feet and an half. The berries are poiſonous, and it is ſaid toads reſort to this plant, on account of its fetid ſmell. 2. The alba, or American herb-chriſtopher is a native of North America. This ſpecies has been uſed as an emetic, and ſometimes called *ipecacoanha*. 3. The Racemoſa, or American black or wild ſnakeroot, likewiſe a native of North America, and ſuppoſed to be an antidote againſt poiſon, or the bite of a rattle-ſnake. 4. The cimicifuga, a native of Siberia. This ſpecies is rare in Britain.

Actæa, in botany, the name which Linnæus gives to the *chriſtophoriana* of Tournefort. He ranges it under the *polyandria monogynia* claſs.

ACTE. See Sambucus.

ACTIAN Games, in Roman antiquity, were ſolemn games inſtituted by Auguſtus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, ſince called *Actius*. Hence *Actian* Years, an æra commencing from the battle of Actium, called the *Æra of Auguſtus*.

ACTINIA, in zoology, a genus belonging to the order of vermes molluſca. The body is oblong and ſmooth, attaching itſelf firmly by its baſis to rocks or other ſolid ſubſtances, having a dilatable apex hooked within. The mouth is furniſhed with crooked teeth, the roſtrum cylindrical and radiated. There are five ſpecies, ſome of which make a beautiful appearance, and are called *Animal Flowers*, *Sea Anemonies*, and *Urtica Marina*. See Animal *Flower*.

Progreſſive motion in theſe creatures is ſo ſlow, that it is difficult to perceive any, as they ſcarce advance the length of one inch in an hour. It would ſeem they do not all produce, when handled, the painful ſenſation which had acquired them the name of *ſea-nettles*.—They are viviparous, feed on ſhell-fiſh, open their mouths more or leſs according to the ſize of the prey they have to deal with, and then reject the ſhell through the ſame aperture. When the mouth is open, all the tentacula of the actinia may be ſeen, reſembling in that ſituation a full-blown flower, which has given it the denomination of the *flower fiſh*.

ACTIO, in Roman antiquities, an action at law in a court of juſtice. The formalities uſed by the Romans, in judicial actions, were theſe: If the difference failed to be made up by friends, the injured perſon proceeded *in jus reum vocare*, to ſummon the offending party to the court, who was obliged to go, or give bond for his appearance.

The offending party might be ſummoned into court *viva voce*, by the plaintiff himſelf meeting the defendant, declaring his intention to him, and commanding him to go before the magiſtrate and make his defence. If he would not go willingly, he might drag and force him along, unleſs he gave ſecurity for his appearance on ſome appointed day. If he failed to appear on the day agreed on, then the plaintiff, whenſoever he met him, might take him along with him by force, calling any by-ſtanders to bear witneſs, by aſking them, *Viſne antęſtari?* the by-ſtanders upon this turned their ear towards him in token of their conſent.

ACTION. Grammarians obſerve ſome diſtinction between *action* and *act*; the former being generally reſtricted to the common or ordinary tranſactions, whereas the latter is uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourſelves of what is neceſſary for their ſake.

Action, in mechanics, implies either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort.—As it is neceſſary in works of this kind to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindered its effect.

Quantity of Action, a name given by M. de Maupertuis, in the Memoirs of the Pariſian Academy of Sciences for 1744, and thoſe of Berlin for 1746, to the product of the maſs of a body by the ſpace which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the ſtate of a body, the quantity of action neceſſary to produce ſuch change, is the leaſt poſſible." This principle he applies to the inveſtigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being.

Action, in ethics, denotes the external ſigns or expreſſions

of the ſentiments of a moral agent. See ACTIVE *Power*, *infra*.

ACTION, in poetry, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *epiſode*. See POETRY.

ACTION, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice and geſture, to the ſubject of which he is treating. See ORATORY.

ACTION, in a theatrical ſenſe. See DECLAMATION.

ACTION *for the Pulpit*. See DECLAMATION.

ACTION, in painting and ſculpture, is the attitude or poſition of the ſeveral parts of the face, body, and limbs of ſuch figures as are repreſented, and whereby they ſeem to be really actuated by paſſions. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſion with regard to animals.

ACTION, in phyſiology, is applied to the functions of the body, whether vital, animal, or natural.

The *vital* functions, or actions, are thoſe which are abſolutely neceſſary to life, and without which there is no life, as the action of the heart, lungs, and arteries. The *natural* functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The *animal* functions are thoſe which we perform at will, as muſcular motion, and all the voluntary actions of the body: they are thoſe which conſtitute the ſenſes of touch, taſte, ſmell, ſight, hearing; perception, reaſoning, imagination, memory, judgement, affections of the mind. Without any, or all of them, a man may live, but not ſo comfortably as with them.

ACTION, in commerce, is a term uſed abroad for a certain part or ſhare of a public company's capital ſtock. Thus, if a company has 400,000 livres capital ſtock, this may be divided into 400 actions, each conſiſting of 1000 livres. Hence a man is ſaid to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital ſtock. The transferring of actions abroad is performed much in the ſame manner as ſtocks are with us. See STOCKS.

ACTION, in law, is a demand made before a judge for obtaining what we are legally intitled to demand, and is more commonly known by the name of *law-ſuit* or *proceſs*. See SUIT.

ACTIONARY, or ACTIONIST, a proprietor of ſtock in a trading company.

ACTIONS, among merchants, ſometimes ſignify moveable effects; and we ſay the merchant's creditors have ſeized on all his actions, when we mean that they have taken poſſeſſion of all his active debts.

ACTIVE, in grammar, is applied to ſuch words as expreſs action; and is therefore oppoſed to paſſive. The active performs the action, as the paſſive receives it. Thus we ſay, a verb *active*, a conjugation *active*, &c. or, an *active* participle.

ACTIVE *Verbs*, are ſuch as do not only ſignify doing, or acting, but have alſo nouns following them, to be the ſubject of the action or impreſſion: Thus, *To love*, *to teach*, are verbs *active*; becauſe we can ſay, *To love a thing*, *to teach a man*. Neuter verbs alſo denote an action, but are diſtinguiſhed from active verbs, in that they cannot have a noun following them: ſuch are, *To ſleep*, *to go*, &c.—Some grammarians, however, make three kinds of active verbs: the *tranſitive*, where the action paſſes into a ſubject different from the agent; *reflected*, where the action returns upon the agent; and *reciprocal*, where the action turns mutually upon the two agents who produced it.

ACTIVE *Power*, in metaphyſics, the power of executing any work or labour; in contradiſtinction to *ſpeculative* powers, or the powers of ſeeing, hearing, remembering, judging, reaſoning, &c. The exertion of active power we call *action*; and as every action produces ſome change, ſo every change muſt be cauſed by ſome effect, or by the ceſſation of ſome exertion of power. That which produces a change by the exertion of its power, we call the *cauſe* of that change; and the change produced, the *effect* of that cauſe.

ACTIVE *Principles*, in chemiſtry, ſuch as are ſuppoſed to act without any aſſiſtance from others; as mercury, ſulphur, &c.

ACTIVITY, *Sphere of*, the whole ſpace in which the virtue, power, or influence, of any object is exerted.

ACTON, a town near London, where is a well that affords a purging water. The ſalt of this water is not quite ſo ſoft as that of Epſom; and is more calcareous than it, being more of the nature of the ſalt of lime. 1½lb. of this water yields 48 grains of ſalt.

ACTOR, among civilians, the proctor or advocate in civil courts or cauſes; as *Actor eccleſiæ* has been ſometimes uſed for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the ſteward or head bailiff of a village.

ACTOR, in the drama, is a perſon who repreſents ſome part or character upon the theatre. The drama conſiſted originally of nothing more than a ſimple chorus, who ſung hymns in honour of Bacchus; ſo that the primitive actors were only ſingers and muſicians. But the moderns have introduced an infinite number of actors upon the ſtage, which heightens the deception, and makes a diverſity, in which the ſpectator is very deeply intereſted.

Actors were highly honoured at Athens. At Rome they were deſpiſed, and not only denied all rank among the citizens, but even when any citizen appeared upon the ſtage, he was expelled his tribe, and deprived of the right of ſuffrage by cenſors. Cicero, indeed, eſteems the talents of Roſcius: but he values his virtues ſtill more; virtues which diſtinguiſhed him ſo remarkably above all others of his profeſſion, that they ſeemed to have excluded him from the theatre. The French have, in this reſpect, adopted the ideas of the Romans; and the Engliſh thoſe of the Greeks.

ACTORUM TABULÆ, in antiquity, were tables inſtituted by Servius Tullius, in which the births of children were regiſtered.

ACTRESS, in the drama, a female performer. Women actors were unknown to the ancients, among whom men always performed the female characters; and hence one reaſon for the uſe of maſks among them.

Actreſſes are ſaid not to have been introduced on the Engliſh ſtage till after the reſtoration of King Charles II. But this can be but partly true, as the queen of James I. acted a part in a paſtoral; and Prynn, in his Hiſtriomaſtix, ſpeaks of women actors in his time as whores. Againſt theatrical performers of both ſexes, there exiſts, in Britain, a very unwarrantable prejudice; but females who exerciſe their talents on the ſtage, are more particularly concerned in it. The conſequence of ſuppoſing every woman immodeſt who embraces the theatrical profeſſion, is that of rendering her deſperate, and really indifferent to the preſervation of her reputation. According to Sir Richard Steele, the actors, from having acquired profligate habits by their unjuſt excluſion from the circles of genteel life, and being courted on the other hand to participate in ſcenes of low diſſipation, have, no doubt, "diſgraced the ſtage;" but how the ſtage ſhould *of neceſſity* "diſgrace the actors," as many vulgarly ſuppoſe, we are at a loſs to conceive.

ACTUAL, ſomething that is real and effective, or that exiſts truly and abſolutely. Hence, among ſurgeons a red-

hot iron, or fire, is called an *actual* cautery; in diſtinction from cauteries, or cauſtics, that have the power of producing the ſame effect upon the animal ſolids as actual fire, and are called *potential* cauteries. Boiling water is *actually* hot; brandy, producing heat in the body, is *potentially* hot, though of itſelf cold.

ACTUAL *Sin*, that committed by the perſon himſelf; in oppoſition to *original* ſin, or that derived from Adam.

ACTUARIÆ NAVES, a kind of ſhips among the Romans, chiefly deſigned for ſwift ſailing.

ACTUARIUS, or ACTARIUS, a notary or officer, appointed to write the acts or proceedings of a court, or the like. In the Eaſtern Empire, the actuarii were properly officers who kept the military accounts, received the corn from the *ſuſceptores* or ſtore-keepers, and delivered it to the ſoldiers.

ACTUATE, to put a thing in action. Thus the mind may be ſaid to *actuate* the body.

ACTUS, in ancient architecture, a meaſure in length equal to 120 Roman feet. In ancient agriculture, the word ſignified the length of one furrow, or the diſtance a plough goes before it turns.

ACTUS *Minimus*, was a quantity of land 120 feet in length, and four in breadth.

ACTUS *Major*, or ACTUS *Quadratus*, a ſquare piece of ground, whoſe ſide was equal to 120 feet.

ACTUS *Intervicenalis*, a ſpace of ground four feet in breadth, left between the lands as a path or footway.

ACUANITES, called more frequently MANICHEES. They took the name from Acua, a diſciple of Thomas the apoſtle.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt.

ACUMINA, in antiquity, a kind of military omen, moſt generally ſuppoſed to have been taken from the points or edges of darts, ſwords, or other weapons.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, performed by pricking the part affected with a ſilver needle to excite inflammation. They employ this in headachs, convulſions, colics, &c.

ACUS, in ichthyology, the trivial name of a ſpecies of ſyngnathus. See SYNGNATHUS.

ACUSIO COLONIA, now ANCONE, between Orange and Valence, on the banks of the Rhone.

ACUTE *Angle*, in geometry, is that which is leſs than a right angle, or does not ſubtend 90 degrees.

ACUTE-*angled Triangle*, is a triangle whoſe three angles are all acute.

ACUTE-*angled Cone*, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

ACUTE, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon of ſome other tone.

ACUTE *Accent*. See ACCENT.

ACUTE *Diſeaſes*, ſuch as come ſuddenly to a criſis. This term is oppoſed to *chronic* in medicine.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments. In the ancient armies there were acutiatores, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

AD, a Latin prepoſition, originally ſignifying *to*.

AD *Beſtias*, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

AD *Hominem*, in logic, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

AD *Ludos*, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts, or with one another, and thus executing juſtice upon themſelves.

AD *Metalla*, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

AD *Valorem*, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: The duties on ſome articles are paid by the number, &c.; and others *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying.

ADAGIO, in muſic. Adverbially, it ſignifies *ſoftly*, *leiſurely*; and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio*, *adagio*, to denote a ſtill greater retardation.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces. In the laws of king Alphonſus, the adalides are ſpoken of as officers appointed to guide and direct the marching of the forces in time of war.

ADAMANT, a name ſometimes given to the diamond. (See DIAMOND) It is likewiſe applied to the ſcoriæ of gold, the magnet, &c.

ADAMIC EARTH, a name given to common red clay, alluding to that ſpecies of earth of which the firſt man is ſuppoſed to have been made.

ADAMI POMUM, in anatomy, a protuberance in the forepart of the throat, formed by the os hyoides. A piece of the forbidden apple, which Adam ate, is ſaid to have ſtuck by the way and occaſioned it.

ADAMITES, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, ſuppoſed to have been a branch of the Baſilidians and Carpocratians.

ADAMUS, the philoſopher's ſtone is ſo called by alchemiſts; they ſay it is an animal, and that it has carried its inviſible *Eve* in its body, ſince the moment they were united by the Creator.

ADAMSHIDE, a diſtrict of the circle of Raſtenburg, belonging to the king of Pruſſia.

ADANA, a town of Aſia, in Natolia, and in the province of Carmania, 30 miles eaſt of Tarſus, on the road to Aleppo. E. long. 35. 42. N. lat. 38. 10.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKIES-BREAD, or AFRICAN CALABASH-TREE, a genus of the monadelphia order, belonging to the polyandria claſs of plants; the characters of which are: The *calyx* is a perianthium one-leaved, half five-cleft, cup-form (the diviſions revolute), deciduous: The *corolla* conſiſts of five petals, roundiſh, nerved, revolute, growing reciprocally with the claws and ſtamina: The *ſtamina* have numerous filaments, coaleſced beneath into a tube, and crowning it, expanding horizontally; the antheræ kidney-form, incumbent: The *piſtillum* has an egged germ; the ſtylus very long, tubular, variouſly intorted; the ſtigmata numerous (10) priſmatic, villous, ray-expanded: The *pericarpium* is an oval capſule, woody, not gaping, 10-celled, with farinaceous pulp, the partitions membranous: The *ſeeds* are numerous, kidney-ſhaped, rather bony, and involved in a friable pulp.

There is at preſent but one known ſpecies belonging to this genus, the BAOBAB, which is perhaps the largeſt production of the whole vegetable kingdom. It is a native of Africa.

The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The loweſt branches extend almoſt horizontally; and as they are about 60 feet in length, their own

weight bends their extremities to the ground, and altogether, they form an hemiſpherical maſs of verdure of about 120 or 130 feet diameter.

The age of this tree is perhaps no leſs remarkable than its enormous ſize. Two names of Europeans which had been cut into the bark of one of them, were dated, one in the 14th, the other the 15th century. The letters were about ſix inches long, but in breadth they occupied a very ſmall part only of the circumference of the trunk; from whence it was concluded, they had not been cut when theſe trees were young.

ADAPTERS, or ADOPTERS. See CHEMISTRY.

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in ſcripture, worth about 15s. ſterling.

ADARME, in commerce, a ſmall weight in Spain; the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce is ſeven *per cent.* lighter than that of Paris.

ADATAIS, ADATSI, or ADATYS, a muſlin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. The fineſt is made at Bengal.

ADCORDABILES DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a feud.

ADCRESCENTES, among the Romans, a kind of ſoldiery, entered, but not yet put on duty; from theſe the ſtanding forces were recruited. See ACCENSI.

ADDA, in geography, a river of Switzerland which riſes in mount Braulio, and falls into the Po.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in zoology. See COLUBER.

ADDER-*Bolts* or *Adder-flies*. See LIBELULLA.

Sea-ADDER; a ſpecies of SYNGNATHUS is ſo named.

Water-ADDER, a name for the COLUBER *Natrix*.

ADDER-*ſtung*, is uſed in reſpect of cattle, when ſtung with any kind of venomous reptiles.

ADDER *Wort* or *Snakewood*. See POLYGONUM.

ADDEXTRATORES, the pope's mitre-bearers, ſo called, becauſe they walk at the pope's right hand when he rides to viſit the churches.

ADDICE or ADZE, a kind of ax uſed by coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was the making over goods to another, either by ſale or by legal ſentence; the goods ſo delivered were called *bona addicta*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a perſon for a certain price, unleſs by ſuch a day, the the owner, or ſome other, ſhould give more for it.

ADDITAMENT, ſomething added to another. Thus phyſicians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, in ARITHMETIC, ALGEBRA, &c. See thoſe articles.

ADDITION, in muſic, a dot marked on the right ſide of a note, ſignifying that it is to be ſounded half as much more as it would have been without ſuch mark.

ADDITION, in law, is that title which is given to a man over and above his proper name and ſurname; to ſhow of what eſtate, degree, or profeſſion he is; and of what town, village, or country.

ADDITIONS *of Eſtate*, or *Quality*, are, Yeoman, Gentleman, Eſquire, and ſuch like.

ADDITIONS *of Degree*, are thoſe we call names of dignity; as Knight, Lord, Earl, Marquis, and Duke.

ADDITIONS *of Myſtery*, are ſuch as ſcrivener, painter, maſon, and the like.

ADDITIONS *of Place*, are, of Thorp, of Dale, of Woodſtock.—Where a man hath houſehold in two places, he ſhall be ſaid to dwell in both; ſo that his addition in either may ſuffice. *Knave* was anciently a regular addition.

ADDITIONS, in diſtilling, a name given to ſuch things as are added to the waſh, or liquor, while in a ſtate of fermentation. See DISTILLING.

ADDITIONS, in heraldry, ſome things added to a coat of arms, as marks of honour; and therefore directly oppoſite to abatements. Among additions we reckon BORDURE, QUARTER, CANTON, GYRON, PILE, &c.

ADDRESS, in commerce, is ſynonymous with direction to a perſon or place. The word is formed of the French verb *addreſſer*.

ADDUCENT MUSCLES, or ADDUCTORS, in anatomy, thoſe muſcles which pull one part of the body towards another. See ANATOMY.

ADEB, in commerce, the name of a large Egyptian weight, uſed principally for rice, and conſiſting of 210 okes, each, of three rotolos, a weight of about two drams leſs than an Engliſh pound.

ADEL, a kingdom on the eaſtern coaſt of Africa, which reaches as far as the ſtraits of Babelmandel, which unite the Red Sea to the ſea of Arabia.

ADELIA, a genus of the monadelphia order, belonging to the diœcia claſs of plants; the characters of which are: The MALE *calyx* is a perianthium one-leaved, three-parted; the florets ſublanced and concave: No *corolla*: The *ſtamina* conſiſt of many capillary filaments the length of the calyx, conjoined at the baſe in a cylinder; the antheræ are roundiſh. The FEMALE *calyx* is a five-leaved perianthium; the leaflets ſublanced, concave, perſiſtent: No *corolla*: The *piſtillum* has a roundiſh germen; the ſtyli are three, ſhort, and divaricated; the ſtigmata lacerated: The *perianthium* is a three-grained, roundiſh, three-celled capſule: The *ſeeds* are ſolitary and roundiſh. In the natural method, this genus belongs to the 38th order, Tricoccæ. Of this genus there are three ſpecies; the *bernardia*, the *ricinella*, and *acidoton*, for which we have no proper names in Engliſh. They are natives of Jamaica, and are akin to the ricinus or croton, and may be propagated in hot-beds from ſeeds procured from Jamaica.

ADELPHIANI, in church-hiſtory, a ſect of ancient heretics, who faſted always on Sundays.

ADELSCALC, in ancient cuſtoms, denotes a ſervant of the king. Among the Bavarians, *adelſcalcs* appear to have been the ſame with royal *thanes* among the Saxons, and thoſe called *miniſtri regis* in ancient charters.

ADEMPTION, in the civil law, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and conſiderable town of Arabia the Happy.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria claſs of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ*. The characters are: The *calyx* a perianthium

conſiſting of one very ſmall five-toothed leaf. The *corolla* conſiſts of five bell-ſhaped lanceolate ſeſſile petals, convex within and concave under. The *ſtamina* have ten erect ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh, incumbent, bearing a globular gland on the exterior top. The *piſtillum* has a long gibbous germen; the ſtylus ſubulated the length of the ſtamina; the ſtigma ſimple. The *pericarpium* is a long compreſſed membranous legumen. The *ſeeds* are very numerous, roundiſh, and remote. Only one ſpecies of this plant is known in Britain. It is a native of India, and riſes to a conſiderable height.

ADENBURG, or ALDENBURG, a town of Weſtphalia, 12 miles N. E. of Cologne. E. long. 7. 25. lat. 51. 2.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the PROSTATÆ.

ADENOLOGY, the ſame with Adenography.

ADENOS, a kind of cotton, otherwiſe called *marine cotton*. It comes from Aleppo by the way of Marſeilles.

ADEONA, in mythology, the name of a goddeſs invoked by the Romans when they ſat out upon a journey.

ADEPHAGIA, in mythology, the goddeſs of gluttony, to whom the Sicilians paid religious worſhip.

ADEPS, in anatomy, the fat found in the abdomen. It alſo ſignifies animal fat of any kind.

ADEPTS, a term among alchemiſts for thoſe who pretended to have found the panacea or philoſopher's ſtone.

ADERBIJAN, a province of Perſia, from 42 to 48. long. from 36 to 39. lat.

ADERNO, a ſmall place in the Val di Demona in the kingdom of Sicily. E. long. 15. 25. lat. 28. 5.

ADES, or HADES, denotes the inviſible ſtate. In the heathen mythology, it comprehends all thoſe regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium.

ADESSENARIANS, ADESSENARII, in church-hiſtory, a ſect of Chriſtians who held the real preſence of Chriſt's body in the euchariſt, though not by way of tranſubſtantiation.

ADFILIATION, a Gothic cuſtom, whereby the children of a former marriage are put upon the ſame footing with thoſe of the ſecond. This is alſo called *unio prolium*, and ſtill retained in ſome parts of Germany.

ADHATODA, in botany. See JUSTICIA.

ADHESION, in philoſophy. See COHESION.

ADHESION, in anatomy, a term for one part ſticking to another, which in a natural ſtate are ſeparate. The lungs very frequently adhere to the pleura in conſequence of inflammation.

ADHIL, in aſtronomy, a ſtar of the ſixth magnitude, upon the garment of Andromeda.

ADHOA, in ancient cuſtoms, denotes what we otherwiſe call *relief*. In this ſenſe we ſometimes alſo find the word written *adoha*, *adhoamentum*, and *adhogamentum*.

ADIANTHUM, MAIDEN-HAIR; a genus of the order of filices, belonging to the cryptogamia claſs of plants. The fructifications are collected in oval ſpots under the reflected tops of the fronds. Of this genus botanical writers enumerate fifteen ſpecies; the moſt remarkable are, 1. The capillus veneris, or true maiden-hair, a native of the ſouthern parts of France. 2. The pedatum, or American maiden-hair, a native of Canada. 3. The trapeziforme, or black American maiden-hair, which is a native of Jamaica, and is ſometimes cultivated in gardens. Maiden-hair was once thought of great conſequence in medicine, as an expectorant; but it is now deſervedly rejected.

ADIAPHORISTS, in church-hiſtory, a name importing lukewarmneſs, given, in the 16th century, to the moderate Lutherans.

ADIAPHOROUS, ADIAPHORUS, a name given by Mr. Boyle to a kind of ſpirit diſtilled from tartar and ſome other vegetable bodies; and which is neither acid, vinous, nor urinous; nor yet like any other ſort of ſpirit.

ADJAZZO, ADRAZZO, or AJACCIO, a handſome town of Corſica. E. long. 41. 54. lat. 38. 5.

ADJECTIVE, a kind of noun joined with a ſubſtantive, either expreſſed or implied. See GRAMMAR.

ADIGE, a river in Italy, which falls into the gulph of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting, till another day. There is a difference between the adjournment and the prorogation of parliament; the former being done by the houſe itſelf, whereas the latter is an act of the king.

ADIPOSE, a term uſed by anatomiſts for any cell, membrane, &c. that is remarkable for its fatneſs.

ADIRBEITSAN, in geography, a province of Perſia, in Aſia, and part of the ancient Media.

ADIT *of a Mine*, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the ſame with *cuniculus* or *drift*, and is diſtinguiſhed from *air-ſhaft*. The adit is uſually made on the ſide of a hill, towards the bottom thereof, about four, five, or ſix feet high, and eight wide, in form of an arch; ſometimes cut in the rock, and ſometimes ſupported with timber, ſo conducted as that the ſole or bottom of the adit may anſwer to the bottom of the ſhaft, only ſomewhat lower, that the water may have a ſufficient current to paſs away without the uſe of the pump. This term is ſometimes uſed for the air-ſhaft itſelf, being a hole driven perpendicularly from the ſurface of the earth into ſome part of a mine, to give entrance to the air.

ADJUDICATION, implies the act of adjudging, or determining a cauſe in favour of ſome perſon.

ADJUNCT, ſignifies ſomething added to another, without being any neceſſary part of it. Thus water abſorbed by a ſponge, is an adjunct, but no neceſſary part of it.

ADJUNCT, in metaphyſics, ſome quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

ADJUNCT, in muſic, is employed to denominate the relation between the principal mode and the modes of its two-fifths, which, from the intervals that conſtitute the relation between them and it, are called its *adjuncts*.

ADJUNCT is alſo uſed to ſignify a colleague, or ſome perſon aſſociated with another as an aſſiſtant.

ADJUNCT *Gods*, or ADJUNCTS *of the Gods*, among the Romans, were a kind of inferior deities, added as aſſiſtants to the principal ones, to eaſe them in their functions. Thus, to Mars were adjoined Bellona and Nemeſis, &c.

ADJUNCTS, in rhetoric and grammar, ſignify certain words or things added to others, to amplify or augment the force of the diſcourſe.

ADJUNCTS or ADJOINTS, in the royal academy of ſciences at Paris, denote a claſs of members, attached to the particular ſciences. The claſs of *Adjuncts* was created in 1716, in lieu of the *Eleves*; and the *Eleves* not taken into this eſtabliſhment, were admitted on the footing of ſupernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whoſe buſineſs it is to aſſiſt the major. Each battalion of foot and regiment of horſe has an adjutant, who receives the orders every night from the brigade-major, which, after carrying them to the colonel, he delivers out to the ſerjeants. When detachments are to be made, he gives the number to be furniſhed. He alſo places the guards; receives, and diſtributes the am-

munition, &c.; and by the major's orders, regulates the prices of proviſions. The word is ſometimes uſed by the French for an *aide-du-camp*.

ADJUTANTS-*general*, among the Jeſuits, a number of fathers, who reſided with the general of the order, each of whom had a province or country aſſigned him, as England, Holland, &c. and their buſineſs was to inform the father-general of ſtate occurrences in ſuch countries.

ADJUTORIUM, a term uſed by phyſicians for any medicine in a preſcription but the capital one.

ADLE-EGGS, ſuch as have not received an impregnation from the ſemen of the cock.

ADLEGATION, a right claimed by the ſtates of the German empire of adjoining plenipotentiaries, in public treaties and negotiations, to thoſe of the emperor, for the tranſacting of matters which relate to the empire in general. In this ſenſe *adlegation* differs from *legation*, which is the right of ſending ambaſſadors on a perſon's own account.—Several princes and ſtates of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vicè verſa*.

ADLOCUTION, ADLOCUTIO, in antiquity, is chiefly underſtood of ſpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find theſe adlocutions expreſſed on medals by the abbreviature ADLOCUT. COH. The uſual formula in adlocutions was, *Fortis eſſet ac fidus*.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book.—In which ſenſe, *admanuenſes* amount to the ſame with laymen; and ſtand oppoſed to clerks, who were forbid to ſwear on the book, their word being to be reputed as their oath.

ADMEASUREMENT, ADMENSURATIO, in law, a writ which lies for the bringing thoſe to reaſon, or mediocrity, who uſurp more of any thing than their ſhare. This writ lies in two caſes; termed,

ADMEASUREMENT *of Dower*, *Admenſuratio dotis*, where the widow of the deceaſed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

ADMEASUREMENT *of Paſture*, *Admenſuratio paſturæ*; this lies between thoſe who have COMMON of paſtures appendant to their freehold, or common by vicinage, in caſe any of them ſurcharge the common with more cattle than they ought.

ADMINICLE, a term uſed chiefly in old law-books, to imply an aid, help, aſſiſtance, or ſupport.

ADMINICULATOR, an ancient officer of the church, whoſe buſineſs it was to defend the cauſe of widows, orphans, and others deſtitute of help.

ADMINISTRATION, in general, the direction or management of public affairs, and particularly the exerciſe of diſtributive juſtice. Among eccleſiaſtics, it is often uſed to expreſs the giving or diſpenſing the ſacraments, &c.

ADMINISTRATION, is alſo the name given by the Spaniards in Peru to the ſtaple magazine, or warehouſe, eſtabliſhed at Callao, a ſmall town on the S. Sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru.

ADMINISTRATOR, in law, he to whom the ordinary commits the adminiſtration of the goods of a perſon deceaſed, in default of an executor.—An action lies for or againſt an adminiſtrator, as for or againſt an executor; and he ſhall be accountable to the value of the goods of the deceaſed, and no farther:—unleſs there be waſte, or other abuſe, chargeable on him. If the adminiſtrator die, his executors are not adminiſtrators; but the court is to grant a new adminiſtration—If a ſtranger, who is neither adminiſtrator nor executor, take the goods of the deceaſed, and adminiſter, he ſhall be charged, and ſued as an executor, not as an adminiſtrator. The origin of adminiſtrators is derived from the civil law.

ADMINISTRATOR, is ſometimes uſed for the preſident of a province; for a perſon appointed to receive, manage, and diſtribute, the revenues of an hoſpital or religious houſe; for a prince who enjoys the revenues of a ſecularized biſhopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRAL, in a general ſenſe, an officer of high naval rank, who uſually commands a fleet or ſquadron of ſhips of war. Anciently there were generally three or four admirals appointed in the Engliſh ſeas, all of them holding the office *durante bene placito*; and each of them having particular limits under their charge and government; as admirals of the fleet of ſhips, from the mouth of the Thames, northward, ſouthward, or weſtward. Before the word *admiral* was adopted, the title of *cuſtos maris* was made uſe of.

Lord High ADMIRAL *of England*, an office of ſo great power and truſt, that it has been thought expedient in modern times to place it in the hands of a body of commiſſioners, who have a kind of Preſident under the title of *firſt* Lord of the Admiralty. Their juriſdiction is exerciſed over all matters of naval concern whatever.

Lord High ADMIRAL *of Scotland*, one of the great officers of the crown, and ſupreme judge in all maritime caſes within that part of Britain.

ADMIRAL, alſo implies the commander in chief of any ſingle fleet or ſquadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-maſt head.

Vice ADMIRAL, is the commander of the ſecond ſquadron, and carries his flag at the fore-top-maſt head.

Rear ADMIRAL, is the commander of the third ſquadron, and carries his flag at the mizen-top-maſt head.

The rank of an Admiral and his ſtation in the line are alſo indicated by the colour of his flag. Hence there are Admirals, Vice Admirals, and Rear Admirals, of the white, of the blue, &c.

ADMIRAL is alſo an appellation given to the moſt conſiderable ſhip of a fleet of merchantmen, or of the veſſels employed in the cod-fiſhery of Newfoundland. He poſſeſſes privileges as long as the fiſhing-ſeaſon continues, and carries a flag on his main-maſt.

ADMIRAL, in zoology, the Engliſh name of a ſpecies of the voluta, a ſhell-fiſh. See VOLUTA.

ADMIRALTY properly ſignifies the office of lord high admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners called *lords of the admiralty*. Theirs is a ſovereign court, where cognizance is taken in all maritime affairs, whether civil or criminal. All crimes committed on the high-ſeas, or on great rivers below the firſt bridge next the ſea, are cognizable in this court only, and before which they muſt be tried by judge and jury. But in civil caſes the mode is different, the deciſions being all made according to the civil law.

Appeals from the vice-admiralty courts in our plantations and ſettlements may be brought before the courts of admiralty in England, though they may alſo be brought before the king in council. But in caſe of prize veſſels, condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commiſſioners of appeals* conſiſting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are eſtabliſhed in all the maritime countries of Europe for the deciſion of this queſtion, Whether lawful prize or not? for this being a queſtion between ſubjects of different ſtates, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

Admiralty *Iſlands*, lie in about 2° 18′ S. lat. and 146° 44′ E. long. There are between 20 and 30 iſlands ſaid to be ſcattered about here, one of which alone would make a large kingdom.

ADMONITION, in eccleſiaſtical affairs, was the firſt ſtep towards the puniſhment or expulſion of delinquents. In private offences, it was performed privately: in caſe of public offence, openly, before the church. If theſe did not ſuffice, recourſe was had to excommunication.

Admonitio *Fuſtium*, among the Romans, a military puniſhment, like our whipping, only performed with vine-branches.

ADMORTIZATION, in the feudal cuſtoms, the reduction of the property of lands or tenements to mortmain. See Mortmain.

ADNATA, in anatomy, one of the coats of the eye, which is alſo called *conjunctiva* and *albuginea*.

Adnata, is alſo uſed for any hair, wool, or the like, which grows upon animals or vegetables.

Adnata, or *Adnaſcentia*, among gardeners, denote thoſe off-ſets, which, by a new germination under the earth, proceed from the lily, narciſſus, hyacinth, and other flowers, and afterwards grow to true roots.

ADNOUN, is uſed by ſome grammarians to expreſs what we more uſually call an Adjective.

ADOLESCENCE, that period of a perſon's age between infancy and manhood; from *adoleſcere*, "to grow." Adoleſcence is commonly computed to be between 15 and 25, or even 30 years of age; though in different conſtitutions its terms are very different.—The Romans uſually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adoleſcens* are frequently uſed indifferently for any perſon under 45 years.

ADON, a populous village in Hungary. Long. 19. 20. lat. 47. 30.

ADONAI, one of the names of the Supreme Being in the Scriptures. The Jews, who either out of reſpect, or ſuperſtition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not ſo ſcrupulous.

ADONIA, in antiquity, ſolemn feaſts in honour of Venus, and in memory of her beloved Adonis. The Adonia were obſerved with great ſolemnity by moſt nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. They laſted two days: on the firſt of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practiſed at funerals: the women wept, tore their hair, beat their breaſts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called Αδωνιασμος. The Egyptian Adonia are ſaid to have been held in memory of the death of Oſiris; by others, of his ſickneſs and recovery.

ADONIDES, a name given to botaniſts who deſcribed or made catalogues of plants cultivated in any particular place.

ADONIS, *Bird's-eye*, or *Pheaſant's-eye*; a genus of the polyandria order, belonging to the polygynia claſs of plants. It is aſſociated with *Multiſiliquæ*, or 26th Nat. Order.—The characters are: The *calyx* a perianthium, conſiſting of five obtuſe concave leaves, ſomewhat coloured, and deciduous. The *corolla* has from five to fifteen oblong petals obtuſe and gloſſy. The *ſtamina* conſiſt of very numerous, ſhort, ſubulated filaments; the antheræ are oblong and inflected. The *piſtillum* has numerous germina collected in a head; no ſtyli; the ſtigmata acute and reflected. There is no *pericarpium*; the receptacle is oblong and ſpiked. The *ſeeds* are numerous, irregular, angular, gibbous at the baſe, reflected at the top, ſomewhat prominent, and awnleſs.

The moſt remarkable ſpecies are the following: 1. The annua, or common adonis, a native of Kent, where it is found in the fields ſown with wheat. Its flowers, of a beautiful ſcarlet colour, are ſold in London under the name of Red Morocco. 2. The æſtivalis, or annual adonis, with yellow flowers. 3. The vernalis, or perennial adonis. 4. The apennina, which is a native of Siberia and the Apennines.

ADONISTS, a ſect or party among divines and critics, who maintain, that the Hebrew points ordinarily annexed to the conſonants of the word Jehovah are not the natural points belonging to that word, nor expreſs the true pronunciation of it; but are the vowel-points, belonging to the words *Adonai* and *Elohim*, applied to the conſonants of the ineffable name Jehovah; to warn the readers, that inſtead of the word Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are oppoſed to *Jehoviſts*: of whom the principal are Druſius, Capellus, Buxtorf, Alting, and Reland, who has publiſhed a collection of their writings on this ſubject.

ADOPTIANI, in church-hiſtory, a ſect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jeſus Chriſt, in his human nature, is the ſon of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, and owns him for his ſon. The cuſtom of adoption was very common among the ancient Greeks and Romans; yet it was not practiſed, but for certain cauſes expreſſed in the laws, and with certain formalities uſual in ſuch caſes. It was a ſort of imitation of nature, intended for the comfort of thoſe who had no children; wherefore he that was to adopt was to have no children of his own, and to be paſt the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children, neither was it lawful for a young man to adopt an elder, becauſe that it would have been contrary to the order of nature: nay, it was even required that the perſon who adopted ſhould be eighteen years older than his adopted ſon, that there might at leaſt appear a probability of his being the natural father. Among the Greeks it was called υιοθεσια, *filiation*. It was allowed to ſuch as had no iſſue of their own; excepting thoſe who were not κυριοι εαυτων, *their own maſters*, e. g. ſlaves, women, madmen, infants, or perſons under twenty years of age; who being incapable of making wills, or managing their own eſtates, were not allowed to adopt heirs to them.

The Romans had two forms of adoption; one before the prætor; the other at an aſſembly of the people, in the times of the commonwealth, and afterwards by a reſcript of the emperor. In the former, the natural father addreſſed himſelf to the prætor, declaring that he emancipated his ſon, reſigned all his authority over him, and conſented he ſhould be tranſlated into the family of the adopter. The latter was practiſed, where the party to be adopted was already free; and this was called *adrogation*. The perſon adopted changed all his names; aſſuming the præname, name, and ſurname, of the perſon who adopted him.

Adoption *by arms*, was when a prince made a preſent of arms to a perſon, in conſideration of his merit and valour. The obligation here laid on the adoptive ſon was, to protect and defend the father from injuries, affronts, &c. And hence the ceremony of dubbing knights, as well as its name.

Adoption *by baptiſm*, is the ſpiritual affinity contracted by god-fathers and god-children in the ceremony of baptiſm.

ADOPTION *by hair*, was performed by cutting off the hair of a perſon, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boſon king of Arles; which, perhaps, is the only inſtance in hiſtory, of adoption, in the order of the eccleſiaſtics; a law that profeſſes to imitate nature, not daring to give children to thoſe in whom it would be thought a crime to beget any.

ADOPTION *by matrimony*, is the taking the children of a wife or huſband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the ſame footing with thoſe of the preſent marriage.

ADOPTION *by teſtament*, that performed by appointing a perſon heir by will, on condition of his aſſuming the name, arms, &c. of the adopter.—Among the Turks, the ceremony of adoption is performed by obliging the perſon adopted to paſs through the ſhirt of the adopter. Hence, among that people, to adopt, is expreſſed by the phraſe, *to draw another through my ſhirt*.

ADOPTION is alſo uſed, in theology, for a federal act of God's free grace; whereby thoſe who are regenerated by faith, are admitted to a ſhare in the inheritance of the kingdom of heaven.

ADOPTION is ſometimes alſo uſed, in ſpeaking of the ancient clergy, who had a cuſtom of taking a maid or widow into their houſes, under the denomination of an *adoptive*, or *ſpiritual ſiſter*, or *niece*.

ADOPTION is alſo uſed in ſpeaking of the admiſſion of perſons into certain hoſpitals, and alſo for the reception of a new academy into the body of an old one. In a ſimilar ſenſe, adoption is alſo applied by the Greeks, to the admitting a monk, or brother, into a monaſtic community; ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another. Adoptive children, among the Romans, were on the ſame footing with natural ones; and accordingly were either to be inſtituted heirs, or expreſsly diſinherited, otherwiſe the teſtament was null.

In eccleſiaſtical writers we find adoptive women, or ſiſters, uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſub-introductæ*.

ADOPTIVE *arms*, are thoſe which a perſon enjoys by the conceſſion of another, and to which he was not otherwiſe intitled.

ADORATION, the act of rendering divine honours; or of addreſſing a being, as ſuppoſing it a god. The Romans practiſed adoration at ſacrifices, and other ſolemnities; in paſſing by temples, altars, groves, &c.; at the ſight of ſtatues, images, or the like, whether of ſtone or wood, wherein any thing of divinity was ſuppoſed to reſide. Uſually there were images of the gods placed at the gates of cities, for thoſe who went in or out, to pay their reſpects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head *covered*, applied his right hand to his lips, the fore-finger reſting on his thumb, which was erect, and thus bowing his head, turned himſelf round from left to right. The Jewiſh manner of adoration was by proſtration, bowing and kneeling. The Chriſtians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary poſture of the ancient Chriſtians was kneeling, but on Sundays ſtanding; and they had a peculiar regard to the Eaſt, to which point they ordinarily directed their prayers.

ADORATION is more particularly uſed for the act of preferring our requeſts or thankſgivings to Almighty God. It is alſo uſed for certain extraordinary civil honours or reſpects which reſemble thoſe paid to the deity, yet are given to men.

The practice of adoration, though highly unbecoming in one human being towards another, is ſtill ſubſiſting in England, in the ceremony of kiſſing the king's or queen's hand, and in ſerving them at table, both being performed kneeling.

ADORATION is more particularly uſed for kiſſing one's hand in preſence of another, as a token of reverence.—The Jews adored by kiſſing their hands and bowing down their heads; whence, in their language, *kiſſing* is properly uſed for *adoration*.—Among the Romans, adoration was paid to orators, actors, &c. The method of expreſſing it was, by riſing, putting both hands to the mouth, and then returning them towards the perſon intended to be honoured.

ADORATION is alſo uſed, in the court of Rome, for the ceremony of kiſſing the pope's feet.—It is ſaid of Diocleſian, that he had gems faſtened to his ſhoes, that divine honours might be more willingly paid him, by kiſſing his feet. The like uſage was afterwards adopted by the popes, who finding a vehement diſpoſition in the people to fall down before them and kiſs their feet, had crucifixes faſtened on their ſlippers; by which, the adoration intended for the pope's perſon is ſuppoſed to be transferred to Chriſt.

ADORATION is alſo uſed for a method of electing a pope. In election by *adoration*, the cardinals ruſh haſtily, as if agitated by ſome ſpirit, to the adoration of ſome one among them, to proclaim him pope. But when it is carried by *ſcrutiny*, they do not adore the new pope till he is placed on the altar.

Barbarous ADORATION is a term uſed, in the laws of king Canute, for that performed after the manner of the heathens who adored idols. The Romiſh church is charged with this, but they deſcribe their adoration of ſaints, crucifixes, &c. as only a relative or ſubordinate worſhip, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the ſame be ſaid of the idol-worſhip of the heathens?

ADOREA, in Roman antiquity, a word uſed ſometimes for all manner of grain, ſometimes for a kind of cakes offered in ſacrifice, and finally for a diſtribution of corn, as a reward for ſome ſervice; whence by metonymy it is put for praiſe or rewards in general.

ADOSCULATION, a term implying a kind of impregnation, without intromiſſion. The impregnation of plants is thus ſaid to be effected by the falling of the farina fœcundans on the piſtil.

ADOSEE, in heraldry, ſignifies two figures or bearings being placed back to back.

ADOUR, the name of a river of France, which runs through Gaſcony, and falls into the bay of Biſcay.

ADOXA, TUBEROUS MOSCHATEL, HOLLOWROOT, or INGLORIOUS, a genus of the tetragynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters of this genus are: The *calyx* a perianthium beneath, divided into two ſegments, flat, perſiſtent. The *corolla* is compoſed of one flat petal, divided into four ovate acute ſegments longer than the calyx. The *ſtamina* conſiſt of eight ſubulated filaments the length of the calyx; with roundiſh antheræ. The *piſtillum* has a germen beneath the receptacle of the corolla; four ſimple, erect, perſiſtent ſtyli, the length of the ſtamina; and ſimple ſtigmata. The *pericarpium* is a globular four-celled berry between the calyx and corolla. The *ſeeds* are ſolitary and compreſſed.

There is but one ſpecies, which is a native of the woods in Britain, and ſeveral parts of Europe: it is a very low plant, ſeldom riſing more than four or five inches high. The leaves and flowers ſmell like muſk, from whence it has by ſome been called *muſk-crowfoot*.

AD PONDUS OMNIUM, among phyſicians, an abbreviation,

ſignifying that the laſt ingredient is to weigh as much as all the reſt together.

AD *Quod Dannum*, in the Engliſh law, a writ directed to the ſheriff, commanding him to enquire into the damage which may befal from granting certain privileges to a place, as a fair, a market, or the like.

ADRACHNE, in botany, a ſpecies of the ſtrawberry-tree. See ARBUTUS.

ADRASTEA, in antiquity, an epithet given to the goddeſs Nemeſis, or Revenge. It was taken from king Adraſtus, who firſt erected a temple to that deity.

ADRASTIA *Certamina*, in antiquity, a kind of Pythian games, inſtituted in honour of Apollo, at Sicyon.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches; the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. The ſecond were the followers of Adrian Hamſtead the anabaptiſt; and held ſome particular errors concerning Chriſt.

ADRIANOPLE, a city of Turkey in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. The Turks took this city from the Greeks in 1362, and made it the capital of the empire, till Mahomet II. took Conſtantinople in 1453. E. long. 26. 27. lat. 41. 41.

ADROGATION, in Roman antiquities, a ſpecies of adoption, whereby a perſon capable of chooſing for himſelf was admitted by another into the relation of a ſon. The word is compounded of *ad*, "to," and *rogare*, "to aſk;" on account of a queſtion put in the ceremony of it, Whether the adopter would take ſuch a perſon for his ſon? and another to the adoptive, Whether he conſented to become ſuch a perſon's ſon?

ADSIDELA, in antiquity, the table at which the flamens ſat during the ſacrifices.

ADSTRICTION, among phyſicians, a term uſed to denote the rigidity of any part.

ADUACA, or ATUACA, anciently a large and famous city of the Tungri. E. long. 5. 52. lat. 50. 54.

ADVANCE, in the mercantile ſtyle, denotes money paid before goods are delivered, or buſineſs performed.

ADVANCED, in a general ſenſe, denotes ſomething poſted or ſituated before another. Thus, ADVANCED *Ditch*, in fortification, is that which ſurrounds the glacis or eſplanade of a place.

ADVANCED *Guard*, or *Vanguard*, in the art of war, the firſt line or diviſion of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches firſt towards them. This term is more particularly uſed for a ſmall party of horſe ſtationed before the main guard.

ADVANCER, among ſportſmen, one of the ſtarts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Mooriſh cuſtoms, a kind of ambulatory village, conſiſting of tents, which theſe people remove from one place to another.

ADVENT, in the calendar, properly ſignifies the approach of the feaſt of the Nativity. It includes four Sundays, which begin on St. Andrew's day, or on the Sunday before or after it. During advent, and to the end of the octaves of epiphany, the ſolemnizing of marriage is forbid without a ſpecial licence.

AD VENTREM INSPICIENDUM, in law; a writ by which a woman is to be ſearched whether ſhe be with child by a former huſband, on her with-holding of lands from the next, failing iſſue of her own body. It is alſo ordered, when a woman pleads pregnancy againſt the execution of the ſentence of death.

ADVENTURE, *Bill of*, among merchants, a writing teſtifying the goods mentioned in it to be ſhipped on board a certain veſſel belonging to another perſon, who is to run all hazards.

ADVENTURERS, an ancient company of merchants and traders, erected for the diſcovery of lands, territories, trades, &c. unknown. It had its riſe in Burgundy, and was known by the name of *The brotherhood of St. Thomas à Becket*.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or ſuffering; or to mark ſome circumſtance or quality ſignified by them. The word is formed from the prepoſition *ad*, "to," and *verbum*, "a verb;" and ſignifies literally a word joined to a verb, to ſhew how, when, or where, one is, does, or ſuffers; as, the boy paints *neatly*, writes *ill*; the houſe ſtands *there*, &c.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day books. It is more particularly uſed for a kind of common-place-book. See COMMON-PLACE-BOOK.

ADVERSATIVE, in grammar, a word expreſſing ſome difference between what goes before and what follows it. Thus, in the phraſe, *he is an honeſt man, but a great enthuſiaſt*, the word *but* is an adverſative conjunction.

ADVERSATOR, in antiquity, a ſervant who attended the rich in returning from ſupper, to give them notice of any obſtacles in the way, over which they might be apt to ſtumble.

ADVERTISEMENT, a brief account of an affair, inſerted in the public papers, for the information of all concerned.

ADULT, an appellation given to any thing that is arrived at maturity: Thus we ſay, an adult perſon, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERATION, the act of debaſing, by an improper mixture. We have laws againſt the adulteration of coffee, tea, tobacco, ſnuff, wine, &c.

ADULTERATION *of coin*, is effected divers ways; as, by making uſe of a wrong metal, or an undue alloy, or too great an admixture of the baſer metals with gold or ſilver. *Adulterating* is ſomewhat leſs extenſive than *debaſing*, which includes diminiſhing, clipping, &c. To adulterate or debaſe the current coin, is a capital crime in all nations.

ADULTERER, a man who commits adultery. See ADULTERY.

ADULTERESS, a woman guilty of ADULTERY. An adultereſs, by our law, undergoes no temporal puniſhment whatever, except the loſs of her dower; and ſhe does not loſe even that, if her huſband is weak enough to be reconciled to her, and cohabit with her after the offence committed.

ADULTERINE, in the civil law, is particularly applied to a child iſſued from an adulterous amour. Adulterine children were more odious than the illegitimate offſpring of ſingle perſons. The Roman law even refuſed them the title of natural children; as if nature diſowned them. The prejudices which exiſt towards baſtard children of every deſcription, are very unwarrantable; ſince they cannot but be innocent of the crime which occaſioned their exiſtence; and they are, in fact, born under ſuch diſadvantages, as give them if poſſible *ſtronger* claims to protection and countenance, than the offſpring of a matrimonial union.

ADULTERY, an unlawful commerce between one married perſon and another, or between a married and unmarried

perſon. Puniſhments have been annexed to adultery in moſt ages and nations, though of different degrees of ſeverity. The Athenians puniſhed adultery by thruſting one of the largeſt radiſhes up the anus of the adulterer, or, in defect thereof, a fiſh with a large head, called *mugil*, "mullet." Among the Romans, ſome will have it to have been made capital by a law of Romulus; and again by the twelve tables. Others, that it was firſt made capital by Auguſtus; and others, not before the emperor Conſtantine. The truth is, the puniſhment in the early days was very various, much being left to the diſcretion of the huſband and parents of the adulterous wife, who exerciſed it differently. Under Theodoſius, women convicted of this crime were puniſhed after a very ſingular manner, viz. by a public conſtupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themſelves.

By the Jewiſh law, adultery was puniſhed with death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adulteress, or a woman ſuſpected of the crime, by making her drink the bitter waters of jealouſy; which, if ſhe were guilty, made her ſwell.

It is much diſputed, whether adultery diſſolves the bond of matrimony, and be a ſufficient cauſe of divorce, ſo that the parties may marry again. This was allowed in the ancient church, and is ſtill continued in the Greek, as well as the Lutheran and Calviniſt churches. Romaniſts, however, diſallow of it, and the council of Trent even anathematized thoſe who maintain it. The eccleſiaſtical courts in England ſo far agree with the Papiſts, that they only grant a divorce *a menſa et thoro*, in caſe of adultery; ſo that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

ADULTERY is alſo uſed in ancient cuſtoms, for the puniſhment or fine impoſed for that offence, or the privilege of proſecuting for it. In which ſenſe, *adulterium* amounts to the ſame with what the Saxons call *leger-wita*.

ADULTERY is ſometimes uſed, in a more extenſive ſenſe, for any ſpecies of impurity or crime, againſt the virtue of chaſtity; and in this ſenſe divines underſtand the ſeventh commandment.

ADULTERY is alſo uſed, eſpecially in ſcripture, for idolatry, or departing from the true God, to the worſhip of a falſe one.

ADULTERY is alſo uſed, in eccleſiaſtical writers, for a perſon's invading or intruding into a biſhopric during the former biſhop's life. The reaſon of the appellation is, that a biſhop is ſuppoſed to contract a kind of ſpiritual marriage with his church.

ADULTERY is alſo uſed in ancient naturaliſts, for the act of ingrafting one plant upon another.

ADVOCATE, among the Romans, a perſon ſkilled in their law, who undertook the defence of cauſes at the bar. The Roman advocates anſwered to one part of the office of a barriſter in England, viz. the pleading part; for they never gave counſel, that being the buſineſs of the *juriſconſulti*.

The Romans, in the firſt ages of their ſtate, held the profeſſion of an advocate in great honour. The bar was not at that time venal. Thoſe who aſpired to honours and offices took this way of gaining an intereſt with the people, and always pleaded *gratis*. But no ſooner were luxury and corruption introduced into the commonwealth, than the ſenators let out their voices for pay, and zeal and eloquence were ſold to the higheſt bidder.

ADVOCATE is ſtill uſed in countries and courts where the civil law obtains, for thoſe who plead and defend the cauſes of clients truſted to them.

ADVOCATE *of a city*, in the German polity, an appellation given to a magiſtrate appointed in the emperor's name to adminiſter juſtice.

ADVOCATE is more particularly uſed in church hiſtory, for a perſon appointed to defend the rights and revenues of a church or religious houſe. The word *advocatus*, or *advowee*, is ſtill retained for what we uſually call the *patron*, or he who has the advowſon, or right of preſentation in his own name.—*Conſiſtorial* ADVOCATES; officers of the conſiſtory at Rome, who plead in all oppoſitions to the diſpoſal of benefices in that court: they are ten in number.—*Elective* ADVOCATES, thoſe choſen by the abbot, biſhop, or chapter; a particular licence being had from the king or prince for that purpoſe.—*Feudal* ADVOCATES. Theſe were of the military kind, who were to lead the vaſſals of the church to war, not only in private quarrels of the church itſelf but in military expeditions for the king's ſervice, in which they were the ſtandard-bearers of their churches.—*Fiſcal* ADVOCATE, *fiſci advocatus*, in Roman antiquity, an officer of ſtate under the Roman emperors, who pleaded in all cauſes wherein the *fiſcus*, or private treaſury, was concerned.—*Juridical* ADVOCATES, in the middle age, thoſe who from attending cauſes in the court of the count of the province, became judges themſelves, and held courts of their vaſſals thrice a year, under the name of the *tria placita generalia*.—*Matricular* ADVOCATES, were the advocates of the mother or cathedral churches.—*Military* ADVOCATES were introduced in the times of confuſion, when every perſon was obliged to maintain his property by force; biſhops and abbots not being permitted to bear arms, recourſe was had to knights, noblemen, ſoldiers, or even to princes.—*Nominative* ADVOCATES, thoſe appointed by a king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord.—*Regular* ADVOCATES, thoſe duly formed and qualified for their profeſſion, by a proper courſe of ſtudy, the requiſite oath, ſubſcription, licence, &c.—*Subordinate* ADVOCATES, thoſe appointed by other ſuperior ones, acting under them, and accountable to them.—*Supreme* or *Sovereign* ADVOCATES, were thoſe who had the authority in chief; but acted by deputies or ſubordinate advocates. Theſe were called alſo *principal*, *greater*, and ſometimes *general* advocates. Such in many caſes were kings, &c. when either they had been choſen advocates, or became ſuch by being founders or endowers of churches.

Faculty of ADVOCATES, in Scotland, a reſpectable body of lawyers, in number above 200, who plead in all cauſes before the Courts of Seſſion, Juſticiary, and Exchequer. They are alſo intitled to plead in the houſe of peers, and other ſupreme courts in England.

Lord ADVOCATE, or *King's Advocate*, one of the eight great officers of ſtate in Scotland, who as ſuch ſat in parliament without election. He is the principal crown-lawyer in Scotland. His buſineſs is to act as a public proſecutor, and to plead in all cauſes that concern the crown.

ADVOWEE, in ancient cuſtoms and law books, denotes the advocate of a church, religious houſe, or the like. There were advowees of cathedrals, abbeys, monaſteries, &c. Thus, Charlemagne had the title of advowee of St. Peter's; king Hugh, of St. Riquier, &c. Theſe advowees were the guardians, protectors, and adminiſtrators of the temporal concerns of the churches, and under their authority were paſſed all contracts which related to them. It appears alſo, from the moſt ancient charters, that the donations made to churches were conferred on the perſons of the advowees. They always pleaded the cauſes of the churches in court, and diſtributed juſtice for them, in the places under their juriſdiction.

Spelman diſtinguiſhes two kinds of eccleſiaſtical advowees. The one, of cauſes or proceſſes, *advocati cauſarum*; the other, of territory or lands, *advocati ſoli*. The former were nominated by the king, and were uſually lawyers, who undertook to plead the cauſes of the monaſteries. The other, which ſtill ſubſiſt, and are ſometimes called by their primitive name, *advowees*, though more uſually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs. Women were ſometimes advowees, *advocatiſſæ*. And, in effect, the canon law mentions ſome who had this title, and who had the ſame right of preſentation, &c. in their churches which the advowees themſelves had. In a ſtat. 25 Edw. III. we meet with *advowee paramount* for the higheſt patron; that is, the king.

ADVOWSON, or ADVOWZEN, in common law, ſignifies a right to preſent to a vacant benefice. Advowſons formerly were moſt of them appendant to manors, and the patrons were parochial barons: the lordſhip of the manor, and patronage of the church, were ſeldom in different hands, until advowſons were given to religious houſes. But of late times, the lordſhip of the manor and advowſon of the church have been divided.

Advowſons are *preſentative*, *collative*, or *donative*: *preſentative*, where the patron preſents or offers his clerk to the biſhop of the dioceſe, to be inſtituted in his church; *collative*, where the benefice is given by the biſhop, as original patron thereof, or by means of a right he has acquired by lapſe; *donative*, as where the king or other patron does, by a ſingle donation in writing, put the clerk into poſſeſſion, without preſentation, inſtitution, or induction.

Sometimes, anciently, the patron had the ſole nomination of the prelate, abbot, or prior; either by inveſtiture (*i. e.* delivery of a paſtoral ſtaff), or by direct preſentation to the dioceſan; and if a free election was left to the religious, yet a *congé d'élire*, or licenſe of election, was firſt to be obtained of the patron, and the perſon elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor.

Colleges holding more advowſons in number than a moiety of the fellows, are not capable of purchaſing more. Grants of advowſons by papiſts are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowſons are temporal inheritances and lay fees; they may be granted by deed or will, and are aſſets in the hands of heirs or executors. Preſentations to advowſons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland this right is called *patronage*. See PATRONAGE.

ADUST, ADUSTUS, among phyſicians of the old ſchool, was applied to ſuch humours as by long heat became of a hot and fiery nature. Melancholy, for inſtance, was conſidered as black and aduſt bile; but the term is now diſuſed.

ADY, in natural hiſtory, a name given to the palm tree of the iſland of St. Thomas; a tall tree, with a thick, bare, upright ſtem, growing ſingle on its root, of a thin light timber, and full of juice. The head of this tree ſhoots into a vaſt number of branches, which being cut off, or an inciſion being made therein, afford a great quantity of ſweet juice, which fermenting, ſupplies the place of wine among the Indians. The fruit of this tree is called by the Portugueſe *Caryoces* and *Carioſſe*; and by the black natives, *Abanga*. An oil is alſo prepared from the fruit, which anſwers the purpoſe of butter. It is alſo uſed for anointing ſtiff and contracted parts of the body.

ADYNAMIA, in medicine, debility, or weakneſs, from long indiſpoſition.

ADYNAMON, among ancient phyſicians, a kind of weak factitious wine, prepared from muſt boiled down with water; which was given to patients to whom genuine wine might be hurtful.

ADYTUM, in pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum.

ADZE, or ADDICE, a cutting tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly uſed for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at. The adze is uſed by carpenters, but more by coopers, as being convenient for cutting the hollow ſides of boards, &c.

AE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the uſe of the *ae* in Engliſh words. Some, from a conſideration that it is no proper diphthong in our language (its ſound being no other than that of the ſimple *e*), contend that it ought to be entirely diſuſed; and, in fact, the ſimple *e* has of late been adopted inſtead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus.

ÆCHMALOTARCHA, in Jewiſh antiquity, a title given to the principal leader or governor of the Hebrew captives reſiding in Chaldea, Aſſyria, and the neighbouring countries. This magiſtrate was called by the Jews *roſch-galath*, i. e. the chief of the captivity: but the above term, of like import in the Greek, is that uſed by Origen and others who wrote in the Greek tongue.

ÆDES, in Roman antiquity, beſides its more ordinary ſignification of a houſe, likewiſe ſignified an inferior kind of temple, conſecrated to ſome deity.

ÆDICULA, a term uſed to denote the inner part of the temple, where the altar and ſtatue of the deity ſtood.

ÆDILE (*ædilis*), in Roman antiquity, a magiſtrate whoſe chief buſineſs was to ſuperintend buildings of all kinds, but more eſpecially public ones, as temples, aqueducts, bridges, &c. To the ædiles likewiſe belonged the care of the highways, public places, weights, and meaſures, &c. They alſo fixed the prices of proviſions, took cognizance of debauches, puniſhed lewd women, and ſuch perſons as frequented gaming-houſes. The cuſtody of the plebiſcita, or orders of the people, was likewiſe committed to them. They had the inſpection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. Added to the above offices, the cuſtody of the plebiſcita, the cenſure and examination of books, &c. they had the power, on certain occaſions, of iſſuing edicts; and, by degrees, they procured to themſelves a conſiderable juriſdiction, the cognizance of various cauſes, &c. This office ruined ſo many by its expenſiveneſs, that, in Auguſtus's time, even many ſenators declined it on that account.

We alſo read of an *ædilis alimentarius*, expreſſed in abbreviature by *Ædil. alim.* whoſe buſineſs ſeems to have been to provide diet for thoſe who were maintained at the public charge, though others aſſign him a different office.—In an ancient inſcription we alſo meet with *ædile* of the camp, *ædilis caſtrorum*.

ÆDILITIUM EDICTUM, among the Romans, was that whereby a remedy was given a buyer, in caſe a vicious or unſound beaſt, or ſlave, was ſold him. It was called *ædilitium*, becauſe the preventing of frauds in ſales and contracts belonged eſpecially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treaſure, and ſacred utenſils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball compoſed of a ſubſtance reſem-

bling hair, generated in the ſtomach of the chamois-goat. This ball is of the ſame nature with thoſe found in cows, hogs, &c.

ÆGIAS, among phyſicians, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGIDA, now *Capo d'Iſtria*, the principal town on the north of the territory of Iſtria. E. long. 14. 20. lat. 45. 50.

ÆGILOPS, the name of a tumour in the great angle of the eye; either with, or without, an inflammation. The word is compounded of *αιξ goat*, and *ωψ eye;* as goats are ſuppoſed extremely liable to this diſtemper. This tumour is well known to ſurgeons, as uſually the forerunner of a fiſtula lachrymalis.

ÆGILOPS, *Wild Feſtuc;* a genus of the monœcia order, belonging to the polygamia claſs of plants, and ranking under the 4th natural order, *Gramina*. The characters are: The *hermaphrodite calyx* is a two-valved glume, triflorous; the corolla a two-valved glume, the exterior valvulet terminated by three ariſtæ or awns, the interior awnleſs: *Stamina*, three capillary filaments; ſtyli, two: *Seed*, one, oblong. *Male calyx* and *Corolla*, each a glume as in the former; and *ſtamina*, the ſame number. There are ſeven ſpecies, natives of Italy and ſome other parts of Europe; one of them, the incurvata, a native of Britain, grows by the ſea-ſhore, and is vulgarly called *ſea-hard-graſs*. ÆGILOPS is alſo the trivial name of a ſpecies of QUERCUS.

ÆGIPHILA, GOAT-FRIEND: a genus of the monogynia order, belonging to the tetrandria claſs of plants; the characters of which are: The *calyx* is a ſingle-leaved perianthium, bell-ſhaped, four tooth'd, looſe, very ſhort, and perſiſtent: The *corolla* conſiſts of one petal; the tubus cylindric, narrower and longer than the calyx; the border divided into four ſegments, flat and equal; the diviſions oblong: The *ſtamina* conſiſt of four erect capillary filaments; the antheræ are incumbent and ſquared: The *piſtillum* has a germen above; a capillary, two-cleft, middle-ſized ſtylus; and a ſimple ſtigma: The *pericarpium* is a roundiſh unilocular berry: The *ſeeds* are four. There is only one ſpecies, a native of Martinico.

ÆGIS, in the ancient mythology, a name given to the ſhield or buckler of Jupiter and Pallas.—The goat Amalthea, which had ſuckled Jove, being dead, that god is ſaid to have covered his buckler with the ſkin thereof; whence the appellation *ægis*, from *αιξ, αγος, ſhe-goat*. Jupiter, afterwards reſtoring the beaſt to life again, covered it with a new ſkin, and placed it among the ſtars. As to his buckler, he made a preſent of it to Minerva: whence that goddeſs's buckler is alſo called *ægis*.—Minerva, having killed the Gorgon Meduſa, nailed her head in the middle of the ægis, which henceforth had the faculty of converting into ſtone all thoſe who looked thereon; as Meduſa herſelf had done during her life.—Others take the ægis not to have been a buckler, but a cuiraſs, or breaſt-plate.

ÆGOBOLIUM, in antiquity, the ſacrifice of a goat offered to Cybele. The ægobolium was an expiatory ſacrifice, which bore a near reſemblance to the taurobolium and criobolium, and ſeems to have been ſometimes joined with them.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUTWORT, GOATSFOOT, HERB GERARD, or ASHWEED; a genus of the digynia order, belonging to the pentandria claſs of plants; the characters of which are: The univerſal *calyx* is a manifold convex umbel; the partial one, conſimilar and flat; there is no involucrum; and the proper perianthium is ſcarcely diſcernible: The univerſal *corolla* is uniform, the florets all fertile; the proper one has five inverſe-ovate, concave, equal petals, inflected at the top: The *ſtamina* conſiſt of five ſimple filaments twice the length of the corolla; the antheræ roundiſh: The *piſtillum* has a germen beneath; two purple erect ſtyli the length of the corollet; the ſtigmata are headed: No *pericarpium:* The fruit is ovate, ſtriated, and bipartite: The *ſeeds* are two, ovate, on one ſide convex and ſtriated, and flat on the other. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves reſemble thoſe of Angelica, and it carries ſmall white flowers.

ÆGOPRICON; a genus of the monœcia order, belonging to the diandria claſs of plants; the characters of which are: The *calyx* both of the male and female is a tubular perianthium of one leaf divided into three ſegments: *Corolla* wanting in both: The *ſtamina* conſiſt of a ſingle erect filament longer than the calyx, with an ovate anthera: The *piſtillum* has an ovate germen, three divaricated ſtyli, and ſimple perſiſtent ſtigmata: The *pericarpium* is a globular berry, three-grained within, and three-cell'd: The *ſeeds* are ſolitary, and angular on one ſide.—There is but one ſpecies, a native of Surinam.

ÆGYPTIACUM, in pharmacy, the old name of ſeveral detergent ointments; in the compoſition of which, copper was diſſolved in vinegar and honey.

ÆGYPTILLA, in natural hiſtory, the name of a ſtone deſcribed by the ancients, and ſaid, by ſome authors, to have the remarkable quality of giving water the colour and taſte of wine.

ÆINAUTÆ, in antiquity, a denomination given to the ſenators of Miletus, becauſe they held their deliberations on board a ſhip, and never returned to land till matters had been agreed on.

ÆLIUS PONS, now *il Ponte S. Angelo*, a ſtone-bridge at Rome, over the Tyber, built by the emperor Adrian.

ÆLURUS, in Egyptian mythology, the deity or god of cats; repreſented ſometimes like a cat, and ſometimes like a man with a cat's head.

AEM, AM, or AMEL, a liquid meaſure uſed in moſt parts of Germany; but different in different towns. See AAM.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the ſacrifices, called *taurobolia* and *criobolia*.

ÆNEATORES, in antiquity, the muſicians in an army, including thoſe who played trumpets, horns, &c. The word is from *æneus*, on account of the brazen inſtruments uſed by them.

ÆNEID, the name of Virgil's celebrated epic poem. There is nothing in antiquity to equal the ſixth book of the Æneid.

ÆNGINA, one of the iſlands of the Archipelago.

ÆNIGMA, denotes any dark ſaying, wherein ſome well-known thing is concealed under obſcure language.

ÆNIGMAS conſiſt in words, which, whether they be in proſe or verſe, contain either ſome deſcription, a queſtion, or a proſopopœia. The laſt kind are the moſt pleaſing, inaſmuch as they give life and action to things which otherwiſe have them not. To make an ænigma, therefore, two things are to be pitched on, which bear ſome reſemblance to each other; as the ſun and a monarch; or a ſhip and a houſe: and on this reſemblance is to be raiſed a ſuperſtructure of contrarieties to amuſe and perplex. It is eaſier to find great ſubjects for ænigmas in figures than in words, inaſmuch as painting attracts the eyes and excites the attention to diſcover the ſenſe. The ſubjects of enigmas in painting, are to be taken either from hiſtory or fable; the compoſition here is a kind of metamorphoſis, wherein, *e.g.* human figures are changed into trees, and rivers into metals. It is eſſential to ænigmas, that the hiſtory or fable, under which they are preſented, be known to everybody; otherwiſe it will be two ænigmas inſtead of one; the firſt of the hiſtory or fable, the ſecond of the ſenſe in which it is to be taken. Another eſſential rule of the ænigma is, that it only admit of one ſenſe. Every ænigma which is ſuſceptive

of different interpretations, all equally natural, is so far imperfect. What gives a kind of erudition to an ænigma, is the invention of figures in situations, gestures, colours, &c. authorised by passages of the poets, the customs of artists in statues, basso relievos, inscriptions, and medals. The ænigma is deservedly considered a species of false wit, and only suitable for men whose talents are of a very inferior description.

ÆNIGMATOGRAPHY, or ÆNIGMATHOLOGY, the art of resolving or making ænigmas.

ÆNITHOLOGIUS, in poetry, a verse of two dactyls and three trochæi; as, *Prælia dira placent truci juventæ.*

ÆOLIC, or ÆOLIAN, in grammar, denotes one of the five dialects of the Greek tongue. It was first used in Bœotia; whence it passed into Æolia, and was that which Sappho and Alcæus wrote in. The ÆOLIC dialect generally throws out the aspirate or sharp spirit, and agrees in so many things with the DORIC dialect, that the two are usually confounded together. —ÆOLIC *digama* is a name given to the letter F.—ÆOLIC *Verse*, in prosody, a verse consisting of an iambus, or spondee; then of two anapests, separated by a long syllable; and, lastly, of another syllable. Such as, *O stelliferi conditor orbis.*

ÆOLIPILE, in hydraulics, is a hollow ball of metal, used to demonstrate the possibility of converting water into an elastic vapour by heat. This instrument is of copper, and consists of a slender neck, or pipe, having a narrow orifice, inserted into a hollow ball which is filled almost full of water. It is then placed on a fire, and as the vapour is emitted, it is thrown by the curved shape of the neck, downward; so as to act upon the fire like a pair of bellows. The stronger the fire is, the more violently the vapour rushes through the small aperture at the point of the tube, and thus the effect is kept up so long as any water remains in the ball. The mode of filling this vessel, is by placing it over a fire till the principal part of the air is expelled, and then plunging the end of the tube into cold water. The fluid, in that ease, rushes in, like the mercury in filling the tube of a thermometer. Des Cartes and others have used this instrument to account for the natural cause and generation of the wind: and hence it was called *Æolipila:* q. d. *pila Æoli*, the ball of Æolus or of the god of the winds.

ÆOLIS, or ÆOLIA—; the ancient name of a country of the Hither Asia, settled by colonies of Æolian Greeks. Taken at large, it comprehends all Troas, and the coast of the Hellespont to the Propontis, because in those parts there are several Æolian colonies: more strictly, it is situated between Troas to the north, and Ionia to the south. The people are called *Æoles* or *Æolii.*

ÆOLIUM MARE—; according to ancient geographers, a part of the Egean sea, washing Æolis; called also *Mysium*, from Mysia. Now called, *Golfo di Smyrna.*

ÆOLUS, *Harp of*, or Æolian lyre. See ACOUSTICS.

ÆON, a Greek word, properly signifying the age or duration of any thing.

ÆON, among the followers of Plato, was used to signify any virtue, attribute, or perfection: hence they represented the deity as an assemblage of all possible æons; and called him πληρωμα, a Greek term signifying *fullness.*

ÆORA, among ancient writers on medicine, is used for gestation; which sort of exercise was often preseribed by the physicians of those days. Other exercises consisted principally in the motion of the body; but in the *æora* the limbs were at rest, while the body was carried about and moved from place to place, in such a manner as the physician prescribed. What we call *swinging* is a species of *æora* useful in consumptions, since by it the patient has all the advantages of motion, without the fatigue of it.

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is sometimes also written in ancient authors *Era.* The origin of the term is contested, though it is generally allowed to have had its rise in Spain. Sepulveda supposes it formed from A. ER. A. the notæ or abbreviatures of the words, *annus erat Augusti*, occasioned by the Spaniards beginning their computation from the time their country came under the dominion of Augustus, or that of receiving the Roman calendar. The difference between the terms *æra* and *epoch* is, that the æras are certain points fixed by some people, or nation; and the epochs are points fixed by chronologists and historians.

ÆRARIUM, the treasury or place where the public money was deposited amongst the Romans.—ÆRARIUM *Sanctius* contained the monies arising from the twentieth part of all legacies: this was kept for the extreme necessities of the state. —ÆRARIUM *Privatum* was the emperor's privy purse, or the place where the money arising from his private patrimony was deposited.—ÆRARIUM *Vicesimarum*, the place where the money arising from the taxes levied from foreign countries was laid up, so called because it most commonly consisted of a twentieth part of the produce.—ÆRARIUM *Ilithyæ*, or *Junonis Lucinæ*, was where the monies were deposited which parents paid for the birth of each child.—There are several other treasuries mentioned in history, as the *ærarium Juventutis, Veneris*, &c.—*Ærarium* differs from *fiscus*, as the first contained the public money, the second that of the prince. The two are, however, sometimes indiscriminately used for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been struck off the list of his century. Such persons were so called because they were liable to all the taxes *(æra)*, without enjoying any of its privileges.—ÆRARIUS was also an officer instituted by Alexander Severus, for the distribution of the money given in largesses to the soldiery, or people.—ÆRARIUS was also used for a person employed in coining or working brass.—These are sometimes called *ærarii fusores:* at other times *ærarius* is distinguished from *fusor;* the former answering to what we now call copper-smiths, the latter to founders—ÆRARIUS was likewise applied to a soldier who received pay.

AERIAL *Perspective.* See PERSPECTIVE and PAINTING.

AERIANS, in church history, a branch of Arians, who to the doctrines of that sect added some peculiar dogmas of their own; as, that there is no difference between bishops and priests; a doctrine maintained by many modern divines, particularly of the presbyterian and reformed churches. The sect received its denomination from Aerius an Armenian priest of the fourth century.

AEROGRAPHY, from αηρ *air*, and γραφω *I describe;* a description of the air, or atmosphere, its limits, dimensions, properties, &c. This amounts to much the same with aerology, unless we suppose the latter to enter into the rational, and the former to confine itself to a description of the more obvious affections thereof. See ATMOSPHERE.

AEROLOGY,

THE doctrine or ſcience of AIR, its nature and different ſpecies, with their ingredients, properties, phenomena, and uſes.

Air, in a general ſenſe, is that inviſible fluid every-where ſurrounding this globe; yet till within theſe laſt 30 years little more than the mere mechanical action of it was diſcovered. Within that period, however, the diſcoveries concerning the conſtituent parts of the atmoſphere itſelf, as well as the nature of the different permanently elaſtic fluids which go under the general name of *air*, have been ſo numerous and rapid, that they have at once raiſed this ſubject to the dignity of a *Science*; and one by which many perplexing proceſſes in chemiſtry have been explained, ſeveral facilitated, and a number of new and uſeful ones introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated; and the knowledge of the uſe of the air in reſpiration, the method of aſcertaining its purity and fitneſs for that function, the inveſtigation of dephlogiſticated air, the method of impregnating water with fixed air, are all calculated to anſwer purpoſes of the higheſt utility.

SECT. I. *Of the general Conſtitution, Mechanical Properties, and Operations of the Air.*

FOR many ages the air was ſuppoſed to be ſimple and homogeneous, and its common operations to depend on its heat, cold, moiſture, or dryneſs; but it is, in fact, the receptacle of all kinds of effluvia produced from terreſtrial ſubſtances either naturally or artificially. Hence, whatever may be its nature when abſolutely pure, that which we breathe under the name of *air*, muſt be conſidered as an exceedingly heterogeneous mixture.

Providentially however it happens, that there are various ways in which the atmoſphere undergoes a kind of ſpontaneous purification. One of the moſt prevalent cauſes of this, is the almoſt incredible quantity of aqueous vapour, which according to Dr. Halley, Dr. Watſon, and other philoſophers, is continually diffuſed through it; and which, in aſcending from the earth, effects this ſalutary purpoſe. But it has been diſcovered alſo, that thoſe parts of the atmoſphere which are unfavourable to animal life, conſtitute the principal nouriſhment of the vegetable world. Hence very probably, not only the phlogiſtic vapours which aſcend becauſe of their leſs ſpecific gravity, but alſo thoſe metalline and other deleterious exhalations which would otherwiſe reſt upon the earth's ſurface, are imbibed by the vegetable productions which every where abound; and which alſo have the property of emitting *pure* air (under certain circumſtances) in return for that which they have conſumed.

The two moſt important properties of the atmoſphere are its gravity and its elaſticity. The firſt compared to the ſpecific gravity of water, according to the computations of Mr. Boyle, is as 1 to 938, but, according to later experiments, as 1 to 800. This property is rendered evident in a variety of ways, but in none more deciſive than in ſimply evacuating the receiver of an air pump, ſo as to evince the prodigious preſſure of the atmoſphere on its outſide. M. Paſcal has computed the quantity of this preſſure on the earth's ſurface to be upwards of 2232 lb. on every ſquare foot.

On the gravity of the air depend the aſcent of water in pumps, ſyphons, &c. and likewiſe all the phenomena of the barometer. But beſides gravity, which the air has in common with other fluids, there is another property which it has only in common with ſteam or vapour. This is called its *elaſticity*; by which, like a ſpring, it allows itſelf to be compreſſed into a ſmaller bulk, and then returns again to its original ſize upon removing the preſſure.

The elaſticity of the air, which was firſt aſcertained by ſome experiments of lord Bacon, is no leſs eaſy of proof than its gravity. If a ſhrivelled bladder containing only a very ſmall quantity of air be put under the receiver of an air pump, and the preſſure of the atmoſphere taken off the outſide of the bladder by exhauſting the receiver, the claſticity of the air within will be ſhewn by its expanding the bladder to its full dimenſions. The ſame fact is ſhewn in a variety of other experiments not neceſſary to be detailed here. It may be proper however to obſerve, that this elaſticity is capable of ſome diminution by long continued and violent preſſure, as ſome late experiments have proved.

The weight or preſſure of the air has no dependence on its elaſticity; but would be the ſame whether it had ſuch a property or not. The air, however, being elaſtic, is neceſſarily affected by the preſſure, which reduces it into ſuch a ſpace, that the elaſticity, which re-acts againſt the compreſſing weight, is equal to that weight. In effect, the law of this elaſticity is, that it increaſes as the denſity of the air increaſes; and the denſity increaſes as the force increaſes by which it is preſſed. Now there muſt neceſſarily be a balance between the action and re-action; i. e. the gravity of the air which tends to compreſs it, and the elaſticity by which it endeavours to expand, muſt be equal. Hence the elaſticity increaſing, or diminiſhing univerſally, as the denſity increaſes or diminiſhes, it is no matter whether the air be compreſſed and retained in ſuch a ſpace by the weight of the atmoſphere, or by any other means; it muſt endeavour in either caſe to expand with the ſame force. And hence, if air near the earth be pent up in a veſſel, and all communication with the external fluid cut off, the preſſure of the incloſed air will be equal to the weight of the atmoſphere at the time the quantity was confined. Accordingly, we find mercury ſuſtained to the ſame height, by the elaſtic force of air incloſed in a glaſs veſſel, as by the whole atmoſpherical preſſure. On the ſame principle air may be artificially condenſed; and hence the ſtructure of the AIR-*Gun*. See Pl. 2.

The utmoſt limits to which air, of the denſity which it poſſeſſes at the ſurface of the earth, is capable of being compreſſed, have not been aſcertained. Dr. Hales, by means of a preſs, condenſed it 38 times; and afterwards, by forcing water in an iron globe, into 1551 times leſs ſpace than it naturally occupies. However, Dr. Halley, from the experiments made at London and Florence, concludes, that no force whatever is able to reduce air into 800 times leſs ſpace than that which it naturally poſſeſſes on the ſurface of our earth. The dilatation of the air, however, by virtue of its elaſtic force is found to be very ſurpriſing. In the experiments made by Mr. Boyle, it dilated into 10,000, and even at laſt into 13,679 times its ſpace; and this altogether by its own expanſive force, without the help of fire.

In fact, it appears, that the air we breathe is compreſſed by its own weight into at leaſt the 13,679th part of the ſpace it would poſſeſs in *vacuo*. But if the ſame air be condenſed by art, the ſpace it will take up when moſt dilated, to

that it poſſeſſes when condenſed, will be, according to the ſame author's experiments, as 550,000 to 1.

Dr. Hales found, that the air in a retort, when the bottom of the veſſel was juſt beginning to be red-hot, was expanded through twice its former ſpace; and in a white heat, it occupied thrice its former ſpace: but Mr. Robins found it was expanded by the heat of iron, juſt beginning to be white, to four times its former bulk.

The elaſtic power of the air is the ſecond great ſource of the effects of this important fluid. Thus it enters the pores of bodies; and by this prodigious faculty of expanding, which is ſo eaſily excited, puts their particles into perpetual oſcillations. Indeed, the degree of heat, and the air's gravity and denſity, and conſequently its elaſticity and expanſion, never remaining the ſame for the leaſt ſpace of time, there muſt be an inceſſant vibration or dilatation and contraction in all bodies.

From this cauſe it is, that the air contained in bubbles of ice, by its continual action, burſts the ice. Thus alſo entire columns of marble ſometimes are cleft, in the winter time, from the increaſed elaſticity of ſome little bubble of air contained in them. From the ſame principle ariſe all putrefaction and fermentation; neither of which will proceed, even in the beſt diſpoſed ſubjects, *in vacuo*.

Beſides theſe properties of gravity and elaſticity, authors have attributed to air ſeveral qualities which rather belong to the accidental mixture of other fluids in its compoſition. Of this nature is its property of corroding metals, ſtones, &c. but we ſhall not dwell on them at preſent farther than to obſerve, that in theſe caſes the diſſolving power of air is increaſed by heat, and by other cauſes. It combines with water; and, by acceſs of cold, depoſits part of the matter which was kept diſſolved in it by a greater degree of heat. Hence the water, by being depoſited and condenſed upon any cold body, ſuch as glaſs, &c. in windows, forms fogs, and becomes viſible.

In the operations of chemiſtry, air is a very important agent; the reſult of particular proceſſes depending on its preſence or abſence, on its being open or incloſed. Thus, the parts of animals and vegetables can only be calcined in open air; in cloſe veſſels they never become any other than black coals. And theſe operations are affected by the changes to which the air is liable. Many inſtances might be adduced to this purpoſe. Let it ſuffice to obſerve, that it is very difficult to procure oil of ſulphur, *per campanam*, in a clear dry atmoſphere; but in a thick moiſt air it may be obtained with greater eaſe, and in larger quantities. So, pure well fermented wine, if it be carried to a place where the air is repleniſhed with the fumes of new wine then fermenting, will begin to ferment afreſh.

The changes in the air ariſe from various cauſes, and are obſervable, not only in its mechanical properties, but in the ingredients that compoſe it. Thus, at Faſhlun, noted for copper mines, the mineral exhalations affect the air in ſuch a manner as to diſcolour the ſilver coin in purſes, and change the colour of braſs. In Carniola, Campania, &c. where are mines of ſulphur, the air ſometimes becomes very unwholeſome, which occaſions frequent epidemic diſeaſes, &c. The effluvia of animals alſo have their effect in varying the air; as is evident in contagious diſeaſes, plagues, murrains, and other mortalities, which are ſpread by an infected air.

Of the ſucceſſive diſcoveries relative to atmoſpheric and other aerial fluids, we might here give an hiſtorical account, were it not more an object with us to detail facts themſelves, than the circumſtances under which they were diſcovered. We ſhall however briefly obſerve, that Van Helmont was the firſt who made diſcoveries on this important ſubject. Mr. Boyle followed his ſteps; and after him, Dr. Hales, and Profeſſor Venel, contributed to the advancement of this important branch of philoſophy. But their diſcoveries at length were greatly eclipſed by our modern chemiſts Dr. Black, Mr. Cavendiſh, and Dr. Prieſtley; but particularly the latter, to whom it was reſerved, to prove by the moſt deciſive teſts the compoſition and nature of our atmoſphere, which appears to be compoſed of two fluids; the one abſolutely noxious, and incapable of ſupporting animal life for a moment; the other extremely ſalutary, and capable of preſerving animals alive and healthy for a much longer time than the pureſt air we can meet with. We now proceed to give an account of the different kinds of aerial fluids, beginning with thoſe which are known, or ſuppoſed, to conſtitute a part of our atmoſphere.

Sect. II. *Of Dephlogiſticated or Pure Air.*

This pure kind of air Dr. Prieſtley names *dephlogiſticated*, from his opinion that common air, in the act of burning, abſorbs phlogiſton. In the courſe of his inquiries, he fell upon a method of extracting it from a great variety of ſubſtances, viz. by moiſtening them with ſpirit of nitre, and then diſtilling them with a ſtrong heat. Thus he obtained it from flowers of zinc, chalk, quicklime, ſlaked lime, tobacco-pipe clay, flint, Muſcovy tales, and even glaſs. He then found, that by ſimply diſſolving any metal in the nitrous acid, and then diſtilling the ſolution, he could obtain very pure air: and Mr. Warltire found even the trouble of diſtillation unneceſſary; nothing more being requiſite than to moiſten red lead with the ſpirit of nitre, and then pour upon it the oil of vitriol, which inſtantly diſengaged the dephlogiſticated air without applying any more heat than what was generated by the mixture.

But Mr. Scheele, without knowing of Dr. Prieſtley's diſcovery, fell upon a method by which pure air may be ſtill more readily procured, viz. by the diſtillation of nitre with a ſtrong heat; by which means it may be obtained in very conſiderable quantity, and in as great purity as by the more expenſive proceſſes. It appears however, that the mode of applying heat has alſo a very conſiderable effect on the quantity of air produced. Thus, Dr. Prieſtley remarks, that "from equal quantities of red lead, without any mixture of ſpirit of nitre, and uſing the ſame apparatus for diſtilling it, he obtained, by means of heat applied ſuddenly, more air than when ſlowly applied, in the proportion of ten to ſix. The proportion of fixed air was the ſame in both caſes, and the remainder equally dephlogiſticated."

By heat alone, the Doctor found, that ſedative ſalt, manganeſe, lapis calaminaris, and the mineral called *lapis ponderoſus*, *wolfram*, or *tungſten*, would yield dephlogiſticated air; the firſt indeed, in very ſmall quantity, and ſometimes even of a quality very little ſuperior to common air. In theſe experiments, he made uſe of ſmall-bellied retorts of green glaſs, which can ſtand the fire beſt, containing about an ounce of water, and having narrow necks 18 or 20 inches long. The ſubſtance to be examined was put into a retort of this kind, and then expoſed to a red heat, either in ſand or over a naked fire, while the neck of the veſſel was plunged in water or mercury.

Having diſſolved ſix pennyweights of very clean iron in oil of vitriol, and then diſtilled the ſolution to dryneſs in a long-necked retort, he received the common air a little phlogiſticated, ſome fixed air, much vitriolic acid air, and laſtly 18 ounce-meaſures of dephlogiſticated air. The iron that remained undiſſolved weighed 23 grains, ſo that the air was yielded by five pennyweights one grain of iron. The ochre weighed ſeven pennyweights thirteen grains: ſo that, ſays he, there

probably remained a quantity of oil of vitriol in it; and conſequently, had the heat been greater, more air would have been obtained.

In his experiments with the nitrous acid, as it had conſtantly been found, that by pouring freſh nitrous acid on the reſiduum, and repeating the operation, more dephlogiſticated air might be obtained, the Doctor determined to try whether the ſame would not hold good with vitriolic acid alſo. For this purpoſe, he added more oil of vitriol to the reſiduum of the laſt-mentioned experiment. When in a red heat with a glaſs retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce-meaſures of dephlogiſticated air; when the retort being melted, a good deal of the air was neceſſarily loſt; but on reſuming the proceſs in a gun-barrel, he procured as much air as had been got before.

The reſult of theſe, and innumerable other experiments made by philoſophers in different countries, was, that dephlogiſticated air may be obtained from a vaſt variety of mineral and metallic ſubſtances by means of the vitriolic and nitrous acids. It now remained only to diſcover in what manner this fluid, ſo eſſentially neceſſary to the ſupport of animal life, is naturally produced in quantities ſufficient for the great expence of it throughout the whole world, by the breathing of animals, the ſupport of fires, &c. This diſcovery, indeed, had been made before even the exiſtence of dephlogiſticated air itſelf was known. Dr. Prieſtley, after having tried various methods of purifying contaminated air unſucceſsfully, found at laſt, that ſome kinds of vegetables, but particularly mint, anſwered this purpoſe very effectually. Having rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a ſprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the ſprig had become reſpirable; for a mouſe lived very well in this, whereas it died the moment it was put into the other.

From theſe experiments he at firſt concluded, that in all caſes the air was meliorated by the vegetation of plants: but ſome experiments of this kind did not anſwer ſo well towards the end of the year as they had done in the hot ſeaſon; and a ſecond courſe ſeemed to be almoſt entirely contrary to the former. At the time of making theſe experiments, he ſuppoſed that the air was meliorated merely by the abſorption of phlogiſton from that which had been tainted; but the experiments of Dr. Ingenhouſz, in 1779, ſhewed that this was accompliſhed, not only by the abſorption juſt mentioned, but alſo by the *emiſſion* of dephlogiſticated air. He obſerved in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when expoſed to the light of the ſun; but, in the night-time, or when they are not influenced by the ſolar rays, they contaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it poſſible to diſcover by the external properties of a plant, whether it be fit for this purpoſe or not. Air phlogiſticated by breathing, and in which a candle could not burn, after being expoſed to the ſun for three hours, with a ſprig of peppermint in it, was ſo far corrected, as to be again capable of ſupporting flame. The following experiment, made with a muſtard plant, may be looked upon as deciſive: A plant of this kind was put into a glaſs receiver containing common air, and its ſtem cut off even with the mouth of the receiver. The veſſel was then inverted in an earthen pan, containing ſome water to keep the plant alive, and the whole apparatus was ſet over-night in a room. Next morning the air was found ſo much contaminated, that it extinguiſhed the flame of a wax taper. On expoſing the apparatus to the ſun for a quarter of an hour, the air was found to be ſomewhat corrected; and after an hour and an half it was ſo far improved, that by the teſt of nitrous air it appeared conſiderably better than common air.

Among the diſcoveries to which theſe experiments led, was that of procuring pure air from pump-water, which had ſtood till a green matter had extended itſelf over the bottom and ſides of the veſſel containing it. Water, in this ſituation, emits pure air very copiouſly, and that even when the green matter exhibits ſigns of decay, and becomes yellowiſh; but the light of the ſun, it appears, is eſſential to this proceſs; very little pure air being emitted in the dark. An improvement on this idea was ſoon afterwards ſuggeſted by Dr. Ingenhouſz, who procured pure air very readily from the leaves of different vegetables, ſome of them of the poiſonous kind, but more eſpecially from aquatic plants, the turpentine trees, and the green matter collected from a ſtone trough.

The purity of this dephlogiſticated air was equal, if not ſuperior, to that procured by the beſt chemical proceſſes; as it ſometimes required eight times its own quantity of nitrous air to ſaturate it. All parts of the plants were not found equally proper for the production of it; the full grown leaves yielded it in greateſt quantity and purity, eſpecially from their under ſurface. It was alſo procured from the green ſtalks.—One hundred leaves of *Naſturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump-water, and expoſed to the ſun from ten to twelve o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and expoſing them again to the ſun till ſeven o'clock, about half as much was produced, of a quality ſtill ſuperior to the former; and next morning by eleven o'clock, they yielded as much more of an equal quality. The roots of plants, he ſays, when kept out of ground, generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers and fruits, in general, yield a very ſmall quantity of noxious air, and contaminate a great quantity of common air at all times, eſpecially in the night, and when kept in the dark. Two dozen of young and ſmall French beans, kept in a quart-jar of common air for a ſingle night, contaminated the air to ſuch a degree, that a very lively chicken died by being confined in it leſs than half a minute.

That the vegetation of plants is one of the great means employed by nature to purify the atmoſphere, ſo as to counteract, in a great meaſure, the damage done by animal reſpiration, combuſtion, &c. is evident from theſe experiments. It may only be ſaid, that vegetation does not appear to be ſufficient to remedy entirely that damage. The power of vegetables in yielding dephlogiſticated air, begins a few hours after the ſun has made its appearance in the horizon, or rather after it has paſſed the meridian, and ceaſes with the cloſe of day; excepting ſome plants which continue it a ſhort time after ſun-ſet. The quantity of dephlogiſticated air, in general, is greater in a clear day than when it is cloudy. It is alſo greater when the plants are more expoſed to the ſun, than when they are ſituated in ſhady places. The damage done by plants in the night, is alſo more than counterbalanced by the benefit they afford in the day-time. "By a rough calculation (ſays Dr. I.) I found the poiſonous air, yielded by any plant during the whole night, could not amount to one hundredth part of the dephlogiſticated air which the ſame plant yielded in two hours time in a fair day." It does not appear, however, that plants yield dephlogiſticated air by any kind of generation of that fluid, but only by filtrating the common air, which all plants abſorb through their pores; the phlogiſtic part becoming part of their ſubſtance, and probably being the true vegetable food. Dry plants have little or no effect upon the air until they are moiſtened.—On all theſe experiments, however, it muſt be ob-

ſerved, that they have ſometimes failed in the hands of thoſe whom we cannot but ſuppoſe very capable of trying them; as Mr. Scheele, Mr. Cavallo, and the Abbé Fontana.

After the publication of Dr. Ingenhouſz's experiments, thoſe of Sir Benjamin Thompſon appeared, in which the green matter ſuppoſed to be vegetable was ſhewn to conſiſt of a number of animalculæ. He obſerved further, that ſeveral animal ſubſtances, as well as vegetables, have a power of ſeparating dephlogiſticated air from water when expoſed to the light of the ſun, and that for a very great length of time. Not that the ſame quantity of water will always continue to furniſh air; but the ſame animal ſubſtance being taken out, waſhed, and again put into freſh water, ſeems to yield dephlogiſticated air, without any kind of limitation.

Raw ſilk was the ſubſtance on which his experiments were firſt attempted; and he not only found that it was capable of yielding pure air in conſiderable quantity when placed in the ſame circumſtances with the leaves of plants, but alſo that the light, no leſs required to produce dephlogiſticated air from animal than vegetable ſubſtances, was not, in either caſe, neceſſarily that of the *ſun*; though indeed the pure air was more ſparingly ſupplied, under the influence of an artificial light, than in the other caſe. In making the experiments, as it was found ſomewhat troubleſome to invert the globes in water, they were at laſt only kept in an inclined poſture on the table, as repreſented in Plate 2, fig. 1. the air collecting itſelf in the upper part of the belly. Having provided himſelf with a number of globes of different ſizes, he proceeded in the following manner:

Finding that raw ſilk, expoſed to the action of light, produced ſo great a quantity of air, he was induced to try ſome other ſubſtances. Having therefore prepared ſix globes of $4\frac{1}{2}$ inches in diameter, and filled them with ſpring water, he introduced into each of them 15 grains of one of the following ſubſtances, *viz.* ſheep's wool, eider-down, fur of a Ruſſian hare, cotton wool, lint, or the ravelings of linen yarn, and human hair. The reſults of theſe experiments were various, though all yielded more or leſs of pure air. The wool, even in the moſt favourable circumſtances, never afforded more than one-third of the quantity which would have been yielded by ſilk. The eider-down began to furniſh air almoſt immediately, and continued to do ſo in quantities little leſs than had been furniſhed by the ſilk, and nearly of the ſame quality. The fur of the hare produced more air than the wool, but leſs than the eider-down. The cotton yielded a conſiderable quantity of air of a better quality than any of the former. The ravelings of linen were very ſlow in furniſhing air, and produced but a ſmall quantity; only two cubic inches being collected in the ſpace of a fortnight. This ſubſtance appeared to be the very reverſe of the hare's fur; for the air, inſtead of attaching and collecting itſelf about the ſubſtance in large bubbles, ſcarce ever made its appearance in ſufficient quantity to raiſe it to the top of the water. The human hair furniſhed ſtill leſs than the linen, and the produce was of inferior quality, though ſtill ſuperior to the common atmoſphere.

In order to diſcover the comparative purity of air produced from vegetables and from raw ſilk, a ſmall quantity of air from the ſtem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw ſilk, and ſeveral of the ſubſtances already mentioned. An entire plant of houſewort, of a moderate ſize, furniſhed only $\frac{3}{4}$ths of a cubic inch of air in ſeven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly ſuperior.

In order to aſcertain how much air would be yielded by expoſure to the ſun's rays, a globe containing 296 inches, filled with freſh ſpring water, and 30 grains of raw ſilk, was expoſed to the air for three days in the month of May, but for the moſt part cold and cloudy. Only $9\frac{1}{2}$ inches of air were produced; but next day, by expoſure to the ſun from 9 in the morning till 5 in the afternoon, 8.46 inches more were produced. Next day, the product of air was 9 cubic inches, of a better quality; and the day following, 6 inches ſtill ſuperior, though expoſed only for 3 hours and an half; but the next day, it being cold and cloudy, only $\frac{3}{4}$ths of an inch of air were produced, and theſe manifeſtly inferior to the foregoing. No more air could afterwards be procured, except one quarter of a cubic inch; ſo that from 296 inches of this water, 33.96 of air were obtained.

In this experiment the air was every day removed, and its place ſupplied with water: the following was made, to determine what alteration would take place on allowing the quantity of air produced to remain from firſt to laſt. The globe being therefore filled again, and the ſilk well waſhed and replaced in it, the quantity of air produced amounted in four days to 30.1 cubic inches; and would probably have been ſtill more conſiderable.

On employing unwaſhed raw ſilk, it was found, that 17 grains in 20 cubic inches of water, produced, for the firſt four days, air of a worſe quality than the atmoſphere; but afterwards yielded near two inches of a ſuperior quality. The quantity of this air was ſuperior to that in other experiments, though its quality was ſomewhat inferior.

Theſe reſults led to a trial of the cotton-like ſubſtance yielded by the *populus nigra*. 120 grains of this in 296 inches of water, during the firſt four days gave a very inconſiderable quantity of air, and that in a phlogiſticated ſtate. On becoming ſuddenly greeniſh, however, it yielded in 6 days $44\frac{1}{2}$ cubic inches of purer air than had been before produced.

Suſpecting that the quantity of pure air might depend on the comparative quantity of ſurface, an hair of ſilk and one of poplar cotton were examined with a microſcope, and found to be as 1000 to 3468. Whilſt 30 grains of the cotton preſented a ſurface of 6600 ſquare inches, the like quantity of ſilk exhibited no more than 476. Hence the produce of air from the two ſubſtances was neither in proportion to their weights nor their ſurfaces. It appeared alſo, that the quality of the air produced at firſt was conſiderably inferior to that yielded ſome time afterwards. In order to aſcertain the times at which air of the beſt quality was produced, &c. ſeveral experiments were made. In ſome of them, the water had acquired a faint greeniſh caſt; but the colour of that with the cotton was deepeſt. On examining with a microſcope, it was found to contain a great number of animalcules exceedingly ſmall, and nearly of an oval figure; that with the ſilk contained them likewiſe, but not in ſuch numbers: however, in all caſes in which the water acquired a greeniſh hue, they never failed to exiſt, ſo as to render it probable, that, from their preſence alone, the colour of the water in the firſt inſtance univerſally aroſe.

To determine a point which appeared by no means decided, viz. what ſhare the ſubſtances employed had in producing air, and whether any other which preſented a large ſurface, and attracted air from water, would not do as well, the experiment was repeated with a quantity of *ſpun glaſs*, and the reſult was, that the globe being expoſed in the ſun, air bubbles began almoſt inſtantly to make their appearance on the ſurface, and in four hours 0.77 of a cubic inch of air was procured; after which, not a ſingle globule more was produced, though the globe was expoſed for a whole week in ſunſhine weather. Hence it appears that ſomething more than mere ſurface was

wanted to produce dephlogiſticated air from water by means of the ſun's light.

To determine the quantity and quality of air produced by means of the heat and light of the ſun from water alone, a large glaſs, containing 455 cubic inches, was filled with freſh ſpring water, inverted, and expoſed for 28 days. Another jar was alſo filled with water from a pond in which many aquatic plants were growing, and expoſed in the ſame way. The latter yielded air in pretty large quantities on the third day, and continued to do ſo till the 14th: the former little or none till the 14th, when it began to emit air, and continued to do ſo till the 22d. On removing the air produced, that from the ſpring water was 14 inches in quantity, and 138 in quality (taking the quality of atmoſpheric air at 100); but from the pond water, 31½ in quantity, and 252 in quality. The colour of the water remaining unchanged, the thickneſs of the glaſs veſſel was thought an objection. The experiment therefore was repeated in a thin conical jar containing 344 inches, and expoſed 21 days to the ſun. Little air was furniſhed till the 7th day, when, a fine ſlimy ſediment of green matter beginning to be formed, air was furniſhed in pretty large quantities till the 18th, when it entirely ceaſed. The whole amounted to 40 cubic inches, and the quality 213.

The opinion of Dr. Ingenhouſz, that the dephlogiſticated air was *elaborated* in the veſſels of the plant, appeared exceedingly doubtful to the ingenious author of theſe experiments: for beſides that many other ſubſtances, in which no elaboration takes place, cauſe the water to yield dephlogiſticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumſtances of the leaves of a vegetable, which, accuſtomed to grow in air, are ſeparated from its ſtem and confined in water, are ſo unnatural, that it is difficult to conceive they can perform the ſame functions in ſuch different ſituations.

Freſh healthy leaves furniſh air only for a ſhort time, and, after a day or two, change colour and ceaſe to yield any. This has been conceived to ariſe from the death of the plant: and from hence it has been inferred, with ſome degree of plauſibility, not only that the leaves actually retain their vegetative powers for ſome time after being ſeparated from their ſtock; but that it was in conſequence of the exertion of thoſe powers, that the air yielded in the experiment was produced.

But though the leaves, expoſed in water to the action of light, actually do ceaſe to furniſh air after a certain time, yet they *regain* this power after a ſhort interval, when they furniſh (or rather cauſe the water to furniſh) more and better air than at firſt; which can hardly be accounted for upon the ſuppoſition that the air is elaborated in the veſſels of the plant.

A confirmation of this doctrine has reſulted from various experiments; and thus we ſee, that nature is provided with abundant means of ſupplying that pure part of the atmoſphere which is ſubject to ſuch continual waſte. No doubt the light of the ſun produces pure air from water as well as from vegetables, and even the waters of the ocean contribute towards this ſalutary purpoſe.

As dephlogiſticated air may poſſibly anſwer a valuable purpoſe in medicine, a cheap method of procuring it is ſuggeſted by Mr. Cavallo, who propoſes to diſtil it from nitre with a ſtrong heat; but the experiments already related point out an eaſier method.

Properties of Dephlogiſticated Air.—This kind of air poſſeſſes ſome of, though not all, the properties of common air. Thoſe in which it excels, are the ſupport of flame and of animal life. It is equally elaſtic, or rather more ſo than common air; as it likewiſe exceeds it a little in ſpecific gravity, the proportion betwixt it and common air being that of 160 to 152. In dephlogiſticated air, the flame of a candle not only grows larger, but becomes exceedingly bright; and burns with a crackling noiſe, as if the air contained ſome combuſtible matter, at the ſame time that the wax or tallow waſtes ſurpriſingly faſt.

The heat of the flame is in proportion to its light. If a bladder full of dephlogiſticated air be pricked with a pin, the ſtream of air will augment the heat of a candle to ſuch a degree, that if any ſmall bits of metal be placed on a piece of charcoal, and held in the apex of the flame, they will almoſt inſtantly be melted.

On mixing dephlogiſticated and inflammable air together, an exploſion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpoſe ſhould be very ſtrong, be filled with a little more than one-third of dephlogiſticated and the reſt inflammable air, and the flame of a candle preſented to its mouth, it will explode nearly as loud as a ſmall piſtol.

All phlogiſtic proceſſes are promoted much better by dephlogiſticated than common air. Dr. Prieſtley put a quantity of pyrophorus into a ſmall jar, and threw in dephlogiſticated air. It always occaſioned a vehement accenſion, like the flaſhing of gun-powder, and the air was greatly diminiſhed.

It has been, almoſt throughout all ages, believed, that combuſtion in every inſtance diminiſhed common air, or reduced it to a ſmaller volume: but the late experiments of Mr. Lavoiſier have ſhown, that this is a miſtake; and that in ordinary proceſſes attended with the production of fixed and phlogiſticated air, the quantity of vapour produced is equivalent to that abſorbed, or otherwiſe made to diſappear during the operation. With dephlogiſticated air the caſe is very different. Mr. Lavoiſier having introduced a burning candle into a glaſs jar filled with very pure air obtained from calcined mercury, a great heat took place; which at firſt expelled a ſmall quantity of the air; but afterwards, when the candle was extinguiſhed, it was found that two thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by cauſtic alkali, was ſtill as pure as before. In the common proceſſes, he obſerves, that not more than one-tenth of the air employed is converted into fixed air. In this experiment, the ſuperior gravity of fixed air, and the conſequent condenſation of the other, muſt undoubtedly have produced ſome diminution in the volume of air, though Mr. Lavoiſier does not take notice of it. In other caſes, however, the diminution is much more perceptible. Mr. Scheele having introduced a piece of phoſphorus into ſeven ounce-meaſures of this kind of air, ſtopped the mouth of the bottle, and ſet fire to the phoſphorus within: the vial broke in pieces, as ſoon as the flame was extinguiſhed, by the preſſure of the external air. A ſtronger vial being uſed, and opened afterwards under water, the fluid ruſhed into it in ſuch a manner as almoſt to fill it entirely. This extraordinary diminution was alſo demonſtrated by filling a matraſs with dephlogiſticated air, and inverting it over a vial containing an effervеſcing mixture of vitriolic acid and iron-filings plunged into a veſſel of hot water, and furniſhed with a ſlender tube reaching above the ſurface of the veſſel, as repreſented Pl. 2, fig. 2. The inflammable air iſſuing from the orifice of the ſmall tube, was ſet on fire previous to the inverſion of the matraſs, and the mouth of the latter immerſed in the water; on which that fluid ſoon began to riſe, and continued to do ſo till ⅞ths of the veſſel were full. In caſes of ſlow combuſtion, where com-

mon air is diminiſhed and phlogiſticated, the dephlogiſticated kind was found to be almoſt entirely deſtroyed.

The purity of dephlogiſticated air is aſcertained by its degree of diminution with nitrous air; which is to be conſidered as a phlogiſtic proceſs. Very great differences are perceived in this reſpect; and according to the quantity of diminution, the air is ſaid to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr. Prieſtley mentions ſome extracted from red lead five times as pure as common air. Another quantity, produced from a ſolution of mercury in nitrous acid, was ſo pure, that one meaſure of it mixed with two of nitrous air, which had been obtained in the firſt part of the ſame proceſs, occupied only 0.03 of a meaſure. On the whole, he is inclined to think, that, were it poſſible to make both the dephlogiſticated and nitrous air in the greateſt purity, and then to mix them in ſome exact proportion, the aerial form of them both would be deſtroyed, the whole quantity ſeeming to diſappear, as in the mixture of alkaline and acid air.

But notwithſtanding its great purity, the beſt dephlogiſticated air is capable of being contaminated by ſome of the proceſſes which affect the atmoſphere. Dr. Prieſtley found $\frac{1}{10}$th conſumed by a quantity of clean dry nails, which had remained in it 9 months though without being ruſted. The effects of combuſtion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal reſpiration probably contaminate it as in atmoſpheric air. Mr. Cavallo informs us, that, when an animal is confined in dephlogiſticated air till it dies, that air is not ſo bad but that it will ſtill be capable of diminution by nitrous air; which ſeems to ſhow, that dephlogiſticated air is ſomewhat different from pure common air; or that common air is originally different from dephlogiſticated air lowered by the addition of phlogiſton. It is certainly very remarkable; and ſometimes a quantity of dephlogiſticated air, after having been breathed by an animal till it died, will appear by the nitrous teſt to be even better than common air. When the experiment is performed over lime-water (to abſorb the fixed air produced in reſpiration), the diminution by a mixture of nitrous air is leſs than it would otherwiſe be; but it is ſtill diminiſhed much more than common air after an animal has died in it; which ſeems to intimate, that the death of the animal in dephlogiſticated air is principally owing to the fixed air formed by the act of reſpiration.

Dephlogiſticated air is much inferior to that of the common atmoſphere in ſupporting vegetable life. This has been aſcertained by the experiments of Dr. Prieſtley, Mr. Fontana, Mr. Scheele, Dr. Ingenhouſz, &c. Dr. Prieſtley took three ſprigs of mint, and introduced them into different jars of dephlogiſticated air, common air, and air which had been phlogiſticated with nitrous air ſeveral months before. The plant in phlogiſticated air grew much better than that in common air; while that in dephlogiſticated air had a very ſickly appearance. It was found, however, that though the plant in phlogiſticated air had grown ſo well, the air was not ſenſibly improved by it, whilſt the dephlogiſticated air was injured by the plant.

Compoſition of Dephlogiſticated Air.—When Dr. Prieſtley firſt diſcovered the exiſtence of this fluid, he imagined it was compoſed of the nitrous acid and earth, with as much phlogiſton as was neceſſary to its elaſticity; and that the common atmoſphere had as much more as was required to bring it into the mean condition in which we find it. His experiments however were oppoſed by others made by Lavoiſier; who inſiſted, that when a ſolution of mercury was carefully diſtilled, the metal was obtained in full quantity, or with ſcarce any loſs, notwithſtanding the dephlogiſticated air produced. Having put two ounces and one dram of mercury into red precipitate, and afterwards revived it, a very few grains of the metal were loſt. Mr. Fontana repeated the experiment often, loſing leſs than a grain. The veſſel he uſed had a neck of about two feet long: and he particularly remarks, that, in order to ſucceed in this experiment, the fire ſhould be managed with very great dexterity; for if that be too ſtrong, part of the precipitate will be volatilized.

Theſe experiments were oppoſed by others made by Dr. Prieſtley; but ſtill the quantity of mercury loſt, or rather the proportion of it to that of the metal employed, was always various, and the difference not very ſmall; whence Mr. Cavallo and others, with great appearance of reaſon, conclude, that the true reaſon of any perceptible loſs was the ſtrong heat made uſe of in the diſtillation, and conſequently that there is no reaſon to ſuppoſe that any earth exiſts in dephlogiſticated air.

The next queſtion was, Whether any of the nitrous acid exiſted in dephlogiſticated air? That it contains none in a proper ſtate of acidity, is indeed evident from many deciſive experiments; but an idea was naturally entertained, that in the formation of dephlogiſticated air the nitrous acid was decompoſed, and part of it entered into the compoſition of the aerial fluid. This gave riſe to the theories of Mr. Lavoiſier and Mr. Kirwan, which are noticed under the article ACID; as alſo the experiments of Mr. Watt, which tended to ſhow that no nitrous acid was deſtroyed in the compoſition of dephlogiſticated air.

On calcining metals in dephlogiſticated air, very ſingular phenomena are obſerved, which ſeem to throw great light upon the compoſition of this fluid. "One of the moſt ſimple of all phlogiſtic proceſſes (ſays Dr. Prieſtley) is that in which metals are melted in dephlogiſticated air. I therefore began with this, with a view to aſcertain whether any water be produced when the air is made to diſappear in it. Accordingly, into a glaſs veſſel, containing ſeven ounce-meaſures of pretty pure dephlogiſticated air, I introduced a quantity of thin iron turnings. I then fired the iron by means of a burning lens, and preſently reduced the ſeven ounce-meaſures to 0.65 of a meaſure; but I found no more water after this proceſs than I imagined it had not been poſſible for me to exclude, as it bore no proportion to the air which had diſappeared. Examining the reſiduum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the teſt of nitrous air, it did not appear that any phlogiſticated air had been produced in the proceſs: for though it was more impure than I ſuppoſe the air with which I began the experiment muſt have been, it was not more ſo than the phlogiſticated air of the ſeven ounce-meaſures which had not been affected by the proceſs, and which muſt have been contained in the reſiduum, would neceſſarily make it. In this caſe, one meaſure of this reſiduum, and two of nitrous air, occupied the ſpace of 0.32 of a meaſure. In another, ten ounce-meaſures of dephlogiſticated air were reduced to 0.8 of a meaſure; and by waſhing in lime-water to 0.38 of a meaſure. In another experiment, $7\frac{1}{2}$ ounce-meaſures of dephlogiſticated air were reduced to half an ounce-meaſure, of which one-fifth was fixed air, and the reſiduum was quite as pure as the air with which I began the experiment; the teſt with nitrous air, in the proportions above mentioned, giving 0.4 in both caſes."

From theſe experiments the Doctor was led to the diſcovery, that the dephlogiſticated air had actually been imbibed by the melted iron, in the ſame manner as inflammable air had been imbibed by the melted calces of metals in his former experiments. In the firſt inſtance, about 12 ounce-meaſures of dephlogiſticated air had diſappeared, and the iron had gained 6 grains in weight. On repeating the experiment, other quan-

tities of iron, treated in the ſame manner, gained an addition of weight, always very nearly that of the air which had diſappeared.

Dr. Prieſtley now proceeded to try the effect of fuſing iron in the open air by means of a burning lens, and he preſently found that it ſaturated itſelf with pure air from the atmoſphere. "I always found (ſays he) that it had gained weight in the proportion of $7\frac{1}{2}$ to 24. The ſame was the effect when I melted ſteel. But I have reaſon to think, that with a greater degree of heat than I could apply, the iron might have imbibed more than even one third of its original weight."

On attempting to revive the calx of iron in inflammable air, a very unexpected appearance took place. Having put a piece of iron ſaturated with pure air into a veſſel filled with inflammable air confined by water, the inflammable air diſappeared and the metal was revived; but on weighing it, $2\frac{1}{2}$ grains out of $11\frac{1}{2}$ had been loſt, beſides the $7\frac{1}{2}$ ounce-meaſures of inflammable air which had vaniſhed. Conſidering all theſe circumſtances, the Doctor had now no doubt that the two kinds of air had united, and formed either fixed air or water; and with a view to determine this point, he repeated the experiment in a veſſel where the inflammable was confined by mercury, both the veſſel and mercury having been previouſly made as dry as poſſible, In theſe circumſtances he had no ſooner begun to heat the iron, than the air was perceived to diminiſh, and at the ſame time the inſide of the veſſel to become cloudy, with particles of dew that covered almoſt the whole of it. Theſe particles by degrees gathered into drops, and ran down. On collecting this water by means of a piece of filtering paper, he found it as nearly as poſſible of the ſame weight with that which had been loſt by the iron; and alſo that the quantity of inflammable air which had diſappeared was about double that of the dephlogiſticated air ſet looſe in the operation. Thus, at one time, a piece of this ſlag abſorbed $5\frac{1}{2}$ ounce-meaſures of inflammable air, while it loſt the weight of about 3 ounce-meaſures of dephlogiſticated air, and the water collected weighed 2 grains. Another time a piece of ſlag loſt 1.5 grains, and the water produced was 1.7 grains. In a third caſe, where $6\frac{1}{2}$ ounce-meaſures of inflammable air were reduced to 0.92 of a meaſure, the iron had loſt the weight of 3.3 ounce-meaſures of dephlogiſticated air, or nearly two grains.

The Doctor, having ſucceeded ſo well with iron, next tried the calx of copper, and found water produced in the inflammable air in the ſame manner. On uſing precipitate *per ſe*, he found no more water than might be ſuppoſed to have been contained as an extraneous ſubſtance either in the inflammable air, or in the red precipitate. With iron, however, the caſe was vaſtly different. As he had formerly ſatisfied himſelf that inflammable air always contains a portion of water, and alſo that when it has been ſome time confined by water, it imbibes more, he repeated the experiment with inflammable air received in a veſſel of dry mercury; but in this caſe the water was produced, to appearance, as copiouſly as before. "Indeed (ſays he) the quantity of water produced, ſo greatly exceeding the weight of all the inflammable air, is ſufficient to prove that it muſt have had ſome other ſource than any conſtituent part of that air, or the whole of it, together with the water contained in it, without taking into conſideration the correſponding loſs of weight in the iron.

"I muſt here obſerve, that the iron ſlag which I had treated in this manner, and which had thereby loſt the weight which it had acquired in dephlogiſticated air, became perfect iron as at firſt, and was then capable of being melted by the burning lens again; ſo that the ſame piece of iron would ſerve for theſe experiments as long as the operator ſhould chooſe. It was evident, therefore, that if the iron had loſt its phlogiſton in the preceding fuſion, it had acquired it again from the inflammable air which it had abſorbed; and I do not ſee how the experiment can be accounted for in any other way."

Theſe experiments certainly throw ſome light on the compoſition of dephlogiſticated air; and others made by Mr. Cavendiſh, Dr. Prieſtley, and the French chemiſts, upon water, have a ſimilar tendency. From all of them it is concluded by the moſt celebrated philoſophers and chemiſts, that dephlogiſticated air is one of the conſtituent and elementary parts of water, inflammable air being the other.

From the experiments made to aſcertain this important fact, an account of which may be found in the Philoſophical Tranſactions, Mr. Cavendiſh draws the following concluſions. He ſays—"There ſeem two ways by which the production of the nitrous acid may be explained: firſt, by ſuppoſing that dephlogiſticated air contains a little nitrous acid, which enters into it as one of its component parts; and that this acid, when the inflammable air is in ſufficient proportion, unites to the phlogiſton, and is turned into phlogiſticated air, but does not when the inflammable air is in too ſmall proportion; and, ſecondly, by ſuppoſing that there is no nitrous acid mixed with or entering into the compoſition of dephlogiſticated air; but that, when the air is in ſufficient proportion, part of the dephlogiſticated air with which it is debaſed is, by the ſtrong affinity of phlogiſton to dephlogiſticated air, deprived of its phlogiſton, and turned into nitrous acid; whereas, when the dephlogiſticated air is not more than ſufficient to conſume the inflammable air, none then remains to deprive the phlogiſticated air of its phlogiſton, and turn it into acid. If the latter explanation be true, I think we muſt allow that dephlogiſticated air is in reality nothing but *dephlogiſticated water*, or water deprived of its phlogiſton; or, in other words, that water conſiſts of dephlogiſticated air united to phlogiſton. On the other hand, if the former explanation be true, we muſt ſuppoſe that dephlogiſticated air conſiſts of water united to a little nitrous acid, and deprived of its phlogiſton; but ſtill the nitrous acid in it muſt only make a very ſmall part of the whole, as it is found that the phlogiſticated air into which it is converted is very ſmall in compariſon of the dephlogiſticated air. I think the ſecond of theſe explanations ſeems much the more likely; as it was found that the acid in the condenſed liquor was of the nitrous kind, not only when the dephlogiſticated air was prepared from nitrous acid, but when procured from plants or turbith mineral. Another ſtrong argument in favour of this opinion is, that dephlogiſticated air yields no nitrous acid when phlogiſticated by liver of ſulphur; for if this air contains nitrous acid, and yields it when phlogiſticated by exploſion with inflammable air, it is very extraordinary that it ſhould not do ſo by other means. But what forms a ſtronger, and, I think, almoſt deciſive argument in favour of this explanation, is, that when the dephlogiſticated air is very pure, the condenſed liquor is made much more ſtrongly acid by mixing the air to be exploded with a little phlogiſticated air."

The whole of Dr. Prieſtley's opinions on the component parts of this kind of air, are ſummed up thus—"The only kind of air that is now thought to be properly *elementary*, and to conſiſt of a ſimple ſubſtance, is dephlogiſticated air; with the addition at leaſt of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their compoſition. Dephlogiſticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other ſubſtances, which, till lately, have been thought to be ſimple."

The experiments of the French philoſophers were of the ſame nature with thoſe of Mr. Cavendiſh, but conducted on a

larger ſcale. The inference drawn from them was the ſame with that already mentioned, viz. that dephlogiſticated and inflammable air in all caſes are the two conſtituent parts of water. This opinion is alſo adopted by Mr. Kirwan in his *Treatiſe on Phlogiſton*.

Notwithſtanding theſe poſitive concluſions, however, by ſome of the moſt reſpectable men in this country, the evidences adduced have been unſatisfactory to ſome French chemiſts, who maintain, that Meſſrs. Cavendiſh, Prieſtley, and Kirwan are totally miſtaken with regard to the production of water from dephlogiſticated and inflammable air; and contend that the water obtained had previouſly exiſted in the air, and was not originally produced in the operation. The fact, indeed, becomes ſomewhat dubious from ſome experiments related by Dr. Prieſtley himſelf, and of which we ſhall now proceed to give an account.

One conſequence of the hypotheſis in queſtion is evident, that if water really be *produced* by the deflagration of either dephlogiſticated or common air with inflammable air, the quantity of liquid obtained ought to increaſe in proportion to the quantity of the two airs conſumed, and that without any limitation. This, however, is not the caſe; and Dr. Prieſtley deſcribes as the greateſt difficulty he ever met, with regard to the preceding theory, his never having been able to procure any water when he revived red precipitate in inflammable air; or at leaſt not more than might have been ſuppoſed to exiſt in the inflammable air as an extraneous ſubſtance.—"The difficulty (ſays he) with reſpect to what becomes of the two kinds of air, was not leſſened by the attempts which I made to collect all that I could from repeated decompoſitions of inflammable and dephlogiſticated air in a cloſe veſſel. As I had produced water in this proceſs when no more than a ſingle exploſion was made at a time, I thought that, by continuing to make exploſions in the ſame veſſel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a conſiderable part of an ounce. And as I ſhould know exactly what quantity of air I decompoſed, I had no doubt of being able to aſcertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, $\frac{1}{3}$ dephlogiſticated, and $\frac{2}{3}$ inflammable, from iron and oil of vitriol. But, though I had a ſenſible quantity of water at the firſt exploſion (in each of which between 4 and 5 ounce-meaſures of the mixture of air were uſed) I was ſurpriſed to perceive no very ſenſible increaſe of the quantity of water on repeating the exploſions. Having therefore expended 48 ounce-meaſures of the mixture, the proceſs was diſcontinued; and collecting the water with all the care that I could, I found no more than 3 grains, when there ought to have been 11."—In this proceſs, the inſide of the veſſel was always very black after each exploſion; and there iſſued from the mouth of it a denſe vapour, which the Doctor took ſome pains to collect and examine, but without effect.

"That water, in great quantities (ſays he), is ſometimes produced from burning inflammable and dephlogiſticated air, is evident from the experiments of Meſſrs. Cavendiſh and Lavoiſier. I have alſo frequently collected conſiderable quantities of water in this way, though never quite ſo much as the weight of the two kinds of air decompoſed. My apparatus for this purpoſe was the following: Into the mouth of a large glaſs balloon I introduced a tube, from the orifice of which there continually iſſued inflammable air from a veſſel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Preſently after the lighting of it, the inſide of the balloon always became cloudy, and the moiſture ſoon gathered in drops, and ſettled in the lower part of the balloon. To catch what might iſſue in the form of vapour, in the current of air through the balloon, I placed the glaſs tube *b*, (pl. 2, fig. 3), in which I always found ſome water condenſed. It is very poſſible, however, that in both theſe modes of experiment, the water may be converted into a kind of vapour, very different from ſteam, and capable of being conveyed a great way through air, or even water, without condenſation along with the air with which it is mixed; and on this account it may not be poſſible, in either of theſe modes, to collect *all* the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condenſed by cold, is very little underſtood, but well deſerves the attention of philoſophers."—

"That the water collected in the balloon comes from the decompoſition of the air, and not from the freſh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding, that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and conſequently there muſt have been the ſame current of the external air through it, no moiſture was found in the balloon."

Sect. III. *Of Phlogiſticated Air.*

The univerſal prejudice in favour of the exiſtence of that principle named *Phlogiſton*, firſt ſuggeſted by Stahl, gave riſe, on the firſt appearance of Dr. Prieſtley's diſcoveries, to a theory, concerning the action of this ſubſtance upon air and other bodies. As it has been obſerved, that air was diminiſhed, in ſome caſes at leaſt, by burning, univerſally by reſpiration, and by ſome other proceſſes, it was imagined, that phlogiſton was a body of ſuch a ſingular nature, that, when mixed with air, it always diminiſhed, inſtead of enlarging, its bulk, as might be more naturally expected from the addition of any vapour whatever. It was alſo ſuppoſed by ſome, that phlogiſton was not only entirely devoid of gravity, but that it was a principle of *poſitive levity*; ſo that the *abſolute* weight of bodies was diminiſhed by an union with it, and augmented when it was expelled, though their *ſpecific* gravity was diminiſhed. Various other ſurpriſing properties were attributed to phlogiſton; ſuch as that of giving elaſticity to air, of conſtituting flame by a *chemical combination* with air, &c. Its emiſſion into the atmoſphere was ſuppoſed to be always attended with a diminution of air; and therefore, all proceſſes in which air was diminiſhed and become noxious, ſuch as that by liver of ſulphur, a mixture of iron filings and brimſtone, &c. were called *phlogiſtic proceſſes*. Reſpiration of animals was taken into the ſame account; but neither in this, nor in combuſtion, was it allowed that any kind of vital ſpirit was abſorbed by the blood, or ſeparated from the air by the burning body. On the contrary, it was ſtrenuouſly argued, that all this was performed by the *emiſſion* of *phlogiſton* from the lungs or the inflamed ſubſtance, which depraved the air, and diminiſhed it in bulk; and as all air was ſuppoſed to contain phlogiſton, it was likewiſe imagined, that in all caſes, where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accompliſhed, not by the emiſſion of any thing into the atmoſphere, but by the mere abſorption of phlogiſton. In other reſpects this ſubſtance was thought to be an exceedingly powerful principle in nature; the light of the ſun itſelf and the electric fluid being ſaid to be modifications of it, the different kinds of airs to be *phlogiſtic vapours*, &c.; ſo that the whole ſyſtem of nature ſeemed ready to be abſorbed by it at once.

The formidable powers of this principle were firſt checked by Lavoiſier, though the latter erred equally on the contrary ſide; and, not content with keeping the phlogiſtic principle

within due bounds, would needs deny its exiſtence altogether. We accordingly find in a treatiſe publiſhed in 1782, he firſt impugns Dr. Prieſtley's theory of reſpiration, and denies that "the reſpiration of animals has the property of phlogiſticating air in a manner ſimilar to what is effected by the calcination of metals and many other chemical proceſſes; and that it ceaſes not to be reſpirable till the inſtant when it becomes ſurcharged, or at leaſt ſaturated, with phlogiſton."

In order to diſprove this aſſertion, he introduced 4 ounces of mercury to 50 cubic inches of common air, propoſing to calcine the metal by keeping it for 12 days in a heat almoſt equal to that which is neceſſary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per ſe* were formed, and the air in the veſſel was diminiſhed about $\frac{1}{6}$th of its volume. In this ſtate it did not precipitate lime water; but inſtantly extinguiſhed candles, and killed animals immerſed in it; no longer affording any red vapours, or being diminiſhed by mixture with nitrous air. On diſtilling the precipitate produced, about as much dephlogiſticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the veſſel, he recompoſed a fluid nearly of the ſame goodneſs with common air. Hence he draws the following concluſions: 1. That $\frac{5}{7}$ths of the air we breathe are mephitic, or incapable of ſupporting the reſpiration of animals, or the inflammation and combuſtion of bodies. 2. That the ſurplus, or only $\frac{1}{5}$ of the volume of atmoſpherical air, is reſpirable. 3. That, in the calcination of mercury, this metallic ſubſtance abſorbs the ſalubrious part, leaving only the mephitic portion of the air. 4. That by reuniting theſe two portions which had been ſeparated, we can recompound air ſimilar to that of the atmoſphere.

To determine the effects of reſpiration upon air, a live ſparrow was placed under a glaſs receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulſed. Notwithſtanding the heat of the animal, which neceſſarily, at firſt, rarefied the air in the receiver, there was a ſenſible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, inſtead of increaſing afterwards, the diminution became ſomething leſs in about half an hour; and when the animal was dead, and the air in the receiver had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-ſixtieth part.—This air, which had been reſpired by the ſparrow, though in many reſpects ſimilar to that in which the mercury had been calcined, differed from it in this reſpect, that it precipitated lime-water, and, by introducing cauſtic fixed alkali to it, was reduced one-ſixth in bulk by the abſorption of fixed air; after which it appeared exactly the ſame with that produced by the calcination of mercury or other metals; and atmoſpherical air was recompoſed by mixing this with pure dephlogiſticated air in the proportions already mentioned.

It appears from the experiments of Scheele and many other chemiſts, that the doctrine of phlogiſton has been carried too far by our Britiſh philoſophers, and that the air conſiſts of two kinds of fluids; one friendly in the higheſt degree to animal life; the other altogether unfit for it. Theſe two appear incapable of being converted directly into one another by any proceſs, natural or artificial: for though both are deſtructible, yet they are always converted into other ſubſtances; from which, indeed, either the one or the other may be extracted at pleaſure.

The ſtrongeſt arguments in favour of the tranſmutation of phlogiſticated air into that of a purer kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former caſe, however, as has been obſerved, this ſeeming purification is no other than an exchange of the one air for the other; the vegetables abſorbing the phlogiſticated, and emitting the dephlogiſticated air in its ſtead. With reſpect to the agitation in water, matters remained more dubious till the diſcovery made by Dr. Prieſtley, of the emiſſion of pure air from the latter, and of the poſſibility of air within a jar being influenced by the atmoſphere through a body of water 12 inches in depth. Theſe remarkable facts, however, were illuſtrated by the following experiments: 1. About 3 ounce-meaſures of air, phlogiſticated by nitrous air, were agitated for a quarter of an hour in a veſſel containing 20 ounces of water, which had been boiled for ſeveral hours, and which was ſtill very warm. By this proceſs it became diminiſhed one-ſixth, and conſiderably improved in quality. The next day the remainder was agitated for another quarter of an hour, and the water which had been boiled at the ſame time, when it was alſo diminiſhed in quantity and improved in quality. 2. An equal quantity of air, phlogiſticated by means of iron filings and brimſtone, being agitated for 20 minutes, was diminiſhed by one ſeventh, and improved ſo far that a candle would burn in it. 3. After expelling all the air he could from a quantity of water by boiling, he put to it, in ſeparate vials, air that had been phlogiſticated with iron-filings and brimſtone, as well as that which the heat had expelled, leaving them with their mouths in water, and agitating them occaſionally. On examining the vials in about two months, he found both the air that was confined by water, and that which had been expelled by heat, completely phlogiſticated. 4. That water does imbibe the purer part of the atmoſphere, in preference to that which is impure, is evident, he ſays, from an examination of it: for if the water be clear, and free from any thing that is putreſcent, the air expelled from it by heat is generally of the ſtandard of 1; whereas that of the atmoſphere, when the nitrous air is the pureſt, is about 1.2.

Phlogiſticated air is equally inviſible with common air, and ſomething more elaſtic. It is fatal to animal life, and friendly to that of vegetables. It ſeems to exiſt originally, in very large quantity, in our atmoſphere, from whence it may be ſeparated by combuſtion, by reſpiration, by putrefaction, and by every ſpecies of phlogiſtic proceſs. Any other ſpecies of air may be converted into this by means of fire, dephlogiſticated air alone excepted.

Phlogiſticated air is now generally believed to be a combination of the nitrous acid with phlogiſton; and that, in its gradual progreſs towards this, which is its ultimate ſtage, it firſt aſſumes the character of phlogiſticated nitrous acid; then of nitrous air, in which it readily parts with its phlogiſton to the atmoſphere, or rather to the dephlogiſticated part of it; and, laſtly, it becomes phlogiſticated air, in which the union betwixt the principles is ſo ſtrong, that it cannot be broken by ſimple expoſure to dephlogiſticated air without heat; though the experiments of Mr. Cavendiſh ſhow, that this may be done by means of the electric ſpark, which produces the moſt violent heat we can imagine.

It had been frequently obſerved, that common atmoſpherical air was always diminiſhed by taking the electric ſpark in it; and this diminution was ſuppoſed to be occaſioned by the *phlogiſtication* of the air, and ſeparation of its fixed part; in conſequence of which it was urged, that lime-water is precipitated by taking the electric ſpark over it in a ſmall quantity of air. Mr. Cavendiſh, however, who has careſully examined this ſubject, denies that any fixed air is produced in this manner: and by a ſet of very curious experiments, publiſhed in the 75th volume of the Philoſophical Tranſactions, has clearly ſhewn that nitrous acid, and not fixed air, is the product of this operation. The apparatus uſed in theſe experiments is repreſented Plate 2, fig. 4, and conſiſts only of a crooked glaſs tube, whoſe ends are plunged into quickſilver, the middle part containing the air confined betwixt the two portions. The air was in-

troduced by means of a ſmaller tube, fig. 5. (the tube of the former figure being filled with quickſilver) the bent end of which was introduced into a jar, filled with a proper kind of air, and inverted in water. In one caſe, however, in which he wiſhed to introduce air into the tube many times in the ſame experiment, he made uſe of the apparatus repreſented fig. 6. conſiſting of a tube of a ſmaller bore, a ball, and a tube of a larger bore.

As in ſome former experiments Mr. Cavendiſh had found, that, by deflagrating nitre with charcoal, the whole of the acid was converted into phlogiſticated air, he concluded that this kind of air is nothing elſe than nitrous acid united to phlogiſton; according to which, it ought to be converted into nitrous acid by being deprived of its phlogiſton. "But (ſays he) as dephlogiſticated air is only water deprived of phlogiſton, it is plain, that adding dephlogiſticated air to a body is equivalent to depriving it of phlogiſton, and adding water to it; and therefore phlogiſticated air ought alſo to be reduced to nitrous acid by being made to unite or form a chemical combination with dephlogiſticated air; only the acid thus formed will be more dilute than if the phlogiſticated air was ſimply deprived of phlogiſton.

"This being premiſed, we may ſafely conclude, that in the preſent experiments, the phlogiſticated air was enabled, by means of the electrical ſpark, to unite to, or form a chemical combination with, the dephlogiſticated air, and was thereby reduced to nitrous acid, which united to the ſoap-leys, and formed a ſolution of nitre; for in theſe experiments the two airs actually diſappeared, and nitrous acid was formed in their room: and as it has been ſhown, from other circumſtances, that phlogiſticated air muſt form nitrous acid when combined with dephlogiſticated air, the above-mentioned opinion ſeems to be ſufficiently eſtabliſhed. And a further confirmation is, that no diminution of air is perceived when the electric ſpark is paſſed either through pure dephlogiſticated or through perfectly phlogiſticated air; which indicates a neceſſity for the combination of the two, in order to produce nitrous acid. It was alſo found by the laſt experiment, that the quantity of nitre produced was the ſame that would have been obtained from the ſoap-leys, had they been ſaturated with nitrous acid; which ſhows that the production of the nitre was not owing to any decompoſition of the ſoap-leys.

"As far as the experiments hitherto publiſhed extend, we ſcarcely know more of the nature of the phlogiſticated part of the atmoſphere, than that it is not diminiſhed by lime-water, cauſtic alkalis, or nitrous air; that it is unfit to ſupport fire, or maintain life in animals; and that its ſpecific gravity is not much leſs than that of common air: ſo that, though the nitrous acid, by being united to phlogiſton, is converted into air poſſeſſed of theſe properties; and, conſequently, though it was reaſonable to ſuppoſe, that part at leaſt of the phlogiſticated air of the atmoſphere conſiſts of this acid united to phlogiſton; yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different ſubſtances confounded by us under the name of phlogiſticated air. I therefore made an experiment to determine whether the whole of a given portion of the atmoſphere could be reduced to nitrous acid, or whether there was not a part of a different nature from the reſt, which would refuſe to undergo that change. For this purpoſe, I diminiſhed a mixture of dephlogiſticated and common air, till it was reduced to a ſmall part of its original bulk; after which ſome dephlogiſticated air was added, and the ſpark continued till no further diminution took place. Having by theſe means condenſed as much as I could of the phlogiſticated air, I let up ſome ſolution of liver of ſulphur to abſorb the dephlogiſticated air; after which only a ſmall bubble of air remained unabſorbed, which certainly was not more than $\frac{1}{120}$th of the bulk of the phlogiſticated air let up into the tube; ſo that, if there is any part of the phlogiſticated air of our atmoſphere which differs from the reſt, and cannot be reduced to nitrous acid, we may ſafely conclude that it is not more than $\frac{1}{120}$th part of the whole."

Though theſe experiments had ſhown, that the chief cauſe of this diminution of airs is the converſion of the phlogiſticated kind into nitrous acid, it ſeemed not unlikely, that when any liquor containing inflammable matter was in contact with the air in the tube, ſome of this matter might be burnt by the ſpark, and thereby diminiſh the air. In order to determine this, the electric ſpark was paſſed through dephlogiſticated air included between different liquors; and the reſult of the experiments was, that when dephlogiſticated air, containing only $\frac{1}{20}$th part of its bulk of phlogiſticated air, was confined between ſhort columns of ſoap-leys, and the ſpark paſſed through it till no farther diminution could be perceived, the air loſt $\frac{43}{200}$dths of its bulk; which is not a greater diminution than might very likely proceed from the decompoſition of the ſmall quantity of phlogiſticated air contained in it, as the dephlogiſticated air might eaſily be mixed with a ſmall quantity of common air while putting into the tube. When the ſame dephlogiſticated air was confined between columns of diſtilled water, the diminution was rather greater than before, and a white powder was formed on the ſurface of the quickſilver beneath: the reaſon of which, in all probability, was, that the acid produced in the operation corroded the quickſilver,, and formed the powder; and that the nitrous air produced by that corroſion united to the dephlogiſticated air, and cauſed a greater diminution than would otherwiſe have taken place. When a ſolution of litmus was uſed inſtead of diſtilled water, the ſolution ſoon acquired a red colour; which grew paler and paler as the ſpark was continued, till it became quite colourleſs and tranſparent. The air was diminiſhed by almoſt $\frac{1}{2}$, and might perhaps have been further diminiſhed had the ſpark been continued. When lime water was let up into the tube, a cloud was formed, and the air was further diminiſhed by about $\frac{1}{5}$; the remainder was good dephlogiſticated air. In this experiment, therefore, the litmus was, if not burnt, at leaſt decompounded, ſo as to loſe entirely its purple colour, and to yield fixed air; ſo that, though ſoap-leys cannot be decompounded by this proceſs, yet the ſolution of litmus can, and ſo very likely might the ſolutions of many other ſubſtances. But there is nothing in any of theſe experiments which favours the opinion of the air being at all diminiſhed by means of phlogiſton communicated to it by the electric ſpark.

Sect. IV. *Of Fixed Air.*

The diſcovery of this kind of air is as old as Van Helmont, who gave it the name of *gas ſilveſtre*, from its being emitted in great quantity by burning charcoal. Subſequent diſcoveries ſhowed, that a fluid of the ſame kind was plentifully produced by fermenting liquors, by almoſt every kind of combuſtion, and was alſo naturally generated in vaſt quantity, in mines and coal-pits, where it is known by the name of the *choak-damp*; that it exiſts in a concrete ſtate in alkaline ſalts, chalk, limeſtone, the ſhells of marine animals, magneſia alba, &c. in a very large proportion, conſtituting $\frac{1}{2}$, and ſometimes more of their weight; and that it might always be extracted from the atmoſphere, in unlimited quantity, by expoſing certain ſubſtances to it.—This fluid, being found ſo manifeſtly acid, has now obtained the name of *aerial acid*.

Fixed air is the heavieſt of all permanently elaſtic fluids, excepting thoſe derived from the mineral acids. Mr. Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air

being extracted from calcareous ſpar by marine acid, whoſe ſpecific gravity was 1.0145. When combined with calcareous earth, it is prodigiouſly concentrated; and were it poſſible to exiſt by itſelf in that ſtate, it would be the heavieſt body known, gold and platina excepted. To prove this, Mr. K. firſt aſcertained the ſpecific gravity of a piece of white marble; then expelled the fixed air from a known weight of it finely powdered, by means of diluted vitriolic acid; the bulk and weight of the obtained fixed air being aſcertained. Next, he calcined a known quantity of the ſame ſort of marble, by keeping it in a white heat for the ſpace of 14 hours; after which, being weighed again, and from the weight loſt by this calcination, the weight of the fixed air, which muſt have eſcaped from it according to the above-mentioned experiment, being ſubtracted, the remainder is the weight of water contained in the marble; from which experiments it appears, that 100 grains of the marble contained 32.42 grains of fixed air, 11.66 grains of water, and 55.92 grains of pure calcareous earth.

"I next (ſays he) proceeded to diſcover the ſpecific gravity of the lime. Into a braſs box, which weighed 607.65 grains, and in the bottom of which a ſmall hole was drilled, I ſtuffed as much as poſſible of the finely-powdered lime, and then ſcrewed the cover on, and weighed it both in air and in water. When immerſed in the latter, a conſiderable quantity of common air was expelled; when this ceaſed, I weighed it. The reſult of this experiment is as follows:

	Grains.
Weight of the box in air - - -	607.65
Its loſs of weight in water - -	73.75
Weight of the box and lime in air -	1043.5
Weight of the lime ſingly in air - - -	435.85
Loſs of weight of the box and lime in water -	256.5
Loſs of weight of the lime ſingly - -	182.3

"Hence, dividing the abſolute weight of the lime by its loſs in water, its ſpecific gravity was found to be 2.3908.

"From theſe data I deduced the ſpecific gravity of fixed air in its fixed ſtate; for 100 grains of marble conſiſt of 55.92 of earth, 32.42 of fixed air, and 11.66 of water; and the ſpecific gravity of the marble is 2.717. Now, the ſpecific gravity of the fixed air, in its fixed ſtate, is as its abſolute weight, divided by its loſs of weight in water; and its loſs of weight in water is as the loſs of 100 grains of marble, *minus* the loſſes of the pure calcareous earth and the water.

Loſs of 100 grs. of marble $= \frac{100}{2.717} = 36.8$ grs.

Loſs of 55.92 grs. of calcareous earth $= \frac{55.92}{2.39} = 23.39$ grs.

Loſs of 11.66 grs. of water $= 11.66$

35.05

"Then the loſs of the fixed air $36.8 - 35.05 = 1.75$; conſequently its ſpecific gravity is $\frac{32.42}{1.75} = 18.52$."

Fixed air differs conſiderably from other airs. Its acidity is manifeſt to the taſte, and ſtill more from its neutraliſing alkalis, ſo as to form cryſtals of a neutral or acidulous ſalt. It has a conſiderable power in checking the putrefaction of animal ſubſtances; though in this caſe it acts only by abſorbing the putrid effluvia already emitted from the body, and becomes itſelf offenſive while it ſweetens the other. When taken into the lungs, it is equally poiſonous with any other noxious air, and extinguiſhes flame as effectually; but, when mixed with dephlogiſticated air, it may be inſpired without danger, and even in its pure ſtate may be copiouſly ſwallowed to effect the cure of diſeaſes, whence it has now become an article of the Materia Medica. As an acid, it ſtands in the loweſt rank, being expelled from alkalis by every other; though it ſeparates oils, ſulphur, and the colouring matter of Pruſſian blue, from the ſubſtances with which they are combined.

The compound nature of fixed air, and the principles from which it is formed, were firſt diſcovered by Mr. Kirwan; but Dr. Prieſtley was not convinced by the proofs he adduced, till after making ſome experiments of his own. The firſt was, by firing ſhavings of iron in dephlogiſticated air; when he obſerved a conſiderable reſiduum of fixed air, though that in the receiver had been of the pureſt dephlogiſticated kind, and iron could only have yielded inflammable air. The hypotheſis of Mr. K. was ſtill further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogiſticated air. On heating theſe in a glaſs retort, they gave a great quantity of fixed air, in ſome portions of which $\frac{19}{20}$ths were abſorbed by lime-water, and the reſiduum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was ſo pure that only $\frac{1}{30}$th part remained unabſorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol. In ſome of theſe experiments it appeared, that 3 ounce-meaſures of dephlogiſticated air went to the compoſition of 2 of fixed air: for 1 ounce of red precipitate gave 60 ounce-meaſures of dephlogiſticated air; and, when mixed with 2 ounces of iron filings, it gave about 40 ounce-meaſures of fixed air that were actually abſorbed by water, beſides a reſiduum that was inflammable. The ſame proportion was obtained when half the quantity of materials were employed; but on uſing an ounce of each, only 20 ounce-meaſures of fixed air, including the reſiduum, could be got.

In conſidering this ſubject farther, it occurred to Dr. Prieſtley, that his experiments, in which charcoal was uſed, lay open to an objection, that ſince dry wood, and imperfectly made charcoal, yield fixed air, it might be ſaid that all the elements of fixed air are contained in charcoal. In order therefore to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and, pounding it while hot, inſtantly mixed 4 meaſures of it with 1 of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was ſufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was leſs, and at laſt no fixed air at all was obtained; but as the reſiduum was worſe than the common atmoſphere, he is thence inclined to believe, notwithſtanding Mr. Cavendiſh's experiments, that phlogiſticated air may be compoſed of phlogiſton and dephlogiſticated air. In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing 1 ounce of precipitate with the ſame quantity of perfect charcoal hot from the retort in which it was made. Putting theſe into a coated retort, he expelled from them, by a ſtrong heat, about 30 ounce-meaſures of air, the whole of which was the pureſt fixed air, leaving only about $\frac{1}{30}$th part unabſorbed by water, and this almoſt perfectly phlogiſticated

Having recollected that formerly he had obtained fixed air from nitrous acid and charcoal, he repeated the experiment with ſome of the ſame charcoal which had then been uſed; when fixed air was obtained, in the quantity ſometimes only of $\frac{1}{5}$, and ſometimes of $\frac{1}{2}$; to the formation of which he ſuppoſed the dephlogiſticated air produced by heating the nitrous acid muſt have contributed. On account of the objections, however, which might be made to the uſe of charcoal, he next employed *iron*, which was liable to nothing of this kind;

and on mixing an ounce of iron-filings with as much charcoal, and then heating them in a glass retort, he obtained 20 ounce-measures of air, of which $\frac{1}{7}$ remained unabsorbed by water. The residuum was of the standard of 1.52, but slightly inflammable. Repeating the experiment with half an ounce of iron filings, he got 26 ounce-measures of air, of which the first part was pretty pure, but afterwards $\frac{1}{10}$th remained unabsorbed by water; but, on mixing one ounce of precipitate with two ounces of filings, he got about 40 ounce-measures of air, of the first portions of which only $\frac{1}{20}$th was unabsorbed by water, though towards the conclusion the residuum was greater. In this process he got in all 36 ounce-measures of pure fixed air, completely absorbed by water, besides about other 4 ounce-measures, which, he supposes, might have been absorbed in receiving the air, and transferring it into other vessels.

Fixed air was also produced from red precipitate mixed with brass filings, with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is easily converted. In this last case the Doctor supposes, that the fixed air was produced from the dephlogisticated kind absorbed by the metals and the phlogiston of the lead; and this is confirmed by an observation, that the fixed air always comes first in the process, when the phlogiston is most readily separated, but afterwards the produce becomes quite pure and dephlogisticated. In attempting, however, to increase the quantity of fixed air by heating this black powder in dephlogisticated air, he found only an augmentation of the quantity of dephlogisticated air, and that of the purest kind.

"Perhaps," says he, "as decisive a proof as any of the real production of fixed air from phlogiston and dephlogisticated air, may be drawn from the experiments in which I always found a quantity of it when I burned sulphur in dephlogisticated air. In one of these experiments, to which I gave particular attention, $6\frac{1}{2}$ ounce-measures of the dephogisticated air were reduced to about two ounce-measures, and $\frac{1}{5}$ of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were absorbed by water, the remainder was very pure dephlogisticated air.

"I had always concluded, that no fixed air could be procured by the decomposition of inflammable air which had been produced by mineral acids, because I had not been able to do it with that which I had got by means of vitriolic acid; but I learned from Mr. Metherie, that this is peculiar to the vitriolic acid, the remains of which, diffused through an inflammable air, procured by it, he conjectures, may actually decompose the fixed air produced in the process. For, as I have hinted before, when the inflammable air is produced from iron by means of spirit of salt, there is a very perceivable quantity of fixed air when it is united with dephlogisticated air. When I decomposed these two kinds of air in equal quantities, they were reduced to about 0.5 of a measure, and of this not more than about $\frac{1}{10}$th part was fixed air. This experiment ought, however, to be added to the other proofs of fixed air being produced by the union of dephlogisticated air and phlogiston.

"The last instance which I shall mention of the generation of fixed air from phlogiston and dephlogisticated air, is of a much more striking nature than any that I have yet recited. Having made what I call *charcoal of copper*, by passing the vapour of spirit of wine over copper when it was red-hot, I heated a piece of it in different kinds of air. In common air, observing neither increase nor decrease in the quantity, I concluded, perhaps too hastily, that no change was made in it; for, when I repeated the experiment in dephlogisticated air, the charcoal burned very intensely; and when a part of it was consumed (which, like common charcoal in the same process, was done without leaving any sensible residuum), I found that no heat which I could apply afterwards had any farther effect on what was left of the charcoal. Concluding, therefore, that some change must be made in the quality of the air, I examined it, and found about $\frac{9}{10}$ths to be the purest fixed air; and the residuum was such as would have been made by separating the absolutely pure part of the dephlogisticated air, leaving all the impurities behind. Having ascertained this fact, I repeated the experiment, weighing the piece of charcoal very carefully before and after the process; and then found, that by the loss of 1 grain of charcoal, I reduced 4 ounce-measures of dephlogisticated air till $\frac{1}{5}$th only remained unabsorbed by water; and again, with the loss of $1\frac{1}{2}$ grain of the charcoal, I reduced $6\frac{1}{2}$ measures of dephlogisticated air till $5\frac{1}{2}$ measures were pure fixed air. In this process there was a diminution of bulk after the experiment, as might have been expected from the change of the air into one of a heavier kind, by means of a substance or principle that could not add much to the weight of it. In one of the experiments, 4.3 ounce-measures of dephlogisticated air were reduced about $\frac{1}{30}$th part of the whole; and in this case, when the fixed air was separated by water, there was a residuum of 0.75 of a measure of the standard of 1.0, whereas the dephlogisticated air, before the experiment, had been of the standard of 0.2.

"That dephlogisticated air actually enters into the composition of the fixed air, in this experiment, is evident from the weight of the latter, which far exceeds that of the charcoal dispersed in the process. For, in this last experiment, the weight of the fixed air produced was 4.95 grains. Consequently, supposing the charcoal to be wholly phlogiston, as it is very nearly so, fixed air may be said to consist of 3.45 parts of dephlogisticated air, and 1.5 of phlogiston; so that the dephlogisticated air is more than 3 times the proportion of phlogiston in it. I must not conclude, however, without observing, that, in one experiment, I never failed to produce fixed air; though it is not easy to see how *one* of its supposed elements, viz. dephlogisticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of these experiments, 4 ounce-measures of the vitriolic acid air were reduced to 0.65 of an ounce-measure; and of the quantity lost $3\frac{1}{2}$ measures were fixed air absorbed by lime-water, and the remainder weakly inflammable."

Pure fixed air is remarkably altered by the electric spark. Dr. Priestley, having taken the electric spark for about 2 hours in a small quantity of fixed air, found that $\frac{1}{4}$th of it remained immiscible with water; though, before it, only $\frac{1}{30}$th part had remained unabsorbed. The inside of the tube had become very black; which, in similar experiments with vitriolic acid air, he had observed to arise from the adhesion of a small quantity of mercury supersaturated with phlogiston. Pursuing this experiment, by taking the electric spark 3 hours in a small quantity of fixed air, he observed that it was first increased, and then diminished about $\frac{1}{5}$th of the whole; the inside of the tube being very black on the upper part, and below the mercury very yellow, for the space of $\frac{1}{4}$th of an inch all round the tube; but this space had been above the mercury in the beginning of the operation. One third of the air remained unabsorbed by water; but so impure, that the standard of it was 1.8, or almost completely phlogisticated.—Varying the process, by using water impregnated with fixed air instead of mercury, the quantity of air was much augmented by that which came from the water; but thus the far greater part of it was incapable of being absorbed by lime water; and on this occasion he observed, that water impregnated with fixed air is a much worse conductor of electricity than the same fluid impregnated with mineral acids. On still varying the circum-

ſtances of the experiment, by uſing common water inſtead of that which had abſorbed fixed air, he found that the quality of the reſiduum was evidently better than that of the original fixed air.

In order to diſcover whether the heat or light of the electric ſpark were the circumſtances which effected the change, the Doctor threw a ſtrong light, by means of a lens, for ſome hours on a quantity of pounded glaſs confined in ſome fixed air; but theſe and other trials proved unſatisfactory, though the quantity of air was increaſed after the operation. By heating iron, however, in fixed air, part of it was evidently converted into phlogiſticated air. On heating turnings of malleable iron for ſome time in fixed air, $\frac{1}{10}$th part of it was rendered immiſcible with water; and, on repeating the proceſs with the remainder, there was a reſiduum of $\frac{1}{4}$th of the whole. There was alſo a ſmall addition to the quantity of air after the firſt part of the proceſs, but none after the ſecond; nor could he, after a third and fourth proceſs, render more than $\frac{1}{4}$th immiſcible with water. In two experiments, the reſiduum was inflammable, and burned with a blue flame.

With regard to the quantity of fixed air which may be expelled from different ſubſtances, Dr. Prieſtley obſerves, that from 7 ounces of whiting, the pureſt calcareous ſubſtance we are acquainted with, he expelled by heat 630 ounce-meaſures of air; by which means the whiting was reduced to 4 ounces. One third of this was ſomewhat phlogiſticated, the ſtandard being 1.36 and 1.38. Repeating the experiment, he obtained 440 ounce-meaſures of air from 6 ounces of whiting; about $\frac{1}{2}$ of which was fixed air, and the remainder of the ſtandard of 1.4. On moiſtening ſome calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce-meaſures; of which the firſt portions were $\frac{3}{4}$ths fixed air, and the ſtandard of the reſiduum 1.5; the latter had leſs fixed air, and the ſtandard of the reſiduum was 1.44. The whiting was rendered black and hard, but became ſoft and white with ſpirit of ſalt. Three ounces and a quarter of lime fallen in the air yielded 375 ounce-meaſures; of which about $\frac{1}{5}$th was fixed air, and the ſtandard of the reſiduum 1.4. Four ounces of white lead had yielded 240 meaſures of air when the retort melted. The reſiduum of the firſt proceſs was $\frac{1}{3}$d, the ſtandard 1.36; and of the laſt the ſtandard was 1.28, that with the common atmoſphere being 1.23. Two ounces and three quarters of wood aſhes yielded, in a very ſtrong heat, 430 ounce-meaſures of air; of the firſt portion of which $\frac{1}{10}$th, of the ſecond $\frac{1}{3}$d, and of the third $\frac{1}{2}$, was fixed air. The ſtandard of the reſiduum of the firſt portion was 1.6, and of the ſecond 1.7. It extinguiſhed a candle; ſo that the air came properly from the aſhes, and not from any remaining particles of the charcoal mixed with them. After the proceſs, the aſhes weighed 839 grains; but by expoſure to the air for one day, the weight was increaſed to 842 grains; and, perhaps with more heat than before, yielded 50 ounce-meaſures of air; of which about $\frac{1}{8}$th was fixed air, and the ſtandard of the reſiduum 1.38 and 1.41. A candle burned in this reſiduum, and the aſhes were reduced to 789$\frac{1}{2}$ grains. Dr. P. afterwards ſubjected Homberg's pyrophorus to ſimilar trials, and the reſults proved highly intereſting; but theſe details run to a conſiderable length, and afford no general concluſion.

Sect. V. *Inflammable Air.*

We owe the knowledge of the exiſtence, and of ſome remarkable properties, of this air, to Mr. Cavendiſh, by whom they were firſt publiſhed in 1767. Its effects, however, had long before been fatally experienced by miners; in whoſe ſubterraneous habitations it is often collected in ſuch quantities as to produce the moſt dreadful effects. It is produced in abundance from putrid animal and vegetable ſubſtances; and, in general, by all thoſe which part with their phlogiſton eaſily.

Being much lighter than common air, it always riſes to the top of thoſe places where it is generated; ſo that it cannot be confined except in ſome vaulted place, but always ſtrives to aſcend and mix with the atmoſphere. By itſelf it will inſtantly put an end to animal life; but mixed with atmoſpherical air, it may be breathed in much greater quantity than fixed air. Its great inflammability in this ſtate, however, renders it very dangerous to bring lights, or even to ſtrike a flint with ſteel, in places where it abounds. Yet this only happens when inflammable air is mixed with common atmoſpherical or elſe with dephlogiſticated air; in which latter caſe, the exploſion is by many degrees more violent; but pure inflammable air extinguiſhes flame as effectually as fixed or phlogiſticated air.

But beſides ſubterraneous places, this kind of air is found in ditches; over the ſurface of putrid waters; in burying grounds; in all places where putrid animal and vegetable matters are accumulated. In hot climates, where putrefaction is moſt prevalent, if the mud at the bottom of a pond be well ſtirred, and a lighted candle brought to the ſurface of the water, a flame will inſtantly ſpread a conſiderable way over the water, from the aſcenſion of the inflammable air. In colder climates, though the generation of inflammable air is not ſo plentiful, it may be eaſily collected in a jar filled with water, and inverted over a pond, the mud at the bottom being ſtirred with a ſtick.

The meteors and *ignes fatui*, which are ſeen in warm climates, have been ſuppoſed nothing more than ſtreams of inflammable air fired in the atmoſphere by electric exploſions; but theſe appearances are accounted for in a more ſatisfactory way.

There is hardly any inflammable ſubſtance out of which this air may not be extracted, yet the fluids which go by the general name of *inflammable air*, have ſcarce any other property in common, beſides thoſe of inflammability, and being ſpecifically lighter than atmoſpherical air. It is, however, neceſſary to make a proper diſtinction between an inflammable gas, properly ſo called, and that which is evidently made by combining an inflammable ſubſtance with common air; which being eaſily ſeparated leaves that fluid in the ſtate it was before.

By heat alone, a conſiderable quantity of this kind of air may be extracted from moſt inflammable ſubſtances, and even from ſome of the metals. Dr. Prieſtley obtained it from a vaſt number of ſubſtances, by diſtilling them in a gun barrel, to the extremity of which was luted a tobacco-pipe, with a flaccid bladder tied on the end. He obſerves, that the heat muſt be ſuddenly applied, in order to get a conſiderable quantity of air from theſe ſubſtances. "Notwithſtanding (ſays he) the ſame care be taken in luting, and in every other reſpect, ſix, or even ten, times more air may be got by a ſudden heat than by a ſlow one, though the heat that is laſt applied be as intenſe as that which was applied ſuddenly. In a trial of the metallic calces he had no ſucceſs.

In the infancy of his experiments, Dr. Prieſtley imagined, that the inflammable air produced in this way came only from the metal; while Lavoiſier, on the other hand, attempted to prove that it proceeded almoſt excluſively from the water. The method which the latter had followed, was to ſend the ſteam of boiling water through a red-hot iron tube; in doing which the intenſe heat acquired by the water occaſioned the production of a great quantity of inflammable air. Dr. Prieſtley repeated his experiments not only with water, but with other fluids. Sending the vapour of 2 ounces of ſpirit of wine through a red-hot earthen tube, he obtained 1900 ounce-mea-

ſures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-meaſures of it weighed 8 grains leſs than an equal quantity of common air. He collected alſo 0.35 of an ounce-meaſure of water. In this experiment the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the ſpirit of wine originally was 821 grains; ſo that as little was loſt in the proceſs as could be expected. Repeating the experiment with vitriolic ether, an ounce of it treated in the ſame manner in an earthen tube almoſt filled with pieces of broken earthen retorts and crucibles, $\frac{1}{10}$th part of an ounce of water was collected, and 740 ounce-meaſures of inflammable air were procured, without any mixture of fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogiſticated air. Twenty-nine ounce-meaſures of this weighed 5 grains leſs than an equal quantity of common air. Vapour of ſpirit of turpentine yielded inflammable air mixed with much black ſmoke, which ſoon collected on the ſurface of the water in the receiver. The ſmell of this air was exceedingly offenſive, and its flame was much leſs luminous than that of the former. Its ſpecific gravity was the ſame with that of the air procured from ſpirit of wine. Olive oil yielded a conſiderable quantity of air on being mixed with calcined whiting; the firſt portions burning with a large white flame, and the laſt with a lambent blue one.

In extracting air from ſolid ſubſtances, the ſteam of water was always neceſſary; and thus inflammable air was produced from a great number of different ones. From ſulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature ſimilar to that from oil of vitriol and iron. From arſenic the produce was $\frac{1}{7}$th of fixed air; but all the reſt ſtrongly inflammable, with a ſmell ſcarcely diſtinguiſhable from that of phoſphorus. Twenty ounce-meaſures of this air weighed $4\frac{1}{2}$ grains leſs than an equal quantity of common air. Both theſe experiments, however, were very troubleſome, on account of the volatility of the matters, which ſublimed and choaked up the tubes. From 2 ounces of the ſcales of iron, or *fining cinder*, which he has found to be the ſame thing, Dr. Prieſtley obtained 580 ounce-meaſures of air; $\frac{1}{10}$th of the firſt part of which was fixed air, but afterwards it was all inflammable. Forty ounce-meaſures of this air weighed 2 grains more than an equal quantity of common air. From charcoal expoſed to the red-hot ſteam of water, inflammable air was procured in great quantities. From 94 grains of perfect charcoal, that is, prepared with a ſtrong heat ſo as to expel all fixed air from it, and 240 ounces of water, 840 ounce-meaſures of air were obtained, $\frac{1}{4}$th part of which was fixed air; and the inflammable part appeared likewiſe, by decompoſition, to have a quantity of fixed air intimately combined with it. Three ounces of bones burnt black, and treated in this manner in a copper tube, yielded 840 ounce-meaſures of air; the water expended being 288 grains, and the bones loſing 110 grains of their weight. This air, he obſerves, differs conſiderably from that of any other kind of inflammable air; being in ſeveral reſpects a medium betwixt the air procured from charcoal and that from iron. It contains about $\frac{1}{4}$th of its bulk of uncombined fixed air, but not quite $\frac{1}{10}$th intimately combined with the remainder. The water that came over was blue, and pretty ſtrongly alkaline; owing to the volatile alkali not having been totally expelled by the heat which had reduced the bones to blackneſs.

A variety of ſubſtances, ſaid not to contain any phlogiſton, were ſubjected to the ſame proceſs, but without yielding any inflammable air. The experiments with iron, however, were the moſt ſatisfactory, as being ſubject to leſs variation than thoſe with charcoal; and clearly evincing, that the air in the proceſs does not come from the water alone, but from the iron alſo; or, as Dr. Prieſtley ſays, "only from the iron; the weight of water expended, deducting the weight of air produced, being found in the addition of weight in the iron as nearly as could be expected in experiments of this kind. The quantity of inflammable air that may be procured by ſteam from any given quantity of iron, the Doctor ſtates thus: "960 grains of iron, when diſſolved in acids, will yield about 800 ounce-meaſures of air; but, treated in this manner, it yielded 1054 meaſures, and then the iron had gained 329 grains in weight."

Inflammable air having been at firſt produced only from metals by means of acids, it was then ſuppoſed that part of the acid neceſſarily enters into its compoſition; but as this hypotheſis was proved to be ill grounded by the moſt deciſive experiments, we ſhall not take up the reader's time farther than by quoting Dr. Prieſtley's concluding remarks on the ſubject: "With reſpect to inflammable air (ſays he) I have obſerved, that when ſufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the ſmalleſt degree affected by a mixture of alkaline air. On the whole, therefore, I have at preſent no doubt, but that pure inflammable air, though it certainly contains *water*, does not neceſſarily contain any acid: yet an acid vapour may be eaſily diffuſed through it, and may perhaps, in many caſes, be obſtinately retained by it, as no kind of air ſeems to be capable of ſo great a variety of impregnations as inflammable air is."

We are indebted to Mr. Cavendiſh for the fact that water is neceſſary to the production of inflammable air, and to Dr. Prieſtley for the diſcovery that charcoal is perfectly deſtructible, or decompoſed, *in vacuo*, and, by the heat of a burning lens, almoſt convertible into inflammable air; nothing remaining beſides an exceedingly ſmall quantity of white aſhes, which are ſcarcely viſible. The great weight of aſhes produced by burning wood in the open air ariſes from what they attract from the atmoſphere. The air got in this manner is wholly inflammable, and without containing the leaſt particle of fixed air; but, in order to this, the charcoal muſt be made with ſuch a heat as will expel all the fixed air from the wood; and it muſt be continued till it yield inflammable air only, which, in an earthen retort, is ſoon produced. Wood or charcoal is even perfectly deſtructible, that is, reſolvable into inflammable air, in a good earthen retort, and a fire that would about melt iron. An ounce of charcoal made from oak generally gives about 5 ounce-meaſures of inflammable air in 12 minutes.

The proofs of the agency of water, in the production of inflammable air, Dr. Prieſtley communicates in the following words: "Appriſed of the influence of unperceived moiſture in the production of inflammable air, and willing to aſcertain it to my perfect ſatisfaction, I began with filling a gun-barrel with iron filings in their common ſtate, without taking any particular precaution to dry them, and I found that they gave air as they had been uſed to do, and continued to do ſo many hours: I even got 10 ounce-meaſures of inflammable air from 2 ounces of iron-filings in a coated glaſs retort: at length, however, the production of inflammable air from the gun-barrel ceaſed; but, on putting water to it, the air was produced again; and a few repetitions of the experiment convinced me, that I had been too precipitate in concluding that inflammable air is pure phlogiſton. I then repeated the experiment with the charcoal, making the receiver the ſtand on which I placed the charcoal, and the charcoal itſelf as dry and hot as poſſible, and uſing cement inſtead of wet leather, in order to exclude the air. In theſe circumſtances, I was not able, with the advantage of a good ſun, and an excellent burning lens, to decompoſe quite ſo much as 2 grains of the piece of charcoal which gave me 10 ounce-meaſures of inflammable air; and

this, I imagine, was effected by means of ſo much moiſture as was depoſited from the air in its ſtate of rarefaction, and before it could be drawn from the receiver. To the production of this kind of inflammable air, therefore, I was now convinced that water is as eſſential as to that from iron."

Of inflammable airs the Doctor obſerves, that the difference moſt commonly perceived is, that ſome of them burn with a lambent flame, white, yellow, or ſometimes blue; while another kind always burns with an exploſion, making more or leſs of a report when a lighted candle is dipped into it. The inflammable air extracted from metals by means of acids is of this laſt kind; and that from wood, coal, or other inflammable ſubſtances by means of heat, belongs to the former. It has alſo been obſerved, that theſe kinds of inflammable air have different ſpecific gravities; the pureſt, or that which is extracted from iron, &c. being about ten times as light as common air; but ſome of the other kinds not more than twice as light.

This difference was for ſome time attributed to a quantity of fixed air intimately combined with the heavier kinds, ſo that it could not be diſcovered by lime-water, while the lighteſt contained no fixed air at all. In order to aſcertain this point, he had recourſe to decompoſition; which was performed by mixing with the inflammable air to be tried, an equal quantity of common or dephlogiſticated air, and then confining them in a ſtrong glaſs veſſel previouſly filled either with water or mercury; making afterwards an electric ſpark in ſome part of the mixture by means of wires inſerted through the ſides of the veſſel, and nearly meeting within it. Thus he ſuppoſed that he might be able to determine the quantity of *combined* fixed air, and likewiſe the relative quantity of phlogiſton contained in each of them. The former appeared by waſhing the air with lime-water after the exploſion, and obſerving how much of them was abſorbed; and the latter by examining the reſiduum with the teſt of nitrous air, and obſerving the purity of it. Finding, however, that in ſome caſes more fixed air was found after the exploſion than could have been *contained* in the inflammable air, he was thence led to obſerve the *generation* of fixed air from the principles mentioned on another occaſion.

In proſecuting this ſubject, it was found that one meaſure of inflammable air produced by ſteam from metals, and one of dephlogiſticated air, ſuch as by mixture with two meaſures of nitrous air was reduced to 0.72 of a meaſure, were reduced by exploſion to 0.6 of a meaſure; the reſiduum, by an equal quantity of nitrous air, was reduced to 0.87. With the ſame dephlogiſticated air, the inflammable air from fining-cinder and charcoal was reduced only to 1.85 of a meaſure; but by waſhing in lime-water, to 1.2. The reſiduum examined by nitrous air appeared to be of the ſtandard of 0.9. In another proceſs, the diminution after the exploſion was to 1.55, and that after waſhing in lime water to 0.65 of a meaſure; in a third, by exploſion, to 1.6, and by waſhing to 0.66; and in a fourth, the firſt diminution was to 1.6, and the ſecond to 0.6. In this laſt experiment there was a generation of an entire meaſure of fixed air; and that this had not been contained originally in any latent ſtate in the original fluid, was evident from the ſpecific gravity of the inflammable air made uſe of. This, indeed, was one of the heavieſt kinds of the fluid: but 40 ounce-meaſures of it weighed only 2 grains more than an equal bulk of common air; whereas, had all the fixed air found in the reſiduum been *contained* in the original air, it muſt have been at leaſt one half heavier. "Indeed (ſays the Doctor) if any quantity of inflammable air, of about the ſame ſpecific gravity with common air (which is the caſe with that ſpecies of it I am now conſidering), yield ſo much as $\frac{7}{10}$ths of its bulk of fixed air in conſequence of its exploſion with dephlogiſticated air, it is a proof that at leaſt part of that fixed air was generated in the proceſs, becauſe $\frac{7}{10}$ths of ſuch fixed air would weigh more than the whole meaſure of inflammable air."

Numerous experiments, evincing ſtill farther the generation of fixed air in the decompoſition of inflammable air, are deſcribed by Dr. Prieſtley, and with various reſults, according to the proceſſes uſed, and the different ſubſtances employed in procuring the latter. From the whole of them it was evident, that at leaſt part of the fixed air found after the exploſion was produced by its means. But the following ſeem proofs no leſs convincing that fixed air may be converted into the inflammable kind, or at leaſt that the elements of fixed air may remain in inflammable air in ſuch a manner as to be imperceptible. On heating in an earthen retort a quantity of ſlaked lime, which had long been kept cloſe corked in a bottle, it gave air, of which $\frac{1}{5}$th was generally fixed air; but in the gun-barrel the ſame lime yielded no fixed air at all, but a great quantity of inflammable air of the exploſive kind, like that which is got from iron alone by means of water. As this total diſappearance of the fixed air appeared extraordinary, the Doctor was induced to repeat it ſeveral times with all poſſible care; and the following was the reſult of his experiments: Three ounces of ſlaked lime, which had for ſome time been expoſed to the open air, heated in an earthen tube, yielded 14 ounce-meaſures of air, of which only $2\frac{1}{2}$ remained unabſorbed by water; the reſiduum was ſlightly inflammable, but not perfectly phlogiſticated. Three ounces of the ſame lime, heated in a gun-barrel, gave 20 ounce-meaſures of air, all of which was inflammable, and no part fixed. It was expected, however, that the fixed air would have appeared on the decompoſition of this inflammable air with the dephlogiſticated kind: but, after this proceſs, it appeared to be exactly ſuch inflammable air as is procured from metals by the mineral acids, or by ſteam; the diminution of the two kinds of air being exactly the ſame: and though ſome fixed air was found in the reſiduum, it was no more than is uſually met with in the decompoſition of inflammable air procured by means of ſpirit of ſalt.—Suppoſing that the two kinds of air might incorporate, when one of them was generated within the other, a gun-barrel was filled with fixed air, and the cloſed end of it put into a hot fire. Inflammable air was inſtantly produced; but when the fixed air was ſeparated from it, it burned like inflammable air with which no other kind had ever been mixed.

On heating iron-turnings in 5 ounce-meaſures of fixed air, the quantity of it was increaſed about 1 ounce-meaſure, and there remained $1\frac{3}{4}$ths unabſorbed by water. The experiment was repeated with the ſame reſult; and it was farther obſerved, that though the inflammable air procured in this manner did not appear by the teſt of lime-water to contain any fixed air, yet when it was decompoſed by firing it with an equal quantity of dephlogiſticated air, the reſiduum contained $\frac{1}{3}$ of fixed air. The diminution was to 1.45. Hence the Doctor conjectures, that though, in ſome caſes, the fixed air appears to be *generated* by the decompoſition of dephlogiſticated and inflammable air, yet that inflammable air, when thus produced in contact with fixed air, may *combine* with it, ſo as to be properly *contained* in it, and in ſuch a manner that it cannot be diſcovered by lime-water.

Inflammable air, when produced in the drieſt way poſſible, is exceedingly light, as has been already obſerved; but Dr. Prieſtley has found, that, by ſtanding on water, a very conſiderable increaſe is made in its ſpecific gravity; ſo that, from being ten or twelve times lighter than atmoſpherical air, it ſoon becomes only ſeven times lighter. This great propenſity to unite with water is alſo taken notice of by Mr. Kirwan; who tells us, that the bulk of inflammable air obtained over

water with the aſſiſtance of heat towards the end, was ⅛th greater than when produced over mercury; but that the weight of it in the former caſe was only eight or nine times leſs than common air.—"From 85 cubic inches of inflammable air obtained over water, I extracted," ſays he, "by oil of vitriol expoſed to it for 55 hours, two grains of water; and, though undoubtedly there is an error in all theſe experiments, yet there can be little doubt but this inflammable air contained one-half its weight of water. The inflammable air, by the ſubtraction of its water, loſt its ſmell, but continued as inflammable as ever; and therefore there is no reaſon to think that it was decompoſed, or that water is any way eſſential to it."

This concluſion is directly contrary to that of Dr. Prieſtley, that *water* is an eſſential ingredient in the compoſition of inflammable air; nor do the experiments of the latter ſeem to have had any weight with him. On the other hand, Dr. P. informs us, that "inflammable air ſeems now to conſiſt of water and inflammable air; which, however, ſeems extraordinary, as the two ſubſtances are hereby made to involve each other; one of the conſtituent parts of water being inflammable air, and one of the conſtituent parts of inflammable air being water; and therefore, if the experiments would favour it (but I do not ſee that they do ſo), it would be more natural to ſuppoſe, that water, like fixed air, conſiſts of phlogiſton and dephlogiſticated air, in ſome different mode of combination.

"There is an aſtoniſhing variety in the different kinds of inflammable air, the cauſe of which is very imperfectly known. The lighteſt, and therefore probably the pureſt kind, ſeems to conſiſt of phlogiſton and water only. But it is probable that *oil*, and that of different kinds, may be held in ſolution in ſeveral of them, and be the reaſon of their burning with a lambent flame, and alſo of their being ſo readily reſolved into fixed air when they are decompoſed by dephlogiſticated air; though why this ſhould be the caſe I cannot imagine.

"When inflammable and dephlogiſticated air are burned together, the weight of the water produced is never, I believe, found quite equal to that of both kinds of air. May not the *light*, therefore, emitted from the flame, be part of the phlogiſton of the inflammable air united to the principle of heat? And as light accompanies the *electric ſpark*, may not this alſo be the real *acceſſion* of ſome phlogiſtic matter, though it is not eaſy to find the ſource of it?

The French chemiſts, who deny the exiſtence of phlogiſton, are of opinion, that inflammable air is a ſimple uncompounded element. See PHLOGISTON.

It has been proved by experiment, that inflammable air is abſorbed by water in conſiderable quantity, and that, by the application of heat, it may be expelled again in equal quantity. Plants in general grow tolerably well in inflammable air, and the willow plant has been obſerved to abſorb great quantities of it. Its inflammability is not diminiſhed by the putrefaction of animal ſubſtances, nor does their putrefaction ſeem to be retarded by it. Animals confined in it are killed almoſt as ſoon as in fixed air: but inſects, which can live a conſiderable time in phlogiſticated air, live alſo a conſiderable time in this. The Abbé Fontana, having filled a large bladder with inflammable air, began to breathe it. The firſt inſpiration produced a great oppreſſion in his lungs, the ſecond made him look very pale, and the third was ſcarce accompliſhed when he fell on his knees through weakneſs. Birds and ſmall quadrupeds, incloſed in ſmall veſſels of this air, died after a very few inſpirations. Laſtly, inflammable air poſſeſſes a ſmaller ſhare of refractive power than common air; as appears from Mr. Warltire's experiment with an hollow triangular priſm filled with it.

The inflammability of this air has given occaſion to various projects, ſuch as lamps, &c. which may be lighted by the electric ſpark. Very pretty artificial fires are alſo made, with glaſs tubes bent in various directions, and pierced with a great number of ſmall apertures. The inflammable gas is preſſed forward into theſe tubes, from a bladder, and the inflammable air, iſſuing out of all the ſmall apertures, is ſet on fire by a lighted taper. None of theſe contrivances, however, have proved of any uſe; and the ſcheme of Mr. Volta, for ſubſtituting its explosive force inſtead of gun-powder, is found inſufficient.

SECT. VI. *Sulphurated Inflammable Air.*

THIS was diſcovered by Dr. Prieſtley at the time he was engaged in tranſmitting ſteam through red-hot tubes containing ſome ſolid material. Having treated manganeſe in this manner, by ſtopping one end of the heated tube with a cork before the ſteam was applied, he received 40 ounce-meaſures of air, of which ⅛th was fixed air, and the reſt of the ſtandard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the ſteam, air was produced more copiouſly than before. Of 50 ounces of this air, ⅓th was fixed, and the reſt, of the ſtandard of 1.8, explosively inflammable. The laſt portions were very turbid: and the ſmell, eſpecially that of the laſt portion, was very ſulphureous, tinging the water of a very dark colour, by depoſiting in it a quantity of blackiſh water. However, the air itſelf became preſently tranſparent; but on looking at the jar in about ten minutes after, it was quite black and opaque; ſo that nothing could be ſeen in the inſide of it. Filling afterwards another jar with the ſame kind of air, in order to obſerve the progreſs of this uncommon phenomenon, he found, that when the water was well ſubſided, black ſpecks began to appear in different places, and, extending themſelves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glaſs opaque. When this was done, he transferred the air into another jar; and it ſoon produced a ſimilar effect upon this, though it never became ſo black as the jar in which it had been firſt received. It alſo frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded, had kept ſubſiding, though inviſibly, in the maſs of air, and occupied only the lower regions, leaving the upper part entirely free from it. On expoſing to the open air the veſſels thus turned black, the colour preſently diſappeared, and a yellow or brown incruſtation was left upon it.—Other ſpecimens of manganeſe produced no air of this kind; but iron that had been melted in vitriolic acid air yielded it readily. Diſſolving this with a conſiderable quantity of freſh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and depoſited more ſediment than in the experiment with manganeſe. On burning a quantity of it, this kind of air appeared to contain ſome vitriolic acid; but on decompoſing it with dephlogiſticated air, the diminution was exactly the ſame as when common inflammable and dephlogiſticated air were uſed; only there was a ſmall quantity of fixed air produced, which is never the caſe with common inflammable air from vitriolic acid and iron.

SECT. VII. *Of Alkaline Air.*

THIS was firſt procured by Dr. Prieſtley, who obtained it by mixing one part of pounded ſal-ammoniac with three parts of ſlaked lime. When pure, it is inſtantly fatal to animal life, and extinguiſhes flame; though, when mixed with atmoſpheric air, it is ſlightly inflammable. A candle dipped into this air is extinguiſhed; but juſt before the flame goes

out, it is enlarged by another flame of a pale yellow, and ſometimes a weak flame ſpreads for a conſiderable way, or even through the whole body of the alkaline air. Electric ſparks taken in it appear of a red colour, augment its bulk, and by degrees turn the whole into inflammable air. It is readily abſorbed by water, and diſſolves ice almoſt as faſt as an hot fire. On confining ſome water impregnated with alkaline air in a glaſs tube, and expoſing it to a ſtrong heat for ſome days, a white pellicle or incruſtation formed on its ſurface. Bits of linen, charcoal, and ſponge, admitted into alkaline air, diminiſhed it, and acquired a very pungent ſmell; eſpecially the ſponge, a bit of which, about the ſize of an hazle-nut, abſorbed an ounce-meaſure. It is remarkable that copper, which is ſo eaſily corroded by the common volatile alkalis, is not affected by alkaline air. Its ſpecific gravity Mr. Kirwan determines to be to that of common air as 600 to 1000; though this differs conſiderably according to the moiſture it contains.

In proſecuting his experiments on alkaline air, Dr. Prieſtley concluded that it contains phlogiſton, both from its being convertible into inflammable air by electric exploſions, and likewiſe from its reviving the calces of metals. In attempting to aſcertain the proportion of lead revived in alkaline air, he found 6 grains of lead in 3 ounce-meaſures, 16½ in 3½ meaſures, 13 in 2½, and 12 in 3¾ths; but the experiment on which he laid the greateſt ſtreſs, was that in which 26½ grains of lead were revived in 7½ ounce-meaſures of alkaline air. In this proportion, 100 ounce-meaſures of alkaline air would revive 352 grains of lead; but an equal quantity of inflammable air from iron would have revived 480 grains of metal. This deficiency appeared ſomewhat ſurpriſing, ſince alkaline air is reſolved into more than twice its bulk of the inflammable kind; though poſſibly inflammable air from iron may contain more phlogiſton than that into which alkaline air is reſolvable.—On heating red precipitate in alkaline air, the mercury was revived as in other caſes, and a conſiderable quantity of water produced, though none appeared on reviving it with common inflammable air.

In examining the phenomena which attend the converſion of alkaline air into the inflammable kind, the Doctor was induced to believe that it was occaſioned by heat alone, without the concurrence of light. The effects of the former were firſt perceived on heating ſome ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a conſiderable increaſe of quantity, inſtead of decreaſe in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. In all his experiments, however, with a burning-glaſs, as a ſtrong light was concerned, he heated a quantity of alkaline air in a green glaſs retort, receiving in a glaſs tube, filled with water, all the air that could be expelled from it by heat. At firſt it was all abſorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly abſorbed, and at laſt none of them were ſo. Theſe were altogether inflammable; ſo that no doubt remained of the change being produced by heat alone, without any intervention of light.

It was farther obſerved, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the proceſs. He therefore ſuppoſed, that ſomething might be depoſited from the air upon the clay. "Indeed (ſays he), if this was not the caſe, I do not ſee why the clay ſhould become black; though, perhaps, part of the ſame phlogiſton which forms the inflammable air may be attracted by the red-hot clay, without there being any proper decompoſition of the air. That this is the caſe ſeems probable from an experiment in which I uſed porcelain inſtead of common earthen ware; which did not become black in the proceſs, though inflammable air was produced."

In ſome of Dr. Prieſtley's experiments, he had obſerved that iron which had long ruſted in nitrous air, gave out a ſtrong ſmell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found that it was much ſooner produced by making uſe of a weak ſolution of copper; by putting iron into which, he obtained that ſpecies of nitrous air called *dephlogiſticated*.

Sect. VIII. *Of Nitrous Air.*

This kind of air is plentifully obtained in all caſes where the nitrous acid is combined with phlogiſton: Thus, when it is mixed with metals, or animal or vegetable ſubſtances, nitrous air is produced in great quantities; but very ſparingly when treated with metallic calces, earths, or other matters which are ſaid to contain little or no phlogiſton. All the metals, except gold, platina, and regulus of antimony, which are not ſoluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from theſe, when diſſolved in aqua regia, ſome quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, braſs, biſmuth or nickel, when put into nitrous acid, yield this air in conſiderable quantity. Mercury yields it but ſlowly without the application of heat, though no great degree of it is neceſſary. Copper and iron, eſpecially the latter, require the acid to be cautiouſly applied on account of the violent emiſſion of fumes. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily; but lead yields it in ſmaller proportion than any other metal; and zinc does the ſame among the ſemi-metals, the elaſtic fluid produced from it being moſtly phlogiſticated air.

In the production of this kind of air, great differences are perceived by a diverſity in the ſtrength of the acid. Thus, if we diſſolve copper in ſtrong nitrous acid, no nitrous air is produced, though the ſame materials will yield air in great quantity by the mere affuſion of water to dilute the acid. This is very properly explained by Doctor Prieſtley, from the property that the nitrous acid has of attracting phlogiſton, which is evident from what happens in the ſolution of mercury. When ſtrong ſpirit of nitre is poured upon this metal, the ſolution ſoon begins, and is very rapid, yet not a ſingle bubble of elaſtic fluid is produced; but in a ſhort time the acid next to the mercury is changed of an orange colour, which is an indication of its having acquired phlogiſton, probably from the nitrous air which is decompoſed the moment it is formed, and before its particles are united into viſible bubbles. The bubbles of air indeed break through the coloured acid, but they diſappear the moment they come in contact with the pale-coloured acid. As ſoon as the whole quantity of acid has aſſumed the orange colour, nitrous air eſcapes from it in conſiderable quantity; but the mixture of water deprives the acid of its power of decompoſing nitrous air. The ſtrong and pale-coloured nitrous acid ought to be diluted with at leaſt two or three parts of water to one of the acid, for the eaſy production of nitrous air from copper and mercury. For common experiments, except the latter be uſed, no other degree of heat is neceſſary than that produced by the effervescence.

Nitrous air is equally as inviſible as common air, except at firſt, when it is ſomewhat coloured, owing to a little ſuperfluous nitrous acid, or to ſome earthy particles carried up with it. Its ſmell reſembles that of nitrous acid, or in-

deed is the very ſame; becauſe, in paſſing through the common air to our noſtrils, it is decompoſed, and converted into nitrous acid. The ſame is to be ſaid of its taſte; though Mr. Fontana, who taſted it without any contact of external air, affirms that it has no taſte whatever.—Though nitrous air extinguiſhes flame, it may be brought into ſuch a ſtate that a candle will burn in it with an enlarged flame; and it becomes what Dr. Prieſtley calls *dephlogiſticated nitrous air*, of which hereafter.

Nitrous air is the moſt fatal of any to animal life. Even inſects, which can bear phlogiſticated and inflammable air, generally die the moment they are put into it. Frogs, ſnails, and other animals which do not reſpire very frequently, die in a few minutes, and ſeldom recover even when taken out of this noxious fluid before they are dead. Plants periſh very ſoon in nitrous air, and even in common air ſaturated with nitrous air; but Dr. Prieſtley informs us of one inſtance to the contrary, where the ſuperfluous nitrous air was let out under water, ſo that no part of it was decompoſed in contact with the water.

By agitation in nitrous air, water may be made to imbibe $\frac{1}{15}$th of its bulk; and afterwards the nitrous air may be expelled again by boiling, though not in the ſame quantity as it was abſorbed; but for this purpoſe the water ſhould be previouſly deprived of its air. Dr. Prieſtley obtained about $\frac{1}{4}$th part, ſufficiently pure, and without any mixture of fixed air.

Nitrous air is abſorbed by ſtrong vitriolic acid nearly in the ſame quantity as by water; the acid acquiring a purple colour, by reaſon of the phlogiſton contained in the air. The ſtrong nitrous acid abſorbs it in great quantity; and becomes ſmoking, orange coloured, and afterwards green, on account of the phlogiſton contained in it. Marine acid imbibes but a ſmall quantity, and very ſlowly, acquiring at the ſame time a light-blue colour. Both nitrous air and common air phlogiſticated by it are meliorated by agitation in nitrous acid.

Nitrous air is abſorbed in conſiderable quantity by the concentrated vegetable acid.—A ſolution of vitriolated iron imbibes it in much greater quantity than water, and acquires a black colour; which, however, ſoon goes off by expoſure to the common air. Its taſte alſo becomes acid.—Very little is abſorbed by cauſtic alkalis. Olive-oil ſlowly abſorbs a conſiderable quantity, but oil of turpentine much more. By a little agitation, it will imbibe more than ten times its quantity of nitrous air; acquiring at the ſame time a yelloviſh or orange colour, and becoming a little glutinous. The part not abſorbed appears to be converted into phlogiſticated air.—Ether and ſpirit of wine abſorb it very quickly, but no nitrous air is obtained by the application of heat after they have abſorbed it. It is greatly diminiſhed by oil of turpentine, liver of ſulphur, and pyrophorus; all of which leave it in a phlogiſticated ſtate. It is alſo diminiſhed and phlogiſticated by being kept in a bladder, alternately expoſed to moiſture and dryneſs. Nitrous acid air has the ſame effect.

One of the moſt remarkable properties of nitrous air is its diminution with dephlogiſticated air; by which means it becomes a teſt of the quantity of that kind of air contained in the atmoſphere. With pure dephlogiſticated air, the diminution is almoſt to nothing, at the ſame time that ſome quantity of nitrous acid is reproduced by the decompoſition of the nitrous air; but as our atmoſphere is always mixed with a conſiderable quantity of phlogiſticated air, on which nitrous air has no effect, the diminution in this caſe is never ſo conſiderable. Upon this principle the EUDIOMETER is conſtructed.

Another very remarkable property of nitrous air is its ſtrong antiſeptic power; inſomuch that animal matter may be preſerved by it for many months. It becomes however very offenſive both to the noſtrils and palate, though the ſmell is not altogether that of putrefaction.

The ſpecific gravity of nitrous air, as well as of other kinds, has been aſcertained by Mr. Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loſs ſuſtained by the materials which produce it. Thus he found, that 14 grains of the materials produced 38.74 inches of nitrous air; and, conſequently, by proper calculation, that the ſpecific gravity of nitrous air is to that of atmoſpheric air as 1195 to 1000.

With regard to its conſtituent principles, all thoſe who regard phlogiſton as a diſtinct ſubſtance, have believed, that the former is a compound of nitrous acid and phlogiſton. By the oppoſite party, it is ſuppoſed to be a ſubſtance entirely ſimple, and one of the conſtituent parts of the nitrous acid. This opinion ſeems in part now to be entertained by Dr. Prieſtley himſelf, notwithſtanding his former ſentiments on the ſubject. "I had no doubt on the ſubject (ſays he) until I read the work of Mr. Metherie; who aſſerts, that nitrous air contains no proper nitrous acid, but only one of the elements of it; the other being dephlogiſticated air, which had before been conſidered by Mr. Lavoiſier as the principle of all acidity.—Among other obſervations in ſupport of his aſſertion, Mr. Metherie has the following: 1. Nitrous air burnt together with inflammable air produces no nitrous acid. 2. Though nitrous air be obtained from a ſolution of mercury in the nitrous acid, almoſt all the acid is found in the ſolution. 3. Nitrous air abſorbed by marine acid does not make aqua regia. 4. He is of opinion, that a ſmall portion of the nitrous acid being decompoſed, furniſhes a pure air, ſo altered, that, uniting with inflammable air, it changes it into nitrous air.—To aſcertain the matter more fully, the Doctor proceeded to try various experiments on the decompoſition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any ſucceſs, or obtaining the ſmalleſt particle of nitrous acid. His concluſions from the whole are theſe:—Water ſeems to be a neceſſary ingredient in nitrous as well as inflammable air; at leaſt, without a quantity of water, nitrous air cannot be formed. For example, copper will be diſſolved in ſtrong nitrous acid without producing any nitrous air, juſt as iron may be diſſolved in concentrated vitriolic acid without producing inflammable air.

"That nothing is neceſſary to the formation of nitrous air beſides phlogiſticated nitrous acid and water, is evident from the production of it by the impregnation of pure water with phlogiſticated nitrous vapour formed by the rapid ſolution of biſmuth.—Nitrous air is alſo produced by pouring a highly coloured or phlogiſticated nitrous acid into pure water, in which no metal or earthy matter is any way concerned.

"I have formerly obſerved, how readily nitrous air is diminiſhed by taking the electric ſpark in it. This experiment I have frequently repeated, in order more particularly to aſcertain the quantity and quality of the reſiduum. In one experiment, the electric ſpark was taken in a quantity of nitrous air till it could be no more diminiſhed, when it was reduced in bulk in the proportion of $10\frac{1}{2}$ to 24. Letting it ſtand all night upon the mercury, it was increaſed in the proportion of $11\frac{1}{4}$ to 24; ſeemingly by the acid uniting to the mercury and generating more nitrous air, ſince it had that ſmell. No water appeared after the proceſs; and the water admitted to it acquired no acid taſte, but an aſtringent one like that of water impregnated with nitrous air. There was a white powder formed, as in the former experiments.—To try if it were poſſible to make water imbibe the acid from the nitrous air, the electric ſpark was taken in it, with a ſmall quantity of water over the mercury. But even this water did

not acquire any acid taſte, but only an aſtringent one."—The Doctor concludes this ſubject with a conjecture, that the phlogiſton, and neither the heat nor light of the electric ſpark, contributes to the decompoſition of the nitrous air.

Sect. IX. *Of Dephlogiſticated Nitrous Air.*

This ſpecies of air differs from common nitrous air in being able to ſupport flame, though it ſtill continues fatal to animal life. Common nitrous air may be converted into the dephlogiſticated. When zinc is diſſolved in nitrous acid, if the air be taken at different times, that which comes about the latter end of the proceſs will be of this kind, and not only ſupport the burning of a candle, but cauſe the flame to enlarge greatly by the addition of a weaker and blueiſh flame round the former; and this with a crackling noiſe, as if the candle were burning in dephlogiſticated air. It may alſo be obtained in procuring nitrous air from iron, though this metal is uncertain: but tin yields a conſiderable quantity of it. By expoſing iron to nitrous air, it may be ſo far dephlogiſticated as to admit a candle to burn in it, but the experiments made with that metal have proved remarkably uncertain and inconcluſive.

In deſcribing the component parts of this kind of air, Dr. Prieſtley obſerves, that water is abſolutely neceſſary to its compoſition, or rather to the decompoſition of the common nitrous air by iron. He had decompoſed it before, either by previouſly filling the veſſels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made uſe of. The reaſon of its being formed at all in this laſt way, was a ſmall quantity of moiſture adhering to the inſide of the veſſel containing the mercury.

To try the influence of water, he put a number of very clean ſmall needles into a vial, and, filling it up with mercury, introduced the nitrous air: but it continued ſix or eight months without alteration. Introducing a few drops of water, a diminution of about $\frac{1}{3}$d of the air took place, and the remainder appeared to be phlogiſticated. In another experiment with iron-ſhavings, one half was abſorbed, and the remainder ſupported the flame of a candle better than common air, though a mouſe died in it; and yet this air had continued ſeveral months in the ſame ſtate with regard to its quantity and quality.

Though this kind of air is produced by the contact of iron and nitrous air, the Doctor has never been able to aſcertain the quantity of nitrous air which a given quantity of iron can decompoſe; and though iron ſoon becomes ſo much affected by this proceſs that it crumbles into powder, it ſtill ſeems equally capable of decompoſing a freſh quantity. Having made a comparative experiment, by putting together one quantity of nitrous air with freſh iron and another with ruſt, he found that in both the air was diminiſhed to about $\frac{1}{3}$d, and a candle burned in both equally well; but neither of them had the properties of freſh nitrous air in any degree.

As the proceſs for obtaining dephlogiſticated nitrous air by means of iron is very tedious, the Doctor endeavoured to find another which might be attended with leſs inconvenience. This he accompliſhed by diſſolving turnings of iron in a dilute ſolution of copper in nitrous acid (the ſame that remains after the production of nitrous air), mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at firſt be acted upon very ſlowly, yet the mixture will at length grow ſo hot as actually to boil, and the proceſs will be exceedingly troubleſome: however, it will be neceſſary, previous to any attempt to diſſolve the iron, to heat the ſolution of copper, in order to expel all the nitrous air and ſuperfluous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Water abſorbs dephlogiſticated nitrous air almoſt as readily as fixed air; taking up about $\frac{1}{2}$ its bulk of air. After being thus ſaturated, the whole quantity of dephlogiſticated nitrous air may be expelled pure by heat. It reſembles fixed air alſo in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the correſponding part of fixed air; and is alſo much more phlogiſticated. Water very ſoon parts with it on being expoſed to the atmoſphere. Neither acid nor alkali can be diſcovered in it. Its ſpecific gravity is leſs than that of common air. On heating red precipitate in it, pure dephlogiſticated air was produced without affecting, or being affected by, the nitrous air. Malleable iron occaſioned the quantity of it to be enlarged, and the whole phlogiſticated, without any mixture of fixed air. By heating bits of clean crucibles or retorts in this kind of air, it ſeemed to approach in quality to common atmoſpherical air. By the electric ſpark it became immiſcible with water, and was brought to the ſtandard of 1.45; ſo that there ſeemed to be no doubt of its being reſpirable. Yet this kind of air, though a candle burns ſo well in it, will not kindle pyrophorus, though the nitrous air from which it is produced inſtantly ſets it on fire.

Sect. X. *Of Vitriolic, Nitrous, Marine, and other Acid Airs.*

Of Vitriolic Acid Air.—This is always a combination of vitriolic acid with phlogiſton, and conſequently may be procured from any mixture of that acid in its highly concentrated ſtate with phlogiſtic matter. Hence all the metals yield it, gold and platina excepted, on boiling them with ſtrong vitriolic acid, which itſelf will produce it when rendered black by any phlogiſtic matter. To expel this kind of air the flame of a candle is ſufficient. It is the heavieſt of all except fluor acid air, being to common air as 2265 to 1000. Dr. Prieſtley aſſerts, that a quantity of vitriolic acid thus impregnated with phlogiſton, will yield many times more air than an equal quantity of the ſtrongeſt ſpirit of ſalt.—When the vitriolic acid air is produced in great plenty, the top of the vial in which it is generated is commonly filled with white vapours. The air has alſo the ſame appearance as it is tranſmitted through the glaſs tube; and it is ſometimes diſcoverable in the recipient. It is moſt equably produced by uſing ſtrong vitriolic acid and charcoal; but the production of this kind of air is moſtly attended with that of inflammable, and ſometimes fixed or phlogiſticated air. With ether about $\frac{1}{2}$ of the firſt produce is inflammable; but the quantity leſſens as the proceſs goes on. Copper, ſilver, and lead, when heated in vitriolic acid, yield the pureſt vitriolic acid air; but lead yields only a ſmall quantity, and requires a great heat. It is procured in the greateſt abundance from the fumes of burning ſulphur, and is then called the *volatile vitriolic*, or *ſulphureous acid*.

Of Nitrous Acid Air.—This is the pure nitrous acid by itſelf, without any addition of phlogiſton. It is procured by heating the ſtrong ſpirit of nitre in a vial, and receiving the vapour in glaſs veſſels filled with quickſilver. It is difficult, or rather impoſſible, to preſerve it for a length of time, by means of any fluid. Water abſorbs it immediately, and quickſilver is corroded, and produces nitrous air.

The moſt remarkable property of this vapour is, that its colour may be more or leſs heightened by the mere circumſtance of heat; the intenſity of colour diminiſhing as it becomes cool. "It ſeems probable (ſays Dr. Prieſtley), that if this vapour was not confined, but had room to expand itſelf, it would become colourleſs with heat. This at leaſt is the caſe

when it is combined with water. The phenomena I refer to are very common in the proceſs for making dephlogiſticated air, in which I firſt obſerved them. But the ſame things are obſervable in the proceſs for producing any other kind of air in which much ſpirit of nitre is made uſe of; and likewiſe conſtantly in the common proceſs for making ſpirit of nitre itſelf. It is, that when the heat is moderate, the vapour within the glaſs tube or retort is red; but that, as the heat increaſes, it becomes tranſparent." The Doctor having obſerved that red lead impregnated with nitrous vapour loſt its red colour and became white, "I put (ſays he) a ſmall quantity of this white minium into a glaſs tube cloſed at one end; then holding it to the fire, make it emit the red vapour till the whole tube is filled with it; and having the other end of the tube drawn out ready for cloſing, as ſoon as the vapour begins to iſſue out of that end, I apply my blowpipe and ſeal it. By this means I conclude that the tube is filled with a pure red vapour, without any mixture of nitrous air, and perhaps common air alſo."

Of Marine Acid Air.—The marine acid, by heat, may be reſolved into a permanently elaſtic and tranſparent inviſible vapour, which, not acting on quickſilver, is more eaſily preſerved than nitrous acid air. It is caſily and cheaply obtained by filling a vial, fitted with a glaſs tube and ſtopper, with common ſalt, and then pouring a ſmall quantity of vitriolic acid upon it; which, by the aſſiſtance of heat, will diſengage the acid principle, or the marine acid air, from the ſalt. A vial thus prepared will ſuffice, for common experiments, many weeks; eſpecially if freſh vitriolic acid be occaſionally put to it. It only requires a little more heat at the laſt than at the firſt. After all the air is expelled, it is ſo weak, as barely to corrode iron. The gas itſelf is to common air as 5 to 3; a cubic inch weighing 0.654 grains. It is very fatal to animal life, but leſs ſo than pure nitrous air. On dipping a candle into it the flame is extinguiſhed; but the moment before it goes out, and when it is afterwards lighted again, it burns with a green or light blue flame, like that of common ſalt thrown into a fire. Its diminution by the electic ſpark is barely perceptible. Ice is diſſolved by it as faſt as by a red-hot iron. It is partly abſorbed by almoſt every ſubſtance containing phlogiſton, and the remaining part becomes inflammable. Oil of olives abſorbs it very ſlowly, and oil of turpentine very faſt; by which they both become almoſt black, and the remainder of the air is inflammable. Eſſential oil of mint abſorbs marine air pretty faſt, becoming brown, conſiſtent, and ſo heavy as to ſink in water; and its ſmell is in great meaſure altered. Ether abſorbs it very faſt, the mixture becoming firſt turbid, then yellow, and at laſt brown. The air over the ether is ſtrongly inflammable. A ſmall bit of phoſphorus ſmoked and gave light in this acid air; and the elaſtic fluid was but little diminiſhed in twelve hours. About $\frac{4}{5}$ths of the gas were abſorbed by water, and the reſt was inflammable. This change was alſo effected by a number of other ſubſtances; ſome of which, however, required a conſiderable time to produce their effect.

Of Fluor Acid Air.—Mr. Scheele firſt obtained this kind of air by diſtilling the ſpar called fluor with vitriolic acid. Dr. Prieſtley, who made ſeveral experiments upon the ſubject, was of opinion that this new acid was only the vitriolic diſguiſed by its connection with the fluor. He even ſuppoſed that he had produced it by pouring vitriolic acid on other phoſphoric ſpars: both theſe opinions, however, he has now retracted, and believes the fluor acid to be one of a peculiar kind. Its moſt remarkable property is the great attraction it has for ſiliceous earth, ſo that it even corrodes and makes holes in the retorts in which it is diſtilled. Some curious etchings on glaſs have been performed by it.

Of the Vegetable and another Acid Air.—By the help of heat alone, the concentrated vegetable acid emits a permanently elaſtic and aerial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the mineral acid airs, though ſimilar in its general characters. Water imbibes it as readily as any of the other acid airs; olive-oil abſorbs it in conſiderable quantity, loſing at the ſame time its yellowiſh colour. Common air is phlogiſticated by it, as by the liquid vegetable acid. As the vegetable acid, however, from which this air had been obtained, was diſtilled with oil of vitriol, it may rather be vitriolic than vegetable acid air.

A new kind of acid air was obtained by Dr. Prieſtley from diſtilling to dryneſs a ſolution of gold in marine acid impregnated with nitrous acid vapour, which makes the beſt kind of aqua regia. The produce was an acid air partaking both of the nature of the nitrous and marine acids; but more of the latter, as it extinguiſhed a candle, which exhibited a moſt beautiful deep blue flame, and on being dipped into the ſame jar went out more than 20 times ſucceſſively, making a very pleaſing experiment. The quantity of this acid air is very great; and the reſiduum ſometimes dephlogiſticated, ſometimes phlogiſticated, and at other times nitrous air.

To the article CHEMISTRY we refer for other particulars relative to the different kinds of air here ſpoken of.

SECT. XI. *Of Hepatic Air.*

THIS ſpecies of air was firſt obtained by Mr. Bergman, from an ore of zinc called *Pſeudogalena nigra Dannemorenſis*. It was produced but in ſmall quantity from vitriolic acid poured on this mineral. Spirit of ſalt yielded it in much larger quantity; but nitrous acid produced only nitrous air. Marine acid poured on hepar ſulphuris extricates it however in vaſt quantity. It is alſo produced naturally from putrefying matter. The ſmell of the pure gas is intolerable; and it has a diſagreeable effect on ſilver, lead, copper, &c. which it renders quite black. It is ſuddenly fatal to animal life, turns ſyrup of violets green, and is inflammable, burning with a very light blue flame. It is decompoſed by vitriolic and nitrous air, by dephlogiſticated air, and by the contact of atmoſpherical air, in which caſe it depoſits a ſmall quantity of ſulphur; being indeed, as is ſuppoſed by Mr. Bergman and Mr. Kirwan, no other than ſulphur in an aerial form. Its ſpecific gravity, compared with atmoſpherical air, is as 1106 to 1000. It combines readily with water, and gives the ſmell to the ſulphureous medicinal waters. Its great attraction for ſome of the metals and their calces makes it the baſis of ſome kinds of *Sympathetic* INK.

SECT. XII. *Of Atmoſpherical Air.*

As the two component parts of our atmoſphere, viz. dephlogiſticated and phlogiſticated air, have already been treated of, little remains to be determined, except the proportion in which they exiſt in the common air. Mr. Scheele conſtructed an eudiometer, with which he examined the goodneſs of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{12}{100}$, nor to fall ſhort of $\frac{8}{100}$; ſo that upon a medium it may be eſtimated at $\frac{9}{100}$. During the months of January and February it was $\frac{10}{100}$. The 23d of March it was $\frac{8}{100}$, though the cold increaſed, and the barometer ſtood higher. The 19th of April it was $\frac{10}{100}$, though the barometer and thermometer did not vary, and ſo ſtood till the 21ſt. In May and June it ſtood between $\frac{8}{100}$ and $\frac{6}{100}$. The 30th of July it ſtood at $\frac{10}{100}$. From the 3d to the 15th of September at $\frac{11}{100}$. The 6th of October at $\frac{10}{100}$, during a high ſtorm; but after it ſtood between $\frac{8}{100}$ and $\frac{6}{100}$, till the 4th of November, when it fell to $\frac{8}{100}$, and continued between $\frac{8}{100}$ and $\frac{9}{100}$ to the 20th, when it roſe to $\frac{10}{100}$. The 21ſt it fell to 8,

and ſtood between $\frac{8}{3}$ and $\frac{9}{3}$ till the 8th of December, when it roſe to $\frac{9}{3}$; and from thence to the 31ſt it ſtood between $\frac{8}{3}$ and $\frac{9}{3}$.

As the pure dephlogiſticated part of the atmoſphere is conſumed by phlogiſtic proceſſes, ſuch as that of fermenting brimſtone and iron-filings, which formed the materials of this eudiometer, it muſt be conſidered as an exact teſt of the proportion of dephlogiſticated air contained in the atmoſphere. The ſmall variation in the quantity ſhews, that the proceſſes in nature which deſtroy this air, are nearly balanced by thoſe which produce it; though it muſt appear ſurpriſing, that both theſe fluids, ſo extremely different, ſhould be produced at all ſeaſons of the year in a proportion nearly equal; nor is it leſs ſurpriſing that two fluids of unequal ſpecific gravity ſhould remain incorporated together without any tendency to ſeparate, which it is certain they never do, either in the atmoſphere itſelf, or when confined in veſſels in any quantity whatever.—As phlogiſticated air is ſomewhat lighter than dephlogiſticated, it will hardly be ſuppoſed, that the upper parts of the air contain a greater proportion of dephlogiſticated air than thoſe near the earth, which however is proved by the eudiometer.

Sect. XIII. *Of the artificial Production of Airs of different Kinds.*

Fixed *Air*, or *Aerial Acid*.—The artificial methods of producing this are principally three, *viz.* by fermentation, by heat, and by acids.

By fermentation.—When vegetable or animal ſubſtances, eſpecially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the ſurface of the fermenting liquor, there is always a ſtratum of fixed air reaching as high as the edge of the vat. The caſe is the ſame whatever ſubſtance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the ſame in all caſes, nor even in the ſame ſubſtance at different times. From 42 cubic inches of beer Dr. Hales obtained 639 cubic inches of air in 13 days. From a quantity of ſugar undergoing the vinous fermentation, Mr. Cavendiſh obtained ſo much fixed air, that out of 100 parts of the former 57 appeared to have been volatilized and converted into fixed air. As the briſkneſs and agreeable pungent acidulous taſte of all fermented liquors depends on the quantity of fixed air remaining in them, whenever they become vapid and flat, we are able to reſtore their flavour by impregnating them again with fixed air, either naturally or artificially produced.

Dr. Prieſtley made ſeveral experiments in order to determine the quantity of fixed air contained in ſeveral ſorts of wine, and found that

$1\frac{1}{2}$ oz. measure of	Madeira	contained of pure fixed air	$\frac{1}{100}$ of an ounce measure.
	Port of ſix years old		$\frac{1}{78}$
	Hock of five years		$\frac{1}{24}$
	Barrelled claret		$\frac{1}{12}$
	Tokay of 16 years		$\frac{1}{20}$
	Champagne of two years		2 oz. meaſures.
	Bottled cyder of 12 years		$3\frac{1}{4}$ ditto.

During the acetous fermentation alſo, liquors emit a vapour, great part of which is fixed air, though the nature of its other component parts has not yet been thoroughly aſcertained.

Fixed air is likewiſe produced, though in no great quantity, by putrefaction. In this caſe, however, a great part of the elaſtic fluid conſiſts of inflammable and phlogiſticated air, and the fixed air itſelf ſeems to be intimately connected with a putrid offenſive effluvium. The elaſtic fluid produced by vegetables putrefying in a moderate degree of heat, is almoſt all fixed air. Theſe yield almoſt all the permanently elaſtic fluid in a few days, but animal bodies continue to emit it for ſeveral weeks.

By Heat.—In every combuſtion, except that of ſulphur or of metals, a quantity of fixed air is generated. During its extrication from atmoſpherical air, the latter is ſuppoſed to be conſiderably diminiſhed; but Lavoiſier and Scheele have now rendered that opinion doubtful. If charcoal be burned by a lens when contained in a glaſs-receiver inverted in water, after the apparatus is cooled, the water will have mounted a ſmall way into the receiver. The diminution, however, is limited, and depends on ſeveral circumſtances. Dr. Hales has obſerved, that in equal receivers, the air ſuffers a greater diminution by burning large candles than ſmall ones; and likewiſe that, when equal candles are made uſe of, the diminution is greater in ſmall than in large receivers. The cauſe of this phenomenon probably is, that the air contained in the receiver cannot all come into contact with the flame of the candle; whence, as ſoon as the air which is neareſt the flame becomes contaminated, the candle is extinguiſhed. This diminution has been ſtated by different philoſophers in different degrees. Mr. Lavoiſier has obſerved, that by the combuſtion of phoſphorus, air may be diminiſhed of about $\frac{1}{7}$th or $\frac{1}{6}$th. This accurate philoſopher has alſo obſerved, that the acid of phoſphorus thus formed, acquires the weight loſt by the diminiſhed air; finding that about 3 inches of air were abſorbed by every one grain of phoſphorus, when the experiment was tried with a receiver inverted in water; but when in quickſilver, the abſorption was conſtantly between $2\frac{1}{4}$th and $2\frac{3}{4}$th inches for each grain. Mr. Cavallo often repeated the experiment of burning phoſphorus in a glaſs tube inverted in water, by applying the cloſed part of the tube, wherein the phoſphorus was contained, to a pretty ſtrong fire, when he always obſerved that the utmoſt diminution of the incloſed air effected by this means was full $\frac{1}{5}$th.

In theſe experiments of burning combuſtible bodies in a quantity of air, and meaſuring the diminution, we ſhould be aware of two cauſes of miſtake, viz. the abſorption of air by the coaly reſiduum of the burned matter, which ſometimes is very conſiderable, or by the fluid in which the receiver is inverted, and the production of elaſtic fluid from the burning ſubſtances; thus gunpowder generates a great quantity of elaſtic fluid when inflamed, &c.

Even the electric ſpark ſeparates fixed air from common atmoſpherical air; for when a number of theſe ſparks are taken in a ſmall quantity of common air over lime-water, a diminution will take place, the lime will be precipitated, and, if we put a blue vegetable juice inſtead of the lime-water, it will be turned red by the acidity of the fixed air depoſited upon it.

The calcination of metals, as already obſerved, phlogiſticates, and conſequently diminiſhes common air; but does not produce any fixed air, ſince the lime-water, over which the calcination is made, does not become turbid; and when metallic calces are expoſed to a ſufficient heat, they generally yield ſome fixed air: ſo that it ſeems the fixed air which is formed in the act of the calcination of metals is abſorbed by the calx. Some fixed air may be obtained from red lead, by no greater degree of heat than that of the flame of a candle applied to the vial that contains it.

The calcareous earths, when acted on by acids, yield a vaſt quantity of fixed air. Dr. Prieſtley, in his experiments on the production of dephlogiſticated air from various ſubſtances, when moiſtened with nitrous acid, and afterwards expoſed to a ſufficient degree of heat, generally found that ſome fixed air was produced together with the dephlogiſticated air; but often obtained fixed air only, without any dephlogiſticated air being mixed with it, or fixed and nitrous air together. But in thoſe experiments he moſtly uſed a gun-barrel, ſo that,

as he juſtly obſerves, the iron might have contributed to the formation of the fixed air. In fact, when he tried ſubſtances of the ſame ſort, firſt in a gun-barrel and then in glaſs veſſels, he obtained much more fixed air in the former than in the latter caſe.

Moſt minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr. Krenger, from a greeniſh fuſible ſpar, which was luminous in the dark, obtained a permanently elaſtic fluid, which, like fixed air, cryſtallized a ſolution of fixed alkali. The malachite alſo contains a vaſt quantity of fixed air, as pure as that extracted from chalk by vitriolic acid.—From almoſt every metallic ore and earthy mineral ſome fixed air may be obtained, as well as from chalk, lime-ſtone, marble, marine ſhells, fixed and volatile alkali, and from magneſia, by means of a violent fire, or of acids.

By Acids.—Calcareous ſubſtances produce abundance of fixed air, eſpecially when acted upon by any of the ſtronger acids, ſuch as the vitriolic, which is both the cheapeſt and fitteſt for the purpoſe. The phenomena attending the production of fixed air from calcareous ſubſtances, &c. are the following: 1. When mixed with acids, they effervеſce; and produce a permanently elaſtic fluid, namely, fixed air. 2. They retain the fixed air very obſtinately; ſo that a ſtrong fire is neceſſary to expel it from magneſia, and the ſtrongeſt is not ſufficient to expel it entirely, either from fixed alkalis or calcareous earths. When theſe ſubſtances are treated with acids, they yield their fixed air, becauſe they have a ſtronger attraction to thoſe acids than to the fixed air. 3. Calcareous earths which are inſoluble in water, when deprived of the fixed air become ſoluble in it. Thus lime-ſtone is not, but lime (viz. lime-ſtone deprived of its fixed air) is, ſoluble in water. And if ſubſtances deprived of their fixed air are put in a ſituation to recover it, they again become inſoluble in water. 4. Alkalis, both fixed and volatile, when deprived of their fixed air, become more cauſtic, and more powerful ſolvents, incapable of cryſtallization, and of effervеſcing with acids. But if to thoſe alkalis, and alſo earths rendered more cauſtic, their fixed air be reſtored, they acquire at once all the properties they had before, viz. they become more mild, effervеſce with acids, recover their weight, &c.—Dr. Black, to whoſe accurate and ſatisfactory experiments on this ſubject chemiſtry is greatly indebted, gives the epithet of *mild* to thoſe ſubſtances when combined with fixed air, and of *cauſtic* when deprived of it; as cauſtic calcareous earth, cauſtic fixed alkali, &c.

Eaſy Methods of obtaining Fixable Air for occaſional Experiments, &c.

By Fermentation.—Mix together equal parts of brown ſugar and good yeaſt of beer, to which add about twice the bulk of water. This mixture being put into a vial, to which a bent tube with a cork may be adapted, will yield a conſiderable quantity of fixed air, which may be received into a vial filled with quickſilver or water, as in the following proceſs.

By Acids.—Let a glaſs tube be bent, as repreſented by AB, (Pl. 2, fig. 7) and fix a cork D to one of its extremities, ſo as to fit the neck of a common vial. Fill a ſimilar vial, or any glaſs receiver K, with water, and invert it in a baſin HI, about half filled with water. Next put ſome chalk or marble, groſsly powdered, into the bottle E, ſo as to fill about a fourth of it, and add water enough to cover the chalk; then pour in as much vitriolic acid as will make about $\frac{1}{5}$th of the whole fluid. Apply immediately the cork D, with the tube AB, to the bottle, and putting it in the ſituation FG, let the extremity B of the tube paſs through the water of the baſin into the neck of the bottle K, which now muſt be kept up with the hand, or other convenient ſupport, as it cannot reſt upon the bottom of the baſin. The mixture in the bottle FG, will immediately begin to effervеſce and grow hot, and the *fixed air* will be copiouſly emitted, and paſſing through the bent tube, and afterwards through the water, will aſcend to the top of the inverted bottle K. In proportion as the elaſtic fluid collects, the water will gradually deſcend, and at laſt be quite expelled, and the bottle thus filled with fixed air may be corked under water, and kept for uſe. That fixed air will extinguiſh flame may be eaſily proved by paſſing a lighted taper (Fig. 8) into any open jar in which it is contained; and that it is very freely abſorbed by water, will appear on taſting that through which the bubbles have ariſen in the above proceſs. The flavour will be briſk and agreeably acidulous. In this ſtate, too, it changes the blue infuſion of ſome vegetable ſubſtances into red; ſo that if a weak ſolution of heliotrope is mixed with it, the liquor acquires a reddiſh appearance. It alſo corrodes iron, and ſome other metals, much more eaſily than common water. But the greateſt and moſt uſeful property of this acidulated water, or water impregnated with fixed air, is its being a powerful antiſeptic. As moſt of the mineral waters are medicinal principally on account of their being thus impregnated, and alſo containing ſome ſmall portion of metal or ſalt diſſolved; they may be imitated by impregnating common water with fixed air, and then adding that quantity of ſalt or of metal, that, by analyſis, the original mineral waters are found to contain. For theſe purpoſes, indeed, a well contrived glaſs apparatus is ſold in the ſhops.

Fixed air has long been conſidered a very powerful remedy in putrid diſeaſes. Sir John Pringle and Dr. Macbride have ſhewn experimentally, that fixed air is diſcharged by ſuch ſubſtances as form our common food; and both aſcribe the preſervation of the body from putrefaction, in a great meaſure, to the fixed air, which in digeſtion is diſengaged from the aliment, and incorporates with the fluids of the body.

The ſame property alſo renders it uſeful for ſeveral œconomical purpoſes. Mr. Henry found, that fixed air can preſerve fruit for a conſiderable time; and Dr. Macbride obſerves, that not only good meat was preſerved incorrupt for a conſiderable time, when expoſed to fixed air; but that the putrefaction of ſubſtances actually putrid was impeded by this means, and even that thoſe ſubſtances were reſtored from the putreſcent to a ſound ſtate. Milk acquires an acidulous taſte by being impregnated with fixed air, and is thereby preſerved for ſome days; which affords a very eaſy expedient of preſerving milk in thoſe places where it cannot be had new very often.

To produce Inflammable *Air.*—The proceſs for making this ſort of gas may be conducted in the ſame way as for fixed air, only ſubſtituting for the chalk about the ſame proportion of iron filings or groſsly powdered zinc. If the capacity of the bottle which contains this air be nearly equal to four ounce-meaſures, and the flame of a candle be applied to its mouth, it will burn quietly for about half a minute, the flame gradually deſcending lower and lower, in proportion as the inflammable gas is conſumed. Hence we ſee, that inflammable air, like all other combuſtible ſubſtances, burns only when in contact with common air; ſo that if the bottle be cloſed, the flame is put out immediately, becauſe the air is intercepted. But if the inflammable air be put in ſuch a ſituation as to expoſe a very great ſurface to the common air, it is plain, that by this means its combuſtion will be accelerated, ſo as to go off with an explоſion, cauſed by the ſudden rarefaction of the air. This circumſtance has given occaſion to the very entertaining experiment with what has been called the electrical piſtol. This inſtrument conſiſts of a hollow braſs ball with a narrow mouth, into which a mixture of inflammable and atmoſpheric air is introduced, and the mouth of the piſtol afterwards corked very firmly. Through

the end immediately oppoſite to the mouth, a glaſs tube is paſſed, and through that, a piece of wire, which, being bent downwards, approaches within a ſtraw's breadth of the inner ſurface of the ball. Along this wire an electric ſpark is conveyed, which ſetting the inflammable air on fire, occaſions a loud exploſion, and forces the cork out of the mouth of the piſtol with conſiderable violence.

By taking electric ſparks in any kind of oil, ſpirit of wine, ether, or ſpirit of ſal ammoniac, Dr. Prieſtley obtained inflammable air. The oil, or other liquor, was confined in a glaſs tube by quickſilver, and a wire was cemented in the upper part of the tube, through which the ſparks being ſent, went to the quickſilver through the oil. After a few ſparks had been taken, a quantity of inflammable air was generated. This elaſtic fluid does not loſe its inflammability by being paſſed ſeveral times from one veſſel into another through water.—Alkaline air, by taking electric exploſions in it, is changed into inflammable air.

If iron is put into ſtrong vitriolic acid, the quantity of elaſtic fluid produced is very little, except heat be applied. But this elaſtic fluid is vitriolic acid air, mixed with a ſmall proportion only of inflammable air, which is always leſs when the acid is more concentrated.—Zinc, treated after the ſame manner, produces the like effects, except that it gives more elaſtic fluid, without the application of heat, than iron does; and the greateſt part of the produced elaſtic fluid is inflammable.—In order to obtain the greateſt quantity of inflammable air from iron or zinc, the vitriolic acid muſt be diluted with five or ſix parts of water. Dr. Prieſtley found, that 11 grains of iron yielded $8\frac{1}{4}$ ounce-meaſures of inflammable air. According to Mr. Cavendiſh, one ounce of zinc, diſſolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, diſſolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.—The ſolutions of iron, tin, copper, lead, and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter is as one to eight in iron, as one to ſix in tin, as three to one in copper and lead, and as one to ten in zinc. Regulus of antimony, diſſolved in marine acid, with the application of heat, yields a ſmall quantity of elaſtic fluid, which is weakly inflammable.

Dr. Prieſtley obtained inflammable air, not only by diſſolving various ſubſtances in marine acid, but alſo by expoſing divers bodies to marine acid air, which is probably the pureſt part of the marine acid. Having admitted iron-filings to this acid air, they were diſſolved by it pretty faſt; half of the elaſtic fluid diſappeared, and the reſt was rendered unabſorbable by water, and inflammable. The ſame effect was produced by almoſt every ſubſtance which contains phlogiſton.—It ſeems in fact, as if this acid air, having a great affinity with phlogiſton, ſeparates it from all thoſe ſubſtances which contain it even in ſmall quantity, and from that combination becomes inflammable.

By means of nitrous acid, inflammable air may be obtained from various ſubſtances containing phlogiſton; but it is always mixed with nitrous air, and ſometimes alſo with fixed and common or phlogiſticated air. If two parts of ſpirit of wine, mixed with one part of nitrous acid, are put into a vial with a ground-ſtopple and tube, and the flame of a candle be applied to it, ſo as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little waſhing in water it may be annihilated.

To produce NITROUS *Air.*—This permanently elaſtic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial.—Silver, copper, braſs, iron, mercury, biſmuth, nickel, &c. when mixed with nitrous acid, yield nitrous air in great quantity. Some of them, eſpecially mercury, require the aid of heat; for ſome, the flame of a candle applied to the vial is ſufficient: but others, eſpecially copper and iron, do not want any heat. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily. Among the metals, lead yields it in the ſmalleſt quantity. Among the ſemi-metals, zinc gives the weakeſt nitrous air, when diſſolved in nitrous acid. The elaſtic fluid produced from it is moſtly phlogiſticated air. From 4 pennyweights and 17 grains of zinc, diſſolved in ſpirit of nitre diluted with an equal quantity of water, Dr. Prieſtley obtained about 12 ounce-meaſures of very weak nitrous air. He alſo obtained nitrous air even from ſome flowers of zinc.

The quantity of nitrous air that may be obtained from metals is difficult to aſcertain, on account of the neceſſary diverſity of the ſtrength of the acid, the peculiar nature of the metal, and the method of performing the experiments. The following table of the produce of nitrous air from various metals is taken from Dr. Prieſtley, who nevertheleſs intimates that it is far from being accurate.

dwts.	grs.		
6	0	of ſilver yielded	$17\frac{1}{2}$ ounce-meaſures.
5	19	of quickſilver,	$4\frac{1}{2}$
1	$2\frac{1}{2}$	of copper,	$14\frac{1}{2}$
2	0	of braſs,	21
0	20	of iron,	16
1	5	of biſmuth,	6
0	12	of nickel,	4

The degree of ſtrength of the acid occaſions great diverſity in the production of nitrous air. Copper diſſolved in ſtrong nitrous acid will not produce the leaſt quantity of nitrous air; but, when diſſolved in nitrous acid diluted with two or three parts of water, it produces a great quantity.

For the generality of experiments, no degree of external heat is required, except mercury be uſed. Copper or braſs, in flat ſcales, two or three grains in weight, and about a quarter of a ſquare inch in ſurface, when diſſolving in diluted nitrous acid, yield nitrous air very equably; but if iron be uſed, the pieces of it ſhould be larger and fewer; in ſhort, it ſhould preſent a much leſs ſurface to the diluted acid; otherwiſe the increaſe of heat in the proceſs, and the rapid production of elaſtic fluid, render the operation both difficult and hazardous.

As nitrous air is moſt uſed to try the goodneſs of reſpirable air, it is of great conſequence to make it always of one uniform degree of purity. Accordingly, braſs yields nitrous air of a more uniform quality than iron: copper excels braſs; but pure mercury is ſtill ſuperior to copper: and indeed this is the metal which, conſidering its nature, uniformity of ſubſtance, and eaſy ſolution, is upon the whole the moſt uſeful for this purpoſe.

To make Nitrous Air.—The whole proceſs is the ſame as that deſcribed for *Fixed Air.*—Fill about one third of the bottle with copper, braſs, or quickſilver, then add as much water as will cover the metal filings, or in proportion if quickſilver is uſed; and laſtly, the nitrous acid, in quantity about one-third or half of the water. The air will then paſs through the tube into the inverted bottle, as in other inſtances.

In order to obſerve the property this elaſtic fluid poſſeſſes of diminiſhing the bulk of common air, let a glaſs tube, cloſed at one end, and about nine inches long, be filled with, and inverted in water; then take an half-ounce vial, and, plunging it under the inverted tube, let all the air enter and go to the top of it, the water ſubſiding accordingly. Let a mark be made, by ſticking a bit of wax on the tube, juſt

oppoſite to the ſurface of the water, which will mark how much of the tube is filled by that given meaſure of air. Repeat this four or five times, marking the tube as the water deſcends each time. Now, if three meaſures of common air be conveyed into this tube, when filled with water and inverted, they will fill a ſpace of it as far as the third mark. The ſame thing will happen if three meaſures of nitrous inſtead of common air be put into it; but if two meaſures of common air and one meaſure of nitrous air, or one meaſure of the former and two of the latter, be ſucceſſively introduced, they will fill a ſpace much ſhorter than the third mark. The moment theſe two kinds of air come in contact, a reddiſh cloud is perceived, which ſoon vaniſhes; and the water, which at firſt nearly reached the third mark, riſes gradually into the tube, and becomes ſtationary after about two or three minutes; which ſhows that the diminution is effected gradually. See EUDIOMETER.

To procure DEPHLOGISTICATED *Air*.—The eaſieſt way of procuring this air is to put ſome red-lead into the apparatus, together with ſome ſtrong vitriolic acid, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity; then apply the bent tube to the bottle, and proceed as above. Without heat, however, this mixture will not give any dephlogiſticated air, or but an inconſiderable quantity; for which reaſon the flame of a wax-taper muſt be applied under the bottom of the bottle. In this manner the red-lead will yield a quantity of elaſtic fluid, the greateſt part of it dephlogiſticated air, but not the whole, a portion of fixed air being generated at the ſame time. In order to ſeparate the fixed air, the inverted bottle, as the air is emitted from the red-lead, muſt be ſhook in the baſin for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air in a pure ſtate.

Animals will live much longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed, that the breathing of it muſt contribute to longevity much more than the common atmoſphere. Dr. Prieſtley however conjectures, that dephlogiſticated air might perhaps wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. In Cavallo's Treatiſe on Air, it is ſaid that "a man makes in general about 15 inſpirations in a minute, and takes in about 30 cubic inches of aerial fluid. But the air which has been once inſpired is not thereby much injured, and it may be reſpired again and again; ſo that, upon a very moderate calculation, and as appears from experiments often repeated, we may ſafely aſſert, that a perſon can breathe 400 cubic inches of good ordinary atmoſpheric air, at leaſt 30 times, without any inconvenience, *i. e.* it would ſerve for two minutes; after which that air, though much depraved, is ſtill in a ſtate of being breathed, but then it would occaſion ſome uneaſineſs. Now, ſuppoſing the dephlogiſticated air employed to be 4 times more pure than common air, 400 cubic inches of dephlogiſticated air would ſerve for at leaſt 120 reſpirations, or eight minutes.

"But ſuppoſing that 30 inches of common air are completely phlogiſticated by a ſingle inſpiration, and changed for ſuch as is quite freſh, which indeed is the caſe in common reſpiration, then 450 cubic inches of common air will be requiſite for one minute's reſpiration, and 27,000 for one hour; and as dephlogiſticated air is ſuppoſed to be four times as good, the ſame quantity of it will ſerve for four hours. Indeed, if we could depend on the aſſertions of Mr. Fontana, that by adding lime-water to abſorb the fixed air produced by reſpiration, an animal can live 30 times as long as without it, no doubt a much ſmaller quantity would ſerve."

But this cannot be true; becauſe, though the fixed air ſhould be abſorbed as ſoon as produced, the remaining quantity would ſtill be contaminated by phlogiſton. Nay, Dr. Prieſtley, who repeated Fontana's experiments, aſſerts, that animals *will not* live longer in dephlogiſticated air when in contact with lime-water, than when no lime-water is uſed. How a difference ſo enormous can take place, between philoſophers in other reſpects ſo accurate, we cannot determine. It is plain, however, that if 27,000 inches of common air are neceſſary for a perſon in one hour, the ſame quantity of dephlogiſticated air cannot be breathed longer than four hours, nor even ſo long, with any real advantage. Mr. Cavallo indeed allows only 12,000 inches for 4 hours; but though this might ſuſtain life, it would not be ſuperior to the atmoſphere, but perhaps much leſs ſalubrious.

A very ready method of procuring dephlogiſticated air in large quantity, is by means of nitre; which muſt be put into a retort or other veſſel, ſo as to fill half or nearly three quarters of its belly; then a bent glaſs tube is luted to the neck of the earthen veſſel, in ſuch a manner as not to let any elaſtic fluid eſcape. The beſt lute or cement for this is a mixture of whiting and drying oil. The retort being put into the furnace, muſt be ſurrounded with lighted charcoal, which is to be renewed as it waſtes, and the belly of the retort muſt be kept quite red, or rather white-hot, for three hours at leaſt. The air is then to be received into large glaſs jars, as uſual. The retorts made of thoſe metals which are uſually employed for this purpoſe, viz. iron and copper, phlogiſticate the air as ſoon as produced. The expence at preſent neceſſary in London for the production of 12,000 cubic inches of dephlogiſticated air (viz. the price of one pound of nitre, of an earthen retort or other veſſel, and of charcoal), amounts to about 4s. or 4s. 6d.

Another method of preparing dephlogiſticated air is by blowing common air through melted nitre. In this proceſs the phlogiſton of the atmoſphere is conſumed, by detonating with the acid of the nitre, and therefore iſſues much more pure than before. This method appears at firſt much eaſier than the former; but as it is impoſſible to mix atmoſpheric air ſo exactly with the melted nitre that their particles may come uniformly in contact with each other, it is plain the former method muſt be preferable; not to mention that the nitre will be apt to concrete into lumps by the cold blaſt.

To procure VITRIOLIC *Acid Air*.—Some concentrated vitriolic acid muſt be put into the bottle, along with ſome ſubſtance capable of furniſhing phlogiſton. Olive oil anſwers very well. The acid ſhould be about three or four times as much as the oil, and both together ſhould fill about one-third or half of the bottle. The elaſtic fluid may then be produced by applying the flame of a wax-taper, as directed above.

To procure MARINE *Acid Air*.—Put ſome common ſalt into the bottle, ſo as to fill about a fourth part of it, and upon this pour a ſmall quantity of concentrated vitriolic acid; then apply the bent tube, and paſs the air through quickſilver into the receiver.

To procure NITROUS *Acid Air*.—This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elaſticity. The great difficulty, however, is to find a fluid capable of confining this acid air during the proceſs, as its being abſorbed by water is one of the properties by which it differs from nitrous air. It acts upon quickſilver, and alſo upon oils; and hence its examination cannot but be very imperfect. When water has abſorbed a good quantity of this elaſtic fluid, it acquires the properties of nitrous acid; and when heated, it yields a large quantity of nitrous air, viz. a quantity many times greater than that which water is wont

to imbibe of it by agitation, or by any known means.—When nitrous acid is combined with eſſential oils, a conſiderable effervescence and heat are produced, nearly as when the nitrous acid itſelf is poured upon thoſe oils.

Fluor *Acid Air*.—Put ſome of thoſe minerals called *fluors*, or *fuſible ſpars*, pulverized, into the bottle, and upon it pour ſome concentrated vitriolic acid; then adapt the bent tube, &c. The fluor acid air is at firſt produced without the help of heat; but in a ſhort time it will be neceſſary to apply the flame of a candle to the bottle, by which means a conſiderable quantity of this elaſtic fluid is obtained.

Alkaline *Air*.—Let the uſual bottle be about half filled with volatile ſpirit of ſal ammoniac; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be produced copiouſly.

Hepatic *Air*.—See Sect. XI. *ſupra*.

AER

AEROMANCY, a ſpecies of divination performed by means of air, wind, &c.

AEROMETRY, the ſcience of meaſuring the air. It comprehends not only the doctrine of the air itſelf, conſidered as a fluid body; but alſo its preſſure, elaſticity, rarefaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics, which ſee.

AERONAUT, a perſon who mounts in and guides an air-balloon. See Aerostation and Air-*Balloon*.

AER

AERONAUTICA, from αηρ and ναυτικος, derived from ναυς *ſhip*; the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See Aerostation.

AEROPHYLACEA, a term uſed by naturaliſts for caverns or reſervoirs of air, ſuppoſed to exiſt in the bowels of the earth. Kircher ſpeaks much of them, as communicating with ſubterraneous receptacles of water, and producing ſprings, rivers, &c.

AEROSTATION

Is a newly created ſcience. The word, in its primitive ſenſe, denotes the ſcience which teaches the means of ſuſpending weights in the air; but in its modern acceptation it ſignifies *aerial navigation*. Hence alſo the machines employed are called *aeroſtats*, or *aeroſtatic* machines; and, from their globular ſhape, *air-balloons*.

The romances of almoſt every nation have recorded inſtances of perſons being carried through the air, both by the agency of ſpirits and by mechanical inventions; but till the time of the celebrated Lord Bacon, no rational principle appears ever to have been thought of by which this might be accompliſhed. Friar Bacon indeed had written upon the ſubject; and many had ſuppoſed, that, by means of artificial wings, a man might fly as well as a bird: but theſe opinions were refuted by Borelli in his treatiſe *De Motu Animalium*, where, from a compariſon between the power of the muſcles which move the wings of a bird, and thoſe which move the arms of a man, he demonſtrates that the latter are utterly inſufficient to ſtrike the air with ſuch force as to raiſe him from the ground.

In the year 1672, Biſhop Wilkins publiſhed his "Diſcovery of the New World," in which he certainly ſeems to have conceived the idea of raiſing bodies into the atmoſphere by filling them with rarefied air. This, however, he did not by any means purſue, but reſted his hopes upon mechanical motions, to be accompliſhed by human ſtrength, or by ſprings, &c. which have been proved incapable of anſwering any uſeful purpoſe.

The Jeſuit Francis Lana, cotemporary with Biſhop Wilkins, propoſed to exhauſt hollow balls of metal of their air, and by that means occaſion them to aſcend. But though the theory was unexceptionable, the means were certainly inſufficient to the end: for a veſſel of copper, made ſufficiently thin to float in the atmoſphere, would be utterly unable to reſiſt the external preſſure; which being demonſtrated, no attempt was made on that principle.

In the year 1766, Mr. Henry Cavendiſh aſcertained that inflammable air was at leaſt ſeven times lighter than common air, and ſuggeſted to Dr. Black, that perhaps a thin bag filled with the former might be buoyed up by the common atmoſphere. The ſame thought occurred afterwards to Mr. Cavallo; and he has the honour of being the firſt who made experiments on the ſubject. He firſt tried bladders; but found them too heavy. He then tried Chineſe paper; but that proved permeable to the vapour. His experiments, therefore, in 1782, proceeded no farther than blowing up ſoap-bubbles with inflammable air, which aſcended rapidly to the ceiling.

But while aeroſtation ſeemed thus on the point of being made known in Britain, it was all at once announced in France, by two brothers, Stephen and John Montgolfier, natives of Annonay, and maſters of a conſiderable paper-manufactory there, who had turned their thoughts to this project as early as the middle of the year 1782. Their idea was to form an artificial cloud, by incloſing ſmoke in a bag, and making it carry up the covering along with it. In that year, the experiment was made at Avignon with a fine ſilk bag; and by applying burning paper to an aperture at the bottom, the air was rarefied, and the bag aſcended to the height of 70 feet.—Various experiments were now tried upon a large ſcale, and which excited the public curioſity very greatly.

An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. Burning chopped ſtraw and wool under the aperture of the machine, immediately occaſioned it to ſwell; and afterwards to aſcend into the atmoſphere. In ten minutes it had riſen 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place it had left.

Soon after this, one of the brothers, invited by the academy of ſciences to repeat his experiments at their expence, conſtructed a large balloon of an elliptical form. In a preliminary experiment, this machine lifted from the ground eight perſons who held it, and would have carried them all off if more had not quickly come to their aſſiſtance. Next day the machine was filled by the combuſtion of 50 pounds of ſtraw, and 12 pounds of wool. The machine ſoon ſwelled, and ſuſtained itſelf in the air, together with the charge of between 4 and 500 pounds weight. It was deſigned to repeat the experiment before the king at Verſailles; but a violent ſtorm of rain and wind happening to damage the machine, it became neceſſary to prepare a new one; and ſuch expedition was uſed, that this vaſt balloon, near 60 feet in height and 43 in diameter, was made, painted within and without, and finely decorated, in no more than four days and four nights. Along with it was ſent a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent on ſuch a voyage. The full ſucceſs of the experiment was however prevented by a violent guſt of wind which tore the machine in two places near the top before it aſcended. Still it roſe 1440 feet; and after remaining in the air about eight minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals were not in the leaſt hurt.

As the great power of theſe aeroſtatic machines, and their very gradual deſcent, ſhewed they were capable of tranſporting people through the air with all imaginable ſafety, M. Pilatre de Rozier offered himſelf to be the firſt aerial adventurer in a new machine, conſtructed in a garden in the fauxbourg of St. Antoine. It was of an oval ſhape, 48 feet in diameter, and 74 in height, elegantly painted with the ſigns of the zodiac, ciphers of the king's name, and other ornaments. A proper gallery, grate, &c. enabled the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds. On the 15th of October 1783, M. Pilatre placing himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat about four minutes and a half; after which it deſcended very gently: and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground. On repeating the experiment, he aſcended to the height of 210 feet. His next aſcent was 262 feet; and in the deſcent, a guſt of wind having blown the machine over ſome large trees in an adjoining garden, M. Pilatre ſuddenly extricated himſelf by throwing ſtraw and wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height by the ſame means. Some time after, he aſcended with M. Girond de Villette to the height of 330 feet; hovering over Paris at leaſt nine minutes in ſight of all the inhabitants, and the machine keeping all the while a ſteady poſition.

Theſe experiments ſhewed, that aeroſtatic machines might be raiſed or lowered at the pleaſure of the perſons who aſcended. On the 21ſt of November 1783, therefore, M. Pilatre and the Marquis d'Arlandes undertook an aerial voyage, which laſted about 25 minutes, and during which time they paſſed over a ſpace of above five miles. From the account given by the Marquis, they met with ſeveral different currents of air, the effect of which was, to give a very ſenſible ſhock to the machine, and the direction of the motion ſeemed to be from the upper part downwards. It appears alſo that they were in ſome danger of having the balloon burnt altogether; as the Marquis obſerved ſeveral round holes made by the fire in the lower part of it, which alarmed him conſiderably, and indeed not without reaſon. However, the progreſs of the fire was eaſily ſtopped by the application of a wet ſponge, and all appearance of danger ceaſed.

This voyage of M. Pilatre and the Marquis may be ſaid to conclude the hiſtory of aeroſtatic machines which are elevated by means of fire; theſe having been ſoon after ſuperſeded by balloons, in which inflammable air was encloſed. This gas, being conſiderably lighter than heated atmoſpheric air, poſſeſſed many advantages over the other. The firſt experiment was made by two brothers, Meſſrs. Roberts, and M. Charles, a profeſſor of experimental philoſophy. The bag was compoſed of luteſtring, varniſhed over with a ſolution of the elaſtic gum, called *caoutchouc*; and was about 13 Engliſh feet in diameter. Many difficulties occurred in filling it with the inflammable air; but being at laſt ſet at liberty, after having been well filled, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmoſphere only three-quarters of an hour, during which it traverſed 15 miles. Its ſudden deſcent was ſuppoſed to have been owing to a rupture which had taken place when it aſcended into the higher regions of the atmoſphere.

The event of this experiment, and the aerial voyage made by Meſſrs. Roſier and Arlandes, naturally ſuggeſted the idea of undertaking ſomething of the ſame kind with a balloon filled with inflammable air. The machine uſed on this occaſion was formed of gores of ſilk, covered with a varniſh of *caoutchouc*, of a ſpherical figure, and meaſuring 27½ feet in diameter. A net was ſpread over the upper hemiſphere, and faſtened to an hoop which paſſed round the middle of the balloon. To this a ſort of car was ſuſpended a few feet below the lower part of the balloon; and, in order to prevent the burſting of the machine, a valve was placed in it; by opening of which ſome of the inflammable air might be occaſionally let out. The car was of baſket work, covered with linen, and beautifully ornamented; being 8 feet long, 4 broad, and 3½ deep; its weight 130 pounds. Great difficulties again occurred in filling the machine; but theſe at laſt being removed, the two adventurers took their ſeats at three quarters after one in the afternoon of the firſt of December 1783. Perſons ſkilled in mathematics were ſtationed with proper inſtruments, to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was 604½ pounds, and the power of aſcent when they ſet out was 20 pounds; ſo that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of the atmoſphere diſplaced by the inflammable gas was calculated to be 771 pounds, ſo that there remains 147 for the weight of the latter; and this calculation makes it only 5¼ times lighter than common air.

At the time the balloon roſe, the thermometer ſtood at 9° of Fahrenheit, and the barometer at 30.18 inches; and, by means of the power of aſcent with which they left the ground, the balloon roſe till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. Throwing out ballaſt occaſionally as they found the machine deſcending by the eſcape of ſome of the inflammable air, they found it practicable to keep at pretty near the ſame diſtance from the earth during the reſt of their voyage; the quickſilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air an hour and three quarters, and alighted at the diſtance of 27 miles from Paris; having ſuffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Meſſrs. Pilatre and Arlandes. As the balloon ſtill retained a great quantity of inflammable gas, M. Charles determined to take another voyage by himſelf. M. Robert accordingly got out of the machine; which now being

130 pounds lighter, aroſe with ſuch velocity, that in twenty minutes he was almoſt 9000 feet in the air, and entirely out of ſight of terreſtrial objects. The globe, which had been rather flaccid, ſoon began to ſwell, and the inflammable air eſcaped in great quantity. He alſo drew the valve to prevent the balloon from burſting; and the inflammable gas, being conſiderably warmer than the external air, diffuſed itſelf all round, and was felt like a warm atmoſphere. In ten minutes, however, the thermometer indicated a great variation of temperature: his fingers were benumbed with cold, and he felt a violent pain in his right ear and jaw, which he aſcribed to the expanſion of the air in theſe organs as well as to the external cold. The beauty of the proſpect which he now enjoyed, however, made amends for theſe inconveniences. At his departure the ſun was ſet on the valleys; but the height to which M. Charles was got in the atmoſphere, rendered him again viſible, though only for a ſhort time. He ſaw, for a few ſeconds, vapours riſing from the valleys and rivers. The clouds ſeemed to aſcend from the earth, and collect one upon the other, ſtill preſerving their uſual form; only their colour was grey and monotonous for want of ſufficient light in the atmoſphere. By the light of the moon, he perceived that the machine was turning round with him in the air; and he obſerved that there were contrary currents which brought him back again. He obſerved alſo, with ſurpriſe, the effects of the wind, and that the ſtreamers of his banners pointed upwards; which, he ſays, could not be the effect either of his aſcent or deſcent, as he was moving horizontally at the time. At laſt, recollecting his promiſe of returning to his friends in half an hour, he pulled the valve, and accelerated his deſcent. When within 200 feet of the earth, he threw out two or three pounds of ballaſt, which rendered the balloon again ſtationary; but, in a little time afterwards, he gently alighted in a field about three miles diſtant from the place whence he ſet out; though, by making allowance for all the turnings and windings of the voyage, he ſuppoſes that he had gone through nine miles at leaſt. By the calculations made, it appears that he roſe at this time not leſs than 10,500 feet; a height ſomewhat greater than that of Mount Ætna.

The ſubſequent aerial voyages differ ſo little from that juſt now related, that any particular deſcription of them ſeems to be ſuperfluous. It had occurred to M. Charles, however, in his laſt flight, that there might be a poſſibility of directing the machine in the atmoſphere; and this was afterwards attempted by M. Jean-Pierre Blanchard. In one of the aeroſtatic excurſions of the latter, he gives an account of the ſenſations he felt during this voyage, and which were ſomewhat different from thoſe of M. Charles; having, in one part of it, found the atmoſphere very warm, in another cold; and having once found himſelf very hungry, and at another time almoſt overcome by a propenſity to ſleep. The height to which he aroſe, as meaſured by mathematical inſtruments, was thought to be very little leſs than 10,000 feet; and he remained in the atmoſphere an hour and a quarter.

The attempts of M. Blanchard to direct his machine through the atmoſphere, were repeated in 1784 by Meſſrs. Morveau and Bertrand, at Dijon, who raiſed themſelves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; paſſing through a ſpace of 18 miles in an hour and 25 minutes. M. Morveau had prepared oars for directing the machine through the air; but they were damaged by the wind, ſo that only two remained ſerviceable; by working theſe, however, they were able to produce a ſenſible effect on the motion of the machine. In a third aerial voyage performed by M. Blanchard, he ſeemed to produce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſidewiſe, and even in ſome meaſure againſt the wind: however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

The ſucceſs of Charles and Robert in former experiments, encouraged them to enlarge their balloon to the ſize of an oblong ſpheroid 46½ feet long and 27½ in diameter, made ſo as to float with its longeſt part parallel to the horizon. The wings were of the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. (See pl. 3, fig. 8.) Five of theſe were diſpoſed round the car, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend; and having riſen to the height of 1400 feet, they perceived ſome thunder-clouds near the horizon, which they took great pains to avoid. From their account, however, it ſhould ſeem, that they had paſſed ſafely through the thunder-clouds; as, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood only at 23.94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

The effect of their wings is deſcribed thus:—"Far from going againſt the wind, as is ſaid by ſome perſons to be poſſible in a certain manner, and ſome aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have uſed our four oars, we might have deviated about 40 degrees from the direction of the wind; and as our machine would have been capable of carrying ſeven perſons, it would have been eaſy for five perſons to have gone, and to have put in action eight oars, by means of which a deviation of about 80 degrees would have been obtained.—We had already obſerved (ſay they), that if we did not deviate more than 22 degrees, it was becauſe the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as ſtrong as it was, we ſhould not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as ſtrong, our deviation would have been proportionably greater."

Having ſaid thus much with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air. The firſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Robert, from the Park of St. Cloud. The

balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out, ſeems to have been very great; as in three minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked, and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of that ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere, had ſuch an effect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that all attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of the inflammable air; for which purpoſe the Duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of ſeven or eight feet. On this they deſcended with great rapidity; and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

This ſcheme for raiſing or lowering aeroſtatic machines by bags filled with common air being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rareſied air under an inflammable air-balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by the celebrated M. Pilatre de Rozier and M. Romaine. Their inflammable air-balloon was about 37 feet in diameter, and the power of the rareſied air one was equivalent to about 60 pounds. They aſcended without any accident; but had not been long in the atmoſphere when the inflammable air-balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down, and uſed in pulling the valve and opening the appendages to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. Shortly after this the machine took fire, at the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk of the balloon ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. Pilatre ſeemed to have been dead before he came to the ground; but M. Romaine was alive when ſome perſons came up to him, though he expired immediately after.

Theſe are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; though a great number of other expeditions through the atmoſphere have taken place. But the moſt daring perhaps was that of M. Blanchard and Dr. Jeffries acroſs the Straits of Dover. This took place on the 7th of January 1785, being a clear froſty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at ten o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock Mr. Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpear in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently, though making very little way on account of there being ſo little wind. At a quarter after one o'clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral veſſels, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and an half of ballaſt; but as they ſaw that it ſtill deſcended, and that with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend, when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and, ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were fain to throw away their proviſions for eating, the wings of their boat, and every other moveable they could eaſily ſpare. "We threw away, ſays Dr. Jeffries, our only bottle, which, in its deſcent, caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and cords, and at laſt ſtripped off their clothes, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over the high lands between Cape Blanc and Calais, the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. They deſcended ſafely among ſome trees in the foreſt of Guiennes, where there was juſt opening enough to admit them.

As it would be uſeleſs to recount all the different aerial voyages that have been performed in this and other countries, we ſhall conclude with noticing the ingenious Mr. Baldwin's excurſion from Cheſter.

In September 1785, Mr. Baldwin aſcended in Mr. Lunardi's balloon; and after traverſing in a variety of directions, he firſt alighted in the neighbourhood of Frodſham; then reaſcending and purſuing his excurſion, he finally landed at Rixtonmoſs, 25 miles from Cheſter. Mr. Baldwin, who publiſhed his obſervations made during the voyage, and taken from minutes,

mentions the following curious particulars. The ſenſation of aſcending he compares to a ſtrong preſſure from the bottom of the car upwards againſt the ſoles of his feet. At the diſtance of what appeared to him ſeven miles from the earth, though by the barometer ſcarcely a mile and a half, he had a grand and moſt enchanting view of the city of Cheſter and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the higheſt building having no apparent height, but reduced all to the ſame level, and the whole terreſtrial proſpect appeared like a coloured map. The perſpective appearance of things to him was very remarkable. The loweſt bed of vapour that firſt appeared as cloud was pure white, in detached fleeces, increaſing as they roſe: they preſently coaleſced, and formed, as he expreſſes it, a ſea of cotton, tufting here and there by the action of the air in the undiſturbed part of the clouds. The whole became an extended white floor of cloud, the upper ſurface being ſmooth and even. Above this white floor he obſerved, at great and unequal diſtances, a vaſt aſſemblage of thunder-clouds, each parcel conſiſting of whole acres in the denſeſt form: he compares their form and appearance to the ſmoke of pieces of ordnance, which had conſolidated as it were into maſſes of ſnow, and penetrated through the upper ſurface or white floor of common clouds, there remaining viſible and at reſt. Some clouds had motions in ſlow and various directions, forming an appearance truly ſtupendous and majeſtic. He endeavours to convey ſome idea of the ſcene by a ſketch, for which, ſee pl. 3, fig. 10. It repreſents a circular view he had from the car of the balloon, himſelf being over the centre of the view, looking down on the white floor of clouds and ſeeing the city of Cheſter through an opening, which diſcovered the landſcape below, limited by ſurrounding vapour to leſs than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (viz. 4 miles) above the white floor of clouds. Theſe regions did not feel colder, but rather warmer, than below, and the ſun felt hotteſt when the balloon was ſtationary. The diſcharge of a cannon when the balloon was at a conſiderable height, was diſtinctly heard; and a ſecond diſcharge when at the height of 30 yards, ſo diſturbed him as to oblige him for ſafety to lay hold firmly of the cords of the balloon. At a conſiderable height he emptied a pint-bottle full of water; and as the air did not oppoſe a reſiſtance ſufficient to break the ſtream into ſmall drops, it moſtly fell down in large ones. The balloon was much affected by the water (a circumſtance obſerved by others), and at one time was going directly towards the ſea. The mouth of the balloon, however, being opened, it deſcended into an under current blowing from the ſea, and at length landed at Bellair Farm in Rinſley, 12 miles from Cheſter.

According to Mr. Cavallo, the uſes to which balloons can be applied, are the following:—"The ſmall balloons, eſpecially thoſe made of paper, and raiſed by means of ſpirit of wine, may ſerve to explore the direction of the winds in the upper regions of the atmoſphere, particularly when there is a calm below: they may ſerve for ſignals in various circumſtances, in which no other means can be uſed; and letters or other ſmall things may be eaſily ſent by them, as for inſtance, from ſhips that cannot ſafely land on account of ſtorms, from beſieged places, iſlands, or the like. The larger aeroſtatic machines may anſwer all the above-mentioned purpoſes in a better manner; and they may, beſides, be uſed as a help to a perſon who wants to aſcend a mountain, a precipice, or to croſs a river; and perhaps one of thoſe machines tied to a boat by a long rope, may be, in ſome caſes, a better ſort of ſail than any that is uſed at preſent. The largeſt ſort of machines, which can take up one or more men, may evidently be ſubſervient to various œconomical and philoſophical purpoſes. Their conveying people from place to place with great ſwiftneſs, and without trouble, may be of eſſential uſe, even if the art of guiding them in a direction different from that of the wind ſhould never be diſcovered. By means of thoſe machines the ſhape of certain ſeas and lands may be better aſcertained; men may aſcend to the tops of mountains they never viſited before; they may be carried over marſhy and dangerous grounds; they may by that means come out of a beſieged place, or an iſland; and they may, in hot climates, aſcend to a cold region of the atmoſphere, either to refreſh themſelves, or to obſerve the ice, which is never ſeen below; and, in ſhort, they may be thus taken to ſeveral places, to which human art hitherto knew of no conveyance.—The philoſophical uſes, to which theſe machines may be ſubſervient, are numerous indeed; and it may be ſufficient to ſay, that hardly any thing which paſſes in the atmoſphere is known with preciſion, and that principally for want of a method of aſcending into it. The formation of rain, of thunder-ſtorms, of vapours, hail, ſnow, and meteors in general, requires to be attentively examined and aſcertained. The action of the barometer, the refraction and temperature of the air in various regions, the deſcent of bodies, the propagation of ſound, &c. are ſubjects which all require a ſeries of obſervations and experiments, the performance of which could never have been properly expected before the diſcovery of aeroſtatic machines."

To theſe uſes we may add the gratification of curioſity as a very ſtrong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears to be little riſque. With regard to the ſuppoſed danger from encountering thunder-clouds, Mr. Cavallo has ſuggeſted ſeveral conſiderations. Balloons have been raiſed when thunder has been heard, and without injury. But in caſe of danger, the aeronauts may either deſcend to the earth, or aſcend above the region of the clouds and thunder-ſtorms. Balloons conſiſt of materials that are not conductors of electricity, and they are leſs likely to receive ſtrokes from being encompaſſed with air. Moreover, inflammable air, unmixed with a certain quantity of common air, will not burn; ſo that if an electric ſpark ſhould happen to paſs through a balloon, it would not ſet fire to the inflammable air.

The general principles of aeroſtation are ſo little different from thoſe of hydroſtatics, that it is almoſt ſuperfluous to inſiſt on them. It is a fact univerſally known, that when a body is immerſed in any fluid, if its weight be leſs than an equal bulk of that fluid, it will riſe to the ſurface; but if heavier, it will ſink; and if equal, it will remain in the place where it is left. For this reaſon ſmoke aſcends into the atmoſphere, and heated air in that which is colder. Upon this ſimple principle depends the whole theory of aeroſtation. A cubic foot of air has been found to weigh about 554 grains, and to be expanded by every degree of heat, about $\frac{1}{500}$th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we juſt double its bulk when the thermometer ſtands at 54 in the open air, and in the ſame proportion we diminiſh its weight; and if ſuch a quantity of this hot air be incloſed in a bag, that the exceſs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will riſe into the atmoſphere, and continue to do ſo until they arrive at a place where the external air is naturally ſo much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raiſing weights, or rather that by which it is itſelf impelled upwards, has been illuſtrated by a variety of experiments with which every one is familiar. From theſe it appears, that in the aeroſtatic machines on Montgolfier's plan, it muſt be an advantage to have them as large as

poſſible; becauſe a ſmaller quantity of fire will then have a greater effect in raiſing them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great meaſure avoided. On this ſubject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increaſe much more rapidly than their ſurfaces, there muſt ultimately be a degree of magnitude at which the ſmalleſt imaginable heat would raiſe any weight whatever. Thus, ſuppoſing any aeroſtatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmoſphere; the tendency of this machine to riſe, even without the application of artificial heat, would be near an ounce. Let its capacity be increaſed 16 times; and the tendency to ariſe will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aeroſtatic machines have a tendency to produce or preſerve heat within them, as Meſſrs. Charles and Roberts found in their aerial voyage of 150 miles, when the external atmoſphere was 63°, and the thermometer within the balloon at 104°. Such a difference of temperature, affording a power of aſcent equal to 41 grains on every cubic foot, muſt, in a machine of 50,000 ſuch feet, have amounted to almoſt 200 pounds. Hence we may eaſily account for Mr. Morveau's accident at Dijon, when a balloon filled only with common air made its eſcape to ſome diſtance by the ſpontaneous rarefaction of the air within. This difference between the external and internal heat being ſo very conſiderable, muſt have a great influence upon aeroſtatic machines, and will undoubtedly influence thoſe filled with inflammable air as well as the other kind. The rain, ſnow, and vapours which condenſe upon them in the higher regions, may alſo occaſion an evaporation, and conſequently a very violent degree of cold, ſo as to make them ſpecifically heavier than the atmoſphere. To this, probably, we may aſcribe the deſcent of the balloon which carried Meſſrs. Blanchard and Jeffries; and which ſeemed ſo extraordinary that many had recourſe to an imaginary attraction in the waters of the ocean, in order to ſolve the phenomenon. This ſuppoſition however is rejected by Cavallo; who explains the matter, by remarking, that in two former voyages made with the ſame machine, it could not long ſupport two men in the atmoſphere; ſo that we had no occaſion to wonder at its weakneſs on this occaſion. In fact, it does not appear that the air over the ſea is at all warmer than that above land; on the contrary, there is every reaſon to believe, that the ſuperior reflective power of the land renders the atmoſphere above it warmer: but it is very natural to ſuppoſe, that the air above the ſea is more moiſt than that above land; and conſequently, by letting fall its moiſture upon the balloon, muſt have occaſioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmoſphere over land.

We ſhall now proceed to the conſtruction of aeroſtatic machines; of which the ſmaller are only for amuſement, or ſome ſlight experiments, and are very eaſily made. As in all, however, it is of conſequence to have as little weight as poſſible, the ſhape becomes an object of great conſideration. For this purpoſe therefore a ſpherical figure has been mathematically demonſtrated to be the beſt: as capable of containing a greater quantity under a ſmaller ſurface than any other; and this holds good with regard to all inflammable air-balloons, whether great or ſmall. But for machines incloſing rarefied air, where the under part muſt neceſſarily be much colder than the upper, an inverted cone, or truncated pyramid, with the ſmaller part undermoſt, ſeems then to be moſt proper, as it allows the heated air, which has a great tendency to expand, to collect in the wide part at the top, while the uſeleſs ſurface in the lower part, and which, in any other figure, would contain only the colde and heavier air, is thus thrown aſide. In fact it was found in the different experiments of Mr. Montgolfier, that aeroſtatic machines of rarefied air, when made of the ſhape of a parallelopiped, or even one deviating ſtill more from the ſhape of a globe, anſwered the purpoſe remarkably well.

For experiments, both the inflammable and rarefied air-balloons may be made of paper; the former of that kind called *thin-poſt*, varniſhed over with linſeed oil; the latter, of what is called *ſilk* or *ſilver* paper, without varniſh. Thoſe with inflammable air have been made of gold-beater's ſkin or peeled bladders; but paper is undoubtedly preferable.

For aeroſtatic machines of a larger ſize, the material univerſally employed is varniſhed ſilk; and for thoſe of the rarefied-air kind, linen painted over with ſome ſize colour, or lined with paper. The beſt varniſh for an inflammable air-balloon is that made with bird-lime, and recommended by Mr. Faujas de Saint-Fond, in a treatiſe publiſhed on the ſubject. The following is his method of preparing it: "Take one pound of bird-lime, put it into a new proper earthen pot that can reſiſt the fire, and let it boil gently for about one hour, viz. till it ceaſes to crackle; or which is the ſame thing, till it is ſo far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of ſpirits of turpentine, ſtirring it at the ſame time with a wooden ſpatula, and keeping the pot at a good diſtance from the flame, leſt the vapour of this eſſential oil ſhould take fire. After this, let it boil for about ſix minutes longer; then pour upon the whole three pounds of boiling oil of nuts, linſeed, or poppy, rendered drying by means of litharge; ſtir it well, let it boil for a quarter of an hour longer, and the varniſh is made. After it has reſted for 24 hours, and the ſediment has gone to the bottom, decant it into another pot; and when you want to uſe it, warm, and apply it with a flat bruſh upon the ſilk ſtuff, whilſt that is kept well ſtretched. One coat of it may be ſufficient; but if two are neceſſary, it will be proper to give one on each ſide of the ſilk, and to let them dry in the open air while the ſilk remains extended." On this ſubject, however, Mr. Cavallo has made ſome improvements, as may be ſeen in his printed publications. Much likewiſe has been ſaid in France of the elaſtic gum-varniſh, and its compoſition kept a ſecret; but Mr. Baldwin, after many expenſive trials, declares it to be made by melting in an iron ladle properly heated, pieces of elaſtic gum, and afterwards ſtirring in a quantity of drying oil. Mr. Blanchard's method of making elaſtic gum varniſh for the ſilk of a balloon, is the following: "Diſſolve elaſtic gum, cut ſmall, in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying linſeed-oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm. The pieces of ſilk, after the varniſh is ſufficiently dry, may be joined by laying about half an inch of the edge of one piece over the edge of the other, and ſewing them by a double ſtitch.

The beſt method of cutting the pieces that are to form a balloon, is to deſcribe a pattern of wood, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect ſegments of circles, they cannot be deſcribed by a pair of compaſſes: but the beſt method of drawing them is as follows: 1. Draw on a flat ſurface, two right lines AE and BC, (pl. 3, fig. 2.) perpendicular to each other. 2. Find the circumference anſwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, ſo that the whole length AE of the pattern may be equal to half the circumference. 3. Divide AD into 18 equal parts; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. 4. Divide the whole circumference in twice

the given number of pieces, and make DC and BB each equal to the quotient of this diviſion; ſo that the whole, BC, is equal to the greateſt breadth of one of theſe pieces. 5. Multiply the above-mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreſſes the length of *fg*; again, multiply the ſame length of DE by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, having found the lengths of all theſe lines, draw by hand a curve-line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to that already found. In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

To the upper part of the balloon there ſhould be adapted a valve opening inwards; to which ſhould be faſtened a ſtring paſſing through a hole, and faſtened to the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from fig. 3. A round braſs plate AB has a round hole CD, about two or three inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather which is to cloſe the hole CD; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall ſtring or other ſecurity ſhould be fixed to the ſhutter and the plate, ſo as not to admit the ſhutter to be opened beyond a certain ſafe diſtance. To the lower part two pipes ſhould be fixed, through which the inflammable gas may be introduced into the balloon.

The car or boat is beſt made of wicker-work, covered with leather, and painted; and the proper method of ſuſpending it, is by ropes proceeding from the net which goes over the balloon. This net ſhould be formed to the ſhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes ſhould go to the edge of the boat. This circle may be made of wood, or of ſeveral pieces of ſlender cane bound together. The meſhes of the net may be ſmall at top, againſt which part of the balloon the inflammable air exerts the greateſt force; and increaſe in ſize as they recede from the top.

With regard to the rarefied-air machines, Mr. Cavallo recommends firſt to ſoak the cloth in a ſolution of ſal-ammoniac and common ſize, uſing one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inſide with ſome earthy colour, and ſtrong ſize or glue. When this paint has dried perfectly, it will then be proper to varniſh it with oily varniſh, which might dry before it could penetrate quite through the cloth. Simple drying linſeed oil will anſwer the purpoſe as well as any, provided it be not very fluid.

It now only remains to give ſome account of the method by which aeroſtatic machines may be filled; and here we are able to determine with much greater preciſion concerning the inflammable air-balloons than the other kind. With regard to theſe, a primary conſideration is, the moſt effectual and cheap method of procuring the inflammable air. Under the article AEROLOGY it will be found that the moſt advantageous methods are, by applying acids to certain metals; by expoſing animal, vegetable, and ſome mineral ſubſtances, in a cloſe veſſel to a ſtrong fire; or laſtly, by tranſmitting the vapour of certain fluids through red-hot tubes.

Fig. 4, of pl. 3, repreſents an apparatus deſcribed by Mr. Cavallo as proper for filling balloons of the ſize of two or three feet in diameter with inflammable air, after paſſing it through water.—A is the bottle with the ingredients; BCD a tube faſtened in the neck at B, and paſſing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will paſs firſt through the water of the bottle E, and then into the balloon. Two ſmall caſks may be uſed inſtead of the bottles A and E.

For obtaining inflammable air from pit-coal, aſphaltum, amber, &c. &c. Mr. Cavallo recommends the following apparatus: Let a veſſel be made of clay, or rather of iron, in the ſhape of a Florence flaſk, ſomewhat larger, and whoſe neck is longer and larger ABC, (fig. 5.) Put the ſubſtance to be uſed into this veſſel, ſo as to fill about four-fifths or leſs of its cavity AB. If the ſubſtance be of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel; and let the end D of the tube be ſhaped as in the figure, ſo that going into the water HI, it may terminate under a ſort of inverted veſſel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the veſſel is put into the fire, and made red hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop-cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop-cock.

To procure inflammable air by means of ſteam, Dr. Prieſtley uſes a tube of red-hot braſs, upon which the ſteam of water has no effect, and which he fills with the turnings of iron that are ſeparated in the boring of cannon. By this means he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings: then the neck of a retort, or cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler ſufficient to make the water boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one half more air by this means than by the action of viriolic acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can with any certainty of ſucceſs be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings. For a balloon of 30 feet diameter, Mr. Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metal, and too little with reſpect to the water. Oil of vitriol will not exert its power upon iron unleſs it be diluted with five or ſix times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve. Mr. Lunardi, who, from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow with about 2000 pounds of iron (the

borings of cannon procured from Carron), as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them, in order to increaſe the ſurface. His apparatus was not materially different from that of Mr. Cavallo, repreſented pl. 3, fig. 1. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted. To theſe the ſilken ones of the balloon are to be tied. Round each of the tubs B, five, ſix, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by CDF; and having expelled all the common air from it, let the ſilken tubes be faſtened round the tin ones EE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the car IK being placed between the two ſets of caſks, is faſtened to the hoop MN, and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it. At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the car. Laſtly, the aeronauts being ſeated, the lateral ropes are ſlipped off, and the machine is let looſe. (See *Blanchard's balloon*, pl. 3.) This apparatus was reduced by Mr. Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through water. Thus his balloon was filled in leſs than half an hour, when, before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

With regard to the rarefied air-balloons, the method of filling them is by means of a ſcaffold, the breadth of which is at leaſt two-thirds of the diameter of the machine, and elevated about ſix or eight feet above the ground. From the middle of it deſcends a well, riſing about two or three feet above it, and reaching to the ground, furniſhed with a door, through which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick, and its diameter ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts, each of which is fixed by ropes, and has a pulley at the top. The machine is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pulleys of the two maſts, ſerves to lift the balloon about 15 feet above the ſcaffold; and it is kept ſteady, and held down, whilſt filling, by ropes paſſing through loops or holes about its equator; and theſe ropes may eaſily be diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and not ſmoke, that is required. Small wood and ſtraw are very fit for this purpoſe. As the current of hot air aſcends, the machine will dilate, and lift itſelf above the ſcaffold and gallery which was covered by it. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, its aperture muſt be brought, by means of the ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fire-place is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off, the machine is let go. (See *Verſailles balloon*, pl. 3.) It has been determined by accurate experiments, that only one-third of the common air can be expelled from theſe large machines; and therefore the aſcending power of the rarefied air in them can be eſtimated as only equal to half an ounce averdupoiſe for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed for elevating or lowering the balloons with rarefied air, has been the increaſe or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable air-balloons have been generally raiſed or lowered by diminiſhing their ballaſt, or by letting out ſome of the gas through the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating; for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the incloſed air, occaſioned by heat and cold, as has been already obſerved. Wings or oars are the only means of this ſort that have been uſed with any probable ſucceſs; and, as Mr. Cavallo obſerves, they ſeem to be capable of conſiderable improvement, though much is not to be expected from them, when the machine goes at a great rate. They are beſt moved by human ſtrength applied ſimilarly to the oars of a boat. They may be made in general of ſilk ſtretched between wires, tubes, or ſticks; and when uſed, muſt be turned edgewiſe when they are moved in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. Fig. 6, pl. 3, is the repreſentation of one of Mr. Blanchard's wings. Fig. 7, is one of thoſe uſed by Mr. Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In conſequence of this conſtruction, this ſort of oars do not need being turned edgewiſe. Fig. 8, repreſents one of the wings uſed by the brothers Roberts; and fig. 9. one conſtructed by Count Zambeccari, conſiſting of a piece of ſilk ſtretched between two tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe by themſelves when they go in one direction. Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect a power upon them as upon a ſhip. It appears, however, that they can have no effect when a machine is only moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it floats ſtands ſtill whilſt the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe contrivances.

AERSHOT, a town in the Netherlands, in the duchy of Brabant. E. long. 5. 4. N. Lat. 51. 15.

ÆRUGINOUS, an epithet given to ſuch things as reſemble or partake of the nature of the ruſt of copper.

ÆRUGO, the ruſt of copper, natural or artificial. The former is found about copper mines, and the latter made by corroding copper with acids. See *Verdegris*.

ÆRUSCATORES, in antiquity, a kind of ſtrolling beggars, not unlike gypſies, who drew money from the credulous by fortune-telling, &c. It was alſo a denomination given to griping exactors, or collectors of the revenue. The Galli, or prieſts of Cybele, were called *æruſcatores magnæ matris*; and μητραγυρται, on account of their begging or collecting alms in the ſtreets.

AERY, or AIRY, among ſportſmen. See AIRY.

ÆS UXORIUM, in antiquity, a ſum paid by bachelors, as a penalty for living ſingle to old age; a tax firſt impoſed in the year of Rome 350. He who had no wife was fined after a certain rate, called *æs uxorium*.

Æs per et libram was a formula in the Roman law whereby purchaſes and ſales are ratified. Originally the phraſe ſeems to have been only uſed in ſpeaking of things ſold by weight, or by the ſcales.

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarſer kinds of braſs.

Æs Caldarium, a term uſed by the German mineraliſts, for a ſubſtance which ſometimes occurs to thoſe who work upon cobalt, and is uſed for the making blue *ſmalt*.

Æs Uſtum, a chemical preparation, made of thin leaves of copper, ſulphur and nitre, placed *ſtratum ſuper ſtratum* in a crucible, and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder. Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as an eſcharotic.

ÆSCHYNOMENE, BASTARD SENSITIVE-PLANT. A genus of the decandria order, belonging to the diadelphia claſs of plants; the characters of which are: The *calyx*, a one-leaved campanulated bilabiated perianthium; the lips equal, but the ſuperior one two-cleft, the inferior tridentate. The *corolla* is papillionaceous; the banner cordated and ſubringent; the *alæ* ovate, obtuſe, and ſhorter than the banner; and the carina lunated, pointed, and the length of the alæ. The *ſtamina* conſiſt of ten ſimple nine-cleft filaments; the antheræ ſmall. The *piſtillum* is an oblong villous columnar germen; the ſtylus ſubulated and aſcending, the ſtigma ſimple and ſomewhat obtuſe. The pericarpium is a long compreſſed, unilocular jointed pod. The *ſeeds* are kidney-ſhaped, and ſolitary within each joint. Of this genus there are reckoned ſix.

Species. 1. The aſpera, which, like the reſt of this genus, is a native of warm countries. It riſes to the height of four or five feet, having a ſingle herbaceous ſtalk, which is rough in ſome parts. 2. The Americana, which ſeldom riſes more than two feet in height. 3. The arborea, this grows to the height of 6 or 7 feet, with a ſingle ſtem; the flowers two or three together, of a copper colour, and as large as thoſe of the aſpera. 4. The ſeſban, with woody ſtems, and branches garniſhed with ſmooth leaves. 5. The pumila, riſing to the height of about 3 feet. 6. The grandiflora, ſix or eight feet high, with a woody ſtem, ſending out branches towards the top, garniſhed with obtuſe leaves.—Theſe plants are propagated by ſeeds, which ſhould be ſown early in the ſpring, on a hot-bed; and when the plants have ſtrength enough to be removed, they ſhould each be put into a ſeparate pot filled with light earth, and plunged into a hot-bed. As they increaſe in ſize, they muſt be removed into larger pots.

ÆSCULUS, the HORSE-CHESNUT: A genus of the monogynia order, belonging to the heptandria claſs of plants; and ranking, in the natural method, under the 39th order, *Trihilatæ*.—The characters are: The *calyx*, a ſmall, ſingle-leaved, bellied perianthium, divided into five ſegments. The *corolla* (except in the *pavia*, where it is four-petal'd and cloſe) five roundiſh, flat, expanding petals, unequally coloured, and with narrow claws inſerted into the calyx. The *ſtamina* have ſeven ſubulated declining filaments, the length of the corolla; the antheræ aſcending. The *piſtillum* is a roundiſh germen, ending in a ſubulated ſtylus; the ſtigma pointed. The *pericarpium* is a leathery, roundiſh, trilocular, three-valved capſule. The *ſeeds* are two, and ſubglobular.—In this genus Van Rozen and Miller obſerve both male and hermaphrodite flowers.—There are two *ſpecies*.

1. The hippocaſtanum, or common horſe-cheſnut, brought from the northern parts of Aſia, about the year 1550, and ſent to Vienna about 1588. 2. The pavia, or ſcarlet flowering horſe-cheſnut, a native of Carolina, the Braſils, and the Eaſt, which grows to about fifteen or ſixteen feet high. The bark of the young ſhoots is quite ſmooth, and the growing ſhoots in ſummer are of a reddiſh hue. The leaves are palmated, being pretty much like thoſe of the horſe cheſnut, only much ſmaller, and the indentures at the edges are deeper and more acute. The lobes of which they are compoſed are ſpear-ſhaped; they are five in number, are united at their baſe, and ſtand on a long red foot-ſtalk. The leaves grow oppoſite by pairs on the branches, which are ſpread abroad on every ſide. The flowers come out from the ends of the branches. The firſt appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and conſequently have a pleaſing effect among the vaſt tribe of yellow flowering ſorts which ſhow themſelves in bloom at that ſeaſon. They continue in ſucceſſion for upwards of ſix weeks; and ſometimes are ſucceeded by ripe ſeeds in our gardens.

The firſt ſpecies is propagated from the nuts, which ſhould be ſown in drills, about two inches aſunder. In the ſpring the plants will come up; and when they have ſtood one year, they may be taken up, their tap-roots ſhortened, and afterwards planted in the nurſery. When they are of ſufficient ſize, they muſt be planted in large holes, ſo that the ſurface of the ground ſhall be level with the top of their roots; the fibres being all ſpread and lapped in the fine mould, and the turf alſo worked to the bottom. A ſtake ſhould be placed to keep them ſafe from the winds; and they muſt be fenced from the cattle till they are of ſufficient ſize. The beſt ſeaſon for all this is October.—The ſecond ſpecies is propagated, 1. By budding it upon the young plants of the horſe-cheſnut. Theſe ſtocks ſhould be raiſed as juſt directed, and after having ſtood in the nurſery about two years, and made at leaſt one good ſummer's ſhoot, the operation muſt be performed in the ſummer following. If the ſtocks were healthy, they will, in the next ſeaſon, make pretty good ſhoots; and in a year or two will flower. 2. By ſeeds; which will ſometimes ripen with us, and may be obtained out of our own gardens. The manner of raiſing them is this—Let a warm border be prepared; and if not naturally ſandy, let drift-ſand be mixed with the ſoil; and the ſeeds ſown in the month of March, about half an inch deep. Conſtant weeding muſt be had; and when the plants appear, they ſhould be ſhaded in the heat of the day, and have now and then a gentle watering. In about two or three years they may be removed into the nurſery, or planted where they are to remain, and they will flower in three or four

years after. The beſt time for planting them there, or where they are to remain, is October; though they will grow if removed in any of the winter months.

ÆSTIMATIO CAPITIS, a term met with in old law-books for a fine paid for offences againſt perſons of quality, according to their ſeveral degrees.

ÆSTIVAL, in a general ſenſe denotes ſomething connected with, or belonging to, ſummer. Hence æſtival ſolſtice, &c.

ÆSTUARIA, in geography, denotes an arm of the ſea, which runs a good way within land. Such is the Briſtol channel, and many of the friths of Scotland.

ÆSTUARIES, in ancient baths, were ſecret paſſages from the hypocauſtum into the chambers.

ÆSTUARY, among phyſicians, a vapour-bath, or any other inſtrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by Æſymnus the Megarean.

ÆETH, or ATH, a ſtrong little town in the Auſtrian Netherlands, about 20 miles S. W. of Bruſſels.

ÆTHER, from αἴθω, "to burn or flame;" the medium ſaid by ancient philoſophers to exiſt in the regions above our atmoſphere, and ſuppoſed of ſo ſubtile and penetrating a nature, as to pervade the air and other bodies, and poſſeſs the pores and intervals of all matter. The term *æther* having long been embarraſſed with vague ideas, and arbitrarily applied to ſo many different things, later philoſophers ſet it aſide, and ſubſtituted a more determinate language. Thus, the Carteſians uſed the term *materia ſubtilis*; which is their æther: and Sir Iſaac Newton, ſometimes a *ſubtile ſpirit*, as in the cloſe of his *Principia*; and ſometimes, a *ſubtile*, or *ætherial medium*, as in his *Optics*.

The exiſtence of ſome matter in the air, much finer than the air itſelf, ſeems indeed to be evident. There is an unknown ſomething, which remains behind when the air is taken away; as appears from certain effects which we ſee produced *in vacuo*. Heat, Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs; and may be very well concluded to permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace, which anſwers to the full character of an æther.

To the weight of this medium he attributes gravitation, or the weight of all other bodies; and to its claſticity, the claſtic force of the air and of nervous fibres, the emiſſion, refraction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, according to that great philoſopher, this ſame matter ſeems the *primum mobile*, the firſt ſource or ſpring of phyſical action in the modern ſyſtem.

The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an abſolute *plenum* in the univerſe. But Sir Iſaac Newton overturns this, by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance; for, hence it follows, that the matter contained therein muſt be immenſely rare, the reſiſtance of bodies being chiefly as their denſity; ſo that if the heavens were thus adequately filled with ever ſo ſubtle a medium or matter, they would reſiſt the motion of the planets and comets much more than quickſilver or gold.

But the late diſcoveries in electricity have thrown great light upon this ſubject, and render it extremely probable, that the *æther* ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature. See ELECTRICITY, FIRE, HEAT, LIGHT, &c.

ÆTHER, in chemiſtry, the lighteſt, moſt volatile, and moſt inflammable of all liquids; produced by diſtillation of acids with rectified ſpirit of wine. See CHEMISTRY and PHARMACY (the *Indexes*).

ÆTHERIAL, ETHERIUS, ſomething that belongs to, or partakes of, the nature of ÆTHER. Thus we ſay, the *ætherial regions*, &c. Some of the ancients divided the univerſe into elementary and ætherial. Under the former was included all that ſpace above the uppermoſt element, viz. fire. This they ſuppoſed to be perfectly homogeneous, incorruptible, unchangeable, &c. See CORRUPTION. The Chaldees placed an ætherial world between the empyreum and the region of the fixed ſtars. Beſides which, they ſometimes alſo ſpeak of a ſecond ætherial world, meaning the ſtarry orb; and a third ætherial world, the planetary region.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See PHARMACY (*Index*).

ÆTHUSA, in botany, a genus of the pentandria digynia claſs; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The characters are: The *calyx*, an univerſal umbel expanding, the interior rays ſhorter by degrees; with a partial umbel, ſmall, and expanding. No univerſal involucrum; the partial one dimidiated, with three or five leaflets, and pendulous; the proper perianthium ſcarcely diſcernible. The univerſal *corolla* is uniform, with fertile florets; the partial one has five heart-inflected unequal petals. The *ſtamina* conſiſt of five ſimple filaments, with roundiſh anthere. The *piſtillum* is a germen beneath; with two reflected ſtyli; the ſtigmata obtuſe. There is no *pericarpium*; the fruit is ovate, ſtriated, and tripartite. The *ſeeds* are two, roundiſh and ſtriated. There is but one ſpecies, viz. the æthuſa ſynapium, fools-parſley, or leſſer hemlock (a native of Britain), which grows in corn fields and gardens. From its reſemblance to common parſley, it has been miſtaken for it; and when eaten, it occaſioned ſickneſs. If the curled-leaved parſley only was cultivated, no ſuch miſtakes would happen. Cows, horſes, ſheep, goats, and ſwine eat it without injury; but it is noxious to geeſe.

AETIANS, in church hiſtory, a branch of Arians, who maintained, that the Son and Holy Ghoſt are in all things diſſimilar to the Father.

ÆTIOLOGY, is that part of Pathology which is employed in exploring the cauſes of diſeaſes.

ÆTITES, or EAGLE-STONE, in natural hiſtory, a flinty or cruſtated ſtone, hollow within, and containing a *nucleus*, which, on ſhaking, rattles within. It was formerly in repute for ſeveral extraordinary magical as well as medical powers; ſuch as preventing abortion, diſcovering thieves, and other ridiculous properties. The word is from ἀετὸς, "eagle;" the popular tradition being, that it is found in the eagle's neſt, where it is ſuppoſed to prevent the eggs from being rotten. It is found in ſeveral parts: near Trevoux in France there are ſtrata or beds of the coarſer or ferruginous kind. The fineſt and moſt valued of all are accidental ſtates of one or other of our common pebbles.

ÆTNA, (in the Itineraries *Ætbana*, ſuppoſed from αἴθω, "to burn;" according to Bochart, from *Athnan*, a furnace, or *Ætuna*, darkneſs), now *Monte Gibello*: a volcano or burning mountain of Sicily, ſituated in lat. 38°. N. long. 15°. E. This mountain, famous from the remoteſt antiquity both for its bulk and terrible eruptions, ſtands in the eaſtern part of the iſland, in a very extenſive plain, called *Val Demoni*, from the notion of its being inhabited by devils, who torment the ſpirits of the damned in the bowels of this volcano. Authors are

not agreed as to its dimenſions, or its height above the ſurface of the ſea. The accounts given of the phenomena which have accompanied its eruptions, by Sir William Hamilton and Mr. Brydone, are exceedingly intereſting.

Ætna ſalt, *Sal Ætnæ*, a name given by ſome authors to the ſal-ammoniac, which is found on the ſurface and ſides of the openings of Ætna, and other burning mountains, after their eruptions. Some of this ſalt is yellow, ſome white, and ſome greeniſh. It is a concrete of nitre, ſulphur, and vitriol, burnt and ſublimed together. Borelli tried many experiments on it, and concluded, that this ſalt is ſo far from occaſioning the exploſions, as ſome have ſuppoſed, that it does not exiſt in it, but is formed during the burning.

ÆTOLARCHA, in Grecian antiquity, the principal magiſtrate or governor of the Ætolians.

AFFA, a weight uſed on the Gold Coaſt of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Moſt of the blacks on the Gold Coaſt give theſe names to thoſe weights.

AFFECTION, in a general ſenſe, implies an attribute inſeparable from its ſubject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind.

Affection, ſignifying *a ſettled bent of mind toward a particular being or thing*, occupies a middle ſpace between *diſpoſition* on the one hand, and *paſſion* on the other. It is diſtinguiſhable from Diſpoſition, which being a branch of one's nature, originally, muſt exiſt before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, becauſe, having a ſpecial relation to a particular object, it cannot exiſt till the object have once at leaſt been preſented. It is alſo diſtinguiſhable from Paſſion, which, depending on the real or ideal preſence of its object, vaniſhes with its object; whereas Affection is a laſting connection; and, like other connections, ſubſiſts even when we do not think of the perſon.

Affection, among phyſicians, ſignifies the ſame as diſeaſe. Thus the hyſteric *affection* is the ſame with the hyſteric diſeaſe.

AFFERERS, or Afferors, in law, perſons appointed in court-leets, courts-baron, &c. to ſettle, upon oath, the fines to be impoſed upon thoſe who have been guilty of faults arbitrarily puniſhable.

AFFETTUOSO, or *Con* Affetto, in the Italian muſic, intimates that the part to which it is added ought to be played in a tender moving way; rather ſlow than faſt.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT ſignifies an oath in writing, ſworn before ſome perſon who is authoriſed to take the ſame.

AFFILIATION, *adfiliatio*, in writers of the middle age, the ſame with *adoption*. Among the ancient Gauls it was performed with military ceremonies.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradiſtinction to conſanguinity, or relation by blood.—Affinity does not found any real kinſhip; it is no more than a kind of fiction, introduced on account of the cloſe relation between huſband and wife. It is even ſaid to ceaſe when the cauſe of it ceaſes: hence a woman who is not capable of being a witneſs for her huſband's brother during his life-time, is allowed as a witneſs when a widow, by reaſon the affinity is diſſolved. Yet, with regard to the contracting marriage, affinity is not diſſolved by death, though it be in every thing elſe. In Lev. xviii. v. 7. et ſeq. we find that there were ſeveral degrees of affinity, wherein marriage was prohibited by the law of Moſes. But theſe caſes are not to be propoſed as examples: becauſe in ſome they were authoriſed by neceſſity; in others by cuſtom; and the law as yet was not in being. If ſome other examples have exiſted, either before or ſince the law, the ſcripture expreſsly diſapproves of them, as Reuben's inceſt with Balah his father's concubine, and the action of Ammon with his ſiſter Tamar; and that of Herod-Antipas, who married Herodias his ſiſter-in-law, his brother Philip's wife, while her huſband was yet living.

Affinity is alſo uſed to denote conformity or agreement. Thus we ſay, the affinity of languages, the affinity of words, the affinity of ſounds, &c.

Affinity, or Elective Attraction, are terms uſed by modern chemiſts to expreſs that peculiar propenſity which different ſpecies of matter have to unite and combine with certain other bodies excluſively, or in preference to any other connection.

AFFIRMATION, in logic, the aſſerting the truth of any propoſition.

Affirmation, in law, denotes an indulgence allowed to the people called *Quakers*: who, in caſes where an oath is required from others, may make a ſolemn affirmation that what they ſay is true; and if they make a falſe affirmation, they are ſubject to the penalties of perjury. But this relates only to oaths taken to the government, and on civil occaſions; for Quakers are not permitted thus to give their teſtimony in any criminal caſe.

Affirmation is alſo uſed for the ratifying or confirming the ſentence or decree of ſome inferior court. Thus we ſay, the houſe of lords affirmed the decree of the lord chancellor.

AFFIRMATIVE, in grammar. Authors diſtinguiſh affirmative particles; ſuch is, *yes*.—The term *affirmative* is ſometimes alſo uſed ſubſtantively; as, "the affirmative is the more probable ſide of the queſtion:"—"there were ſo many votes, or voices, for the affirmative," &c.

AFFIX, in grammar, a participle added at the cloſe of a word, either to diverſify its form or alter its ſignification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more eſpecially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are ſingle ſyllables, frequently ſingle letters, ſubjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the ſame as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS literally denotes a blaſt of wind, breath, or vapour, ſtriking with force againſt another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturaliſts ſometimes ſpeak of the afflatus of ſerpents. Tully uſes the word figuratively, for a divine inſpiration; in which ſenſe, he aſcribes all great and eminent accompliſhments to a divine afflatus.

AFFLICTION, a term ſometimes uſed for *malady*, but incorrectly; ſince, whatever bodily evils it may produce, it is in itſelf none.

AFFORAGE, in the French cuſtoms, a duty heretofore paid to the lord of a diſtrict, for permiſſion to ſell wine, or other liquors, within his ſeignory. Afforage was alſo uſed for the rate of proviſions fixed by the provoſt or ſheriffs of Paris.

AFFORESTING, Afforestatio, the turning ground into foreſt. The Conqueror, and his ſucceſſors, continued afforeſting the lands of the ſubject for many reigns; till the grievance became ſo notorious, that the people ſued for relief; which was at length obtained; and all the new afforeſted lands were re-converted to the uſes of their proprietors, under the name and quality of *purlieu* or *pouralle land*.

AFFRAY, or Affrayment, in law, formerly ſignified

the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. but, at preſent, *affray* denotes a ſkirmiſh or fight between two or more.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an eſcutcheon; a kind of bearing otherwiſe called *confrontee*, and ſtands oppoſed to *adoſſee*.

AFFUSION, the act of pouring ſome fluid on another body. Divines and church hiſtorians ſpeak of baptiſm by affuſion; which amounts to much the ſame with what we now call *ſprinkling*.

AFRICA (according to Bochart, from a Punic word, ſignifying *Ears of Corn*); one of the four great diviſions, by the moderns called *quarters*, of the world, and one of the three called by the Greeks Ηπειροι, or *continents*. By them it was alſo called *Libya*.

Africa lies ſouth of Europe, and weſt of Aſia. It is bounded on the north by the Mediterranean, which ſeparates it from the former: on the north-eaſt, by the Red Sea, which divides it from Aſia, except in that part where a neck of land called the *Iſthmus of Suez*, about 60 miles over, ſeparates the Mediterranean from the Red Sea. On the weſt, ſouth, and eaſt, it is bounded by the main ocean: ſo that it is properly a vaſt peninſula, bearing ſome faint reſemblance of a pyramid, the baſe of which is the northern part, running along the ſhores of the Mediterranean; and the top of the pyramid is the moſt ſoutherly point, called the *Cape of Good Hope*. Its greateſt length from north to ſouth is 4300 miles, and its greateſt breadth from eaſt to weſt is 3500 miles; reaching from Lat. 37° N. to 35° S. and from Long. 170° W. to 50° E.

Though the greateſt part of this continent has been in all ages unknown both to the Europeans and Aſiatics, its ſituation is more favourable than either Europe or Aſia for maintaining an intercourſe with other nations. It ſtands, as it were, in the centre of the three other quarters of the globe; and has thereby a much nearer communication with Europe, Aſia, and America, than any one of theſe has with another. For, 1. It is oppoſite to Europe in the Mediterranean, for almoſt 1000 miles in a line from eaſt to weſt; the diſtance ſeldom 100 miles, never 100 leagues, and ſometimes not above 20 leagues. 2. It is oppoſite to Aſia for all the length of the Red Sea, the diſtance ſometimes not exceeding five leagues, ſeldom fifty. 3. Its coaſt for the length of about 2000 miles lies oppoſite to America, at the diſtance of from 500 to 700 leagues, including the iſlands: whereas America, unleſs where it may be a *terra incognita*, is no where nearer Europe than 1000 leagues; and Aſia, than 2500.

As the equator divides this continent almoſt in the middle, the far greateſt part of it is within the tropics; and of conſequence the heat in ſome places is almoſt inſupportable by Europeans, it being there greatly increaſed by vaſt deſerts of burning ſand.—It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance, not only the neceſſaries, but alſo the luxuries, of life. It has been aſſerted, that the ſugars of Barbadoes and Jamaica, as alſo the ginger, cotton, rice, pepper, pimento, cocoa, indigo, &c. of theſe iſlands, would thrive in Africa to as much perfection as where they are now produced. Nor can it be doubted, that the Eaſt Indian ſpices, the tea of China and Japan, the coffee of Mocha, &c. would all thrive in ſome parts of the African coaſt; as this continent has the advantage of feeling no cold, the climate being either very warm or very temperate.

No part of the world abounds with gold and ſilver in a greater degree than this; and it is ſurpriſing, that neither the ancient nor modern Europeans, notwithſtanding their inſatiable thirſt after riches, ſhould have endeavoured to eſtabliſh themſelves effectually in a country much nearer to them than either America or the Eaſt Indies; and where the objects of their deſire are found in equal, if not greater, plenty.

Next to gold and ſilver, copper is the moſt valuable metal; and on this continent it is found in great plenty, inſomuch that the mountains of Atlas are ſaid by travellers all to be compoſed of copper ore. In ſhort, Africa though a full quarter of the globe, ſtored with inexhauſtible treaſures, and capable of producing almoſt every neceſſary, convenience, and luxury of life, within itſelf, ſeems to be utterly neglected both by its own inhabitants and all other nations; the former being in a ſavage ſtate, and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the eaſieſt rate what they procure with as little trouble as poſſible, or to carry the people off for ſlaves to their plantations.

Upwards of 200 years have the European nations traded with Africa in human fleſh; and encouraged in the Negro countries, wars, rapine, deſolation, and murder, that the Weſt India iſlands might be ſupplied with that commodity. The annual exportation has exceeded 100,000; numbers of whom are driven down like ſheep, perhaps a thouſand miles, to the ſea-coaſt; and theſe are generally inhabitants of villages that have been ſurrounded in the night by armed force, and carried off to be ſold to our traders.—Nor do our planters, who purchaſe them, uſe any pains to inſtruct them in religion, to make amends for the oppreſſion thus exerciſed on them. It is ſaid they are naturally averſe to every thing that tends to it; yet the Portugueſe, French, and Spaniards, in their ſettlements, ſucceed in their attempts to inſtruct them, as much to the advantage of commerce as of religion. It is for the ſake of Chriſtianity, and the advantages accompanying it that Engliſh ſlaves embrace every occaſion of deſerting to the ſettlements of theſe nations.—But upon this ſubject the feelings and reflection of the nation have of late been abundantly roufed, and the legiſlature it is to be hoped will ſhortly put an entire ſtop to ſo infamous a kind of traffic.

AFRICAN Company, a ſociety of merchants, eſtabliſhed by King Charles II. for trading to Africa; which trade is now laid open to all his Majeſty's ſubjects, paying 10 *per cent* for maintaining the forts.

AFSLAGERS, perſons appointed by the burgomaſters of Amſterdam to preſide over the public ſales made in that city, acting as brokers or auctioneers do with us.

AFT in the ſea language, the ſame with ABAFT.

AFTERBIRTH, in midwifery, ſignifies the membranes which ſurround the infant in the womb, generally called the ſecundines. See Midwifery.

AFTERMATH, in huſbandry, ſignifies the graſs which ſprings or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or the ſpace between noon and night.

AFTER-PAINS, in midwifery, exceſſive pains felt in the groin, loins, &c. after a woman is delivered.

AFTER SWARMS, in the management of bees, are thoſe which leave the hive ſome time after the firſt has ſwarmed. See Bee.

AFWESTAD, a large copper-work in the province of Dalecarlia, in Sweden. W. Long. 14. 10. N. Lat. 58. 10.

AGA, in the Turkiſh language, ſignifies a great lord or commander. Hence the aga of the Janiſſaries is the commander in chief of that corps; as the general of horſe is denominated *ſpahiclar aga*. The former is an officer of great importance. We find alſo *agas* in other countries. The chief officers under the Khan of Tartary are ſo called; and among the Algerines we read of *agas*, choſen from among the *Iclan*

baſhis (the firſt rank of military officers), and ſent to govern in the chief towns and garriſons. The *aga* of Algiers is the preſident of the divan, or ſenate.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM. See Xylo Aloes.

AGALMATA, in antiquity, a term originally uſed to ſignify any kind of ornaments in a temple; but afterwards for the ſtatues only, as being moſt conſpicuous.

AGANIPPIDES, in ancient poetry, a deſignation given to the muſes, from a fountain of mount Helicon, called *Aganippe*.

AGANIPPE, in antiquity, a fountain of Bœotia at mount Helicon, on the borders between Phocis and Bœotia.

AGAPE, in eccleſiaſtical hiſtory, the love-feaſt, or feaſt of charity, of the primitive Chriſtians; when a liberal contribution was made by the rich to feed the poor. The word is Greek, ἀγάπη, and ſignifies *love*. Theſe love-feaſts, during the three firſt centuries, were held in the church without ſcandal or offence; but, in after times, the heathens began to tax them with impurity. This at length gave occaſion to their reformation; but, notwithſtanding this precaution, the abuſes committed occaſioned their abolition at the council of Carthage, in the year 397.

AGAPETÆ, in eccleſiaſtical hiſtory, a name given to certain virgins and widows, who, in the ancient church, aſſociated themſelves with, and attended on, eccleſiaſtics, out of a motive of piety and charity.—In thoſe days, women were inſtituted Deaconesses; and, in the fervour of the primitive piety, there was nothing ſcandalous in ſuch ſocieties; but they afterwards degenerated into libertiniſm, and were at length ſuppreſſed.

AGARIC. See Agaricus.

Female Agaric. See Boletus.

Mineral Agaric, a marley earth, reſembling the vegetable of that name in colour and texture. It is found in the fiſſures of rocks, and on the roofs of caverns; and is ſometimes uſed as an aſtringent in fluxes, hemorrhages, &c.

AGARICUS, or Mushroom, a genus of the order of fungi, belonging to the cryptogamia claſs of plants.

Species and uſes. Botanical writers enumerate 55 ſpecies belonging to this genus; of which the moſt remarkable are:—1. The campeſtris, or common muſhroom, which has the top or cap firſt of a dirty cream colour, convex, and, if but juſt expanding, the under part, or what are called the *gills*, of a bright fleſh red: this colour laſts but a little time before it turns darker; and when the plant is old, or has been ſome time expanded, the gills become of a dark brown, the cap almoſt flat, of a dirty colour, and often a little ſcaly. It differs much in ſize in different plants, it being from an inch to ſeven inches broad. 2. The pratenſis, or *champignon*, is very common upon heaths and dry paſtures. A number of them generally come up in a place, ranged in curved lines or circles. 3. The chantarellus, or *chantarelle agaric*, is rather a ſmaller fungus than the former. The cap is yellow, of different hues in different plants, ſome being of a pale yellow, and others of an orange colour. 4. The delicioſus, or orange agaric. The general ſize of the cap of this ſpecies is from two to four inches broad. Its form is circular, with the edges bent inwards; convex on the upper ſurface, except in the centre, where it is a little depreſſed, ſo as nearly to reſemble the apex of a ſmooth apple. 5. The cinnamomeus, or brown muſhroom, has a cap the colour of freſh-tanned hides; and at firſt is hemiſpherical, firm, even, and fleſhy, with moſtly a ſmall riſing in the centre; but when old is quite flat. 6. The violaceus, or violet muſhroom. Its cap, when firſt expanded, is ſmooth, hemiſpherical, the main ſurface of a livid colour, but towards the margin of a better blue. Hudſon's bulboſus is only a variety of this plant.

The above are the only ſpecies that can be ſafely recommended as edible: though ſome other ſorts are frequently eaten by country people; and it is probable, thoſe with firm fleſhy caps might be eaten with ſafety, if choſen from dry grounds. Even the common muſhroom, which is in general eſteem, is not ſafely eaten when produced upon a moiſt ſoil.

Of the poiſonous ſorts, the three following are the moſt ſingular:—7. The muſcarius, or reddiſh muſhroom, has a large hat almoſt flat, either white, red, or crimſon, ſometimes beſet with angular red warts; the gills are white, flat, and inverſely ſpear-ſhaped; the pillar is hollow, the cap fixed to the middle of the pillar, limber, and hanging down. This ſpecies grows in paſtures, and is ſaid to poiſon flies, and to deſtroy bugs effectually if the juice be rubbed upon the walls and bedpoſts.—It is the *moucho more* of the Ruſſians, Kamtſchadales, and Koriacs, who uſe it as an inſtrument of intoxication, and even perſonify this muſhroom; and, if its effects urge them to ſuicide, or any dreadful crime, they ſay they obey its commands—8. The clypeatus, or long-ſtalked muſhroom, has an hemiſpherical hat tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, duſted with a fine powdery ſubſtance on each ſide; the root is bulbous, long, and hooked at the end. This ſpecies is thought to be poiſonous; and we have an account of the dangerous ſymptoms produced by eating it, in Dr. Percival's Eſſays.—Many of the different ſpecies of this genus grow on cows or horſes dung, on dunghills, on rotten wood, in cellars, or on the trunks of trees; of which the moſt remarkable is,—9. The quercinus, or agaric of the oak. This is of various ſizes, ſometimes not exceeding the bigneſs of the fiſt, ſometimes as large as a man's head. It is dark-coloured, hard, heavy, and woody; it is ſometimes uſed by dyers, as an ingredient in the black dye. It taſtes at firſt ſweetiſh in the mouth, but preſently becomes very bitter and nauſeous. It was formerly an article in the Materia Medica; but is now deſervedly rejected.

Culture. Only the eſculent kinds of muſhrooms are cultivated; and the following method is uſed by the gardeners who raiſe them for ſale.—If the young muſhrooms cannot be procured from gardens, they muſt be looked for in rich paſtures in Auguſt and September. The ground muſt be opened about their roots, where it is frequently found full of ſmall white knots; which are the off-ſets, or young muſhrooms. Theſe muſt be carefully gathered in lumps, with the earth about them: but as this ſpawn cannot be found in the paſture, except at that ſeaſon when the muſhrooms are naturally produced, it may be ſought for in old dung-hills, eſpecially where there has been much litter. The ſpawn has the appearance of white mould ſhooting out into long ſtrings, by which it may be eaſily known. The beds for receiving the ſpawn ſhould be made of dung which has lain ſpread abroad for a month or longer. The beds ſhould be made on dry ground, and the dung laid about a foot thick; covering it with ſtrong earth about 4 inches deep. Upon this lay more dung, about 10 inches thick; then another layer of earth, ſtill drawing in the ſides of the bed, ſo as to form it like the roof of a houſe; which may be done by three layers of dung, and as many of earth. When the bed is finiſhed, it muſt be covered with litter or old thatch, both to prevent its drying too faſt and to keep out wet. In this ſituation it ought to remain 8 or 10 days, when it will be in a proper temperature to receive the ſpawn. The covering of litter being now taken off, and the ſides of the bed ſmoothed, a covering of

light rich earth, about an inch thick, ſhould be laid all over the bed; but this ſhould not be wet. Upon this the ſpawn muſt be thruſt, laying the lumps 2 or 3 inches aſunder: then gently cover this with the ſame light earth, above half an inch thick; and put the covering of litter over the bed, laying it ſo thick as to keep out wet, and prevent the bed from drying. In ſpring or autumn the muſhrooms will begin to appear, perhaps in a month after making; but when the beds are made in ſummer or winter, they are much longer before they produce.—The difficulty of managing muſhroom-beds is, to keep them always in a proper degree of moiſture. In the ſummer ſeaſon they may be uncovered to receive gentle ſhowers of rain at proper times; and in long dry ſeaſons the beds ſhould now and then be watered, but much wet ought by no means to be ſuffered to come to them. During the winter ſeaſon they muſt be kept as dry as poſſible, and ſo cloſely covered as to keep out cold. For an extraordinary method of producing muſhrooms, ſee LYNCURIUS.

AGATE, or ACHAT (among the Greeks and Latins, Ἀχάτης, and *Achates*, from a river in Sicily, on the banks of which it was firſt found), a very extenſive genus of the ſemipellucid gems.

Theſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of cryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given, by the fluid they were formed in, to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of thoſe with a *white* ground there are 3 ſpecies. (1.) The *dendrachates mocoa ſtone*, or *arboreſcent agate*. This ſeems to be the ſame with what ſome authors call the achates with roſemary in the middle, and others achates with little branches of black leaves. (2.) The *dull, milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful ſtone. It is common on the ſhores of rivers in the Eaſt Indies, and alſo in Germany and ſome other parts of Europe. Our lapidaries cut it into counters for card playing, and other toys of ſmall value. (3.) The *lead-coloured agate*, called the *phaſſachates* by the ancients.

Of the agates with a *reddiſh* ground there are four ſpecies. (1.) An impure one of a fleſh-coloured white, which is but of little beauty in compariſon with other agates. It is found in Germany, Italy, and ſome other parts of Europe; and is wrought into toys and German gun-flints. (2.) That of a pure blood colour, called *hæmachates*, or the *bloody agate*, by the ancients. (3.) The clouded and ſpotted agate, of a pale fleſh colour, called by the ancients the *carnelian agate*, or *jard-achates*. (4.) The red-lead coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowiſh* ground there are only two known ſpecies; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very elegant ſtone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonteſeres* by the ancients.

Laſtly, Of the agates with a *greeniſh* ground, there is only one known ſpecies, called by the ancients *jaſpachates*.

Of all theſe ſpecies there are a great many varieties; ſome of them having upon them natural repreſentations of men and different kinds of animals, &c. A curious one is mentioned by De Boot, wherein appears a circle ſtruck in brown, as exactly as if done with a pair of compaſſes, and in the middle of the circle the exact figure of a biſhop with a mitre on; but inverting the ſtone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man, and the other of a woman. Agates have alſo been found, repreſenting the numbers 4191, 191; whence they were called *arithmetical* agates, as thoſe repreſenting men or women have obtained the name of *anthropomorphous*.

Agates may be ſtained artificially with ſolution of ſilver in ſpirit of nitre, which has rendered the curious figures they exhibit ſtrongly ſuſpected. Some account for theſe phenomena from natural cauſes: whilſt others reſolve much of the wonder into fancy, and ſuppoſe them formed in the ſame manner with the *cameux* or Florentine ſtones. See CAMIEUX.

The agate is uſed for making cups, rings, ſeals, handles for knives and forks, &c. being cut or ſawed with no great difficulty. Conſiderable quantities of theſe ſtones are ſtill found near the river Achates in Sicily. There are found in ſome of theſe the ſurpriſing repreſentations above-mentioned, or others ſimilar to them. By a dexterous management of the natural ſtains they contain, medals have been produced, which ſeem maſter-pieces of nature; for this ſtone bears the graver well; and as pieces of all magnitudes are found of it, they make all ſorts of work of it. The high altar of the cathedral of Meſſina is all over encruſted with it.

AGATE, among antiquaries, denotes a ſtone of this kind engraven by art. In this ſenſe, agates make a ſpecies of antique gems. Several of exquiſite beauty are preſerved in the cabinets of the curious; but the facts or hiſtories repreſented on theſe antique agates, however well executed, are now become ſo obſcure, and their explications ſo difficult, that ſeveral diverting miſtakes and diſputes have ariſen among thoſe who undertook to give their true meaning. In one which had been preſerved, from time immemorial, in one of the moſt ancient churches of France, two figures ſuppoſed to repreſent Adam and Eve, with a tree, a ſerpent, &c. proved to be Jupiter and Minerva, and bore an inſcription of a modern date, written in a Rabbinical character, very incorrect, and poorly engraven.

AGATE is alſo a name of an inſtrument uſed by gold-wire-drawers; ſo called from the agate in the middle of it.

AGAVE, the common American aloe; a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: No *calyx*: The *corolla* monopetalous and funnel-ſhaped; the border ſix-parted, with lanced erect diviſions: The *ſtamina* conſiſt of ſix erect filaments, longer than the corolla; the antheræ are linear, ſhorter than the filaments, and verſatile: The *piſtillum* is an oblong germen; the ſtylus is filiform, the length of the ſtamina, and triangular; the ſtigma headed and triangular: The *pericarpium* is an oblong triangular capſule, trilocular and three-valved: The *ſeeds* are numerous. Of this genus, botanical writers enumerate eight ſpecies.

Of the Americana, or great American aloe, the ſtems generally riſe upwards of 20 feet high, and branch out on every ſide towards the top, ſo as to form a kind of pyramid: the ſlender ſhoots being garniſhed with greeniſh yellow flowers, which ſtand erect, and come out in thick cluſters at every joint: theſe make a fine appearance, and continue long in beauty; a ſucceſſion of new flowers being produced for near three months in favourable ſeaſons, if the plant is protected from the autumnal colds. The ſeeds do not ripen in England. It has been generally thought, that theſe plants do not flower till they are 100 years old: but this is a miſtake; for the time of their flowering depends on their growth: ſo that in hot countries, where they grow faſt, and expand many leaves every ſeaſon, they will flower in a few years; but in colder climates, where their growth is ſlow, it will be much longer before they ſhoot up their ſtems. There is a variety

of this ſpecies, with ſtriped leaves, pretty common in the Engliſh gardens. The other ſorts are ſo tender, that they muſt conſtantly remain in the ſtove.

AGDE, a city of France, in Lower Languedoc; E. long. 3. 20. lat. 43. 19.

AGE, in the moſt general ſenſe of the word, ſignifies the duration of any being, from its firſt coming into exiſtence to the time of ſpeaking of it, if it ſtill continues; or to its deſtruction, if it has ceaſed to exiſt. Among the ancient poets, this word was uſed for the ſpace of thirty years; in which ſenſe, *age* amounts to much the ſame with *generation*. Thus, Neſtor is ſaid to have lived *three ages* when he was 90 years old.—Greek hiſtorians divided the time elapſed ſince the beginning of the world into three *ages*. 1. From the creation to the deluge; which they called the *obſcure* or *uncertain* age, becauſe the hiſtory of mankind is uncertain during that period. 2. The *fabulous* or *heroic* age, becauſe of the fabulous exploits of their gods and heroes. It began with the Ogygian deluge, and continued to the firſt Olympiad; where the 3d or *hiſtorical* age commenced.—This diviſion, however, it muſt be obſerved, holds good only with regard to the Greeks and Romans, who had no hiſtories earlier than the firſt Olympiad: the Jews, Egyptians, Phœnicians, and Chaldees, not to mention the Indians and Chineſe, who pretend to much higher antiquity, are not included in it.

By the poets, however, the interval ſince the firſt formation of man has been divided into four *ages*, diſtinguiſhed by the epithets of *golden*, *ſilver*, *brazen*, and *iron*; according to the progreſſive increaſe of vice and depravity in the world, and the conſequent decreaſe of happineſs among mankind.

In ſome ancient northern monuments, the *rocky* or *ſtony* age correſponds to the *brazen* age of the Greeks; and the northern poets ſtyle the 4th age of the world the *aſhen* age, from a Gothic king, who on account of his great ſtrength was ſaid to be made of aſh, or becauſe in his time weapons made of that wood were uſed.

Among the Jews, the duration of the world is alſo divided into three ages. 1. The *ſeculum inane*, or *void age*, was the ſpace of time from the creation to Moſes. 2. The *preſent* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world.

Various other diviſions of the duration of the world into *ages* have been made by hiſtorians.—The Sibylline oracles divide the duration of the world into ten *ages*; and according to Joſephus, each age contained 600 years. It appears, by Virgil's 4th eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration.

By ſome, the ſpace of time commencing from Conſtantine, and ending with the taking of Conſtantinople by the Turks in the 15th century, is called the *middle age*: but others date it from the diviſion of the empire made by Theodoſius at the cloſe of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was firſt divided into circles.—The *middle* is by ſome denoted the *barbarous* age, and the latter part of it the *loweſt* age. Some divide it into the *non-academical* and *academical* ages. The firſt includes the ſpace of time from the 6th to the 9th century, during which ſchools or academies were loſt in Europe. The ſecond from the 9th century, when ſchools were reſtored, and univerſities eſtabliſhed by Charlemagne.

The ſeveral *ages* of the world may be reduced to three grand epochas, *viz.* the *age* of the law of nature, called by the Jews the *void age*, from Adam to Moſes; the *age* of the Jewiſh law, from Moſes to Chriſt; and the *age* of grace, from Chriſt to the preſent year.

AGE is alſo frequently uſed in the ſame ſenſe with *century*, to denominate a duration of 100 years.

AGE likewiſe ſignifies a certain period of the duration of human life; by ſome divided into four ſtages, namely, infancy, youth, manhood, and old age; the firſt extending to the 14th year, the ſecond to the 25th, the third to the 50th, and the fourth to the end of life: by others divided into infancy, childhood, youth, manhood, and old age.

AGE, in law, ſignifies a certain period of life, when perſons are enabled to do certain acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chooſe his own guardian, and claim his lands held in ſoccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themſelves.

AGE *of a Horſe*. See HORSE.

AGE *of Trees*. Theſe after a certain age waſte. An oak at 100 years old ceaſes to grow. The *age* of wood is calculated by the number of circles which appear in the ſubſtance of a trunk or ſtock cut horizontal, each circle being ſuppoſed the growth of a year; but ſome reject this as precarious, and allege, that a ſingle circle is ſometimes the produce of ſeveral years; beſides that, after a certain age, no new circles are formed.

AGE-*prier*, in law, is when an action being brought againſt a perſon under age, for lands deſcended to him, he, by motion or petition, ſhews the matter to the court, praying the action may be ſtaid till his full age, which the court generally agrees to.

AGEMA, in Macedonian antiquity, was a body of ſoldiery, not unlike the Roman legion.

AGEMOGLANS, AGIAMOGLANS, or AZAMOGLANDS, in the Turkiſh polity, are children purchaſed from the Tartars, or raiſed for the purpoſes of war every third year, by way of tribute, from the Chriſtians tolerated in the Turkiſh empire. From this corps the janiſſaries are recruited; but their appointments are very ſmall, not exceeding ſeven aſpers and a half (about $3\frac{1}{2}$d) per day.

AGEN, a city of France, on the river Garonne, the capital of Agenois in Guienne; E. long. 0. 30. N. lat. 44. 12.

AGENDA, with philoſophers and divines, ſignifies the duties a man lies under an obligation to perform: we meet with this in oppoſition to the *credenda*, or things he is to believe.

AGENDA, among merchants, a term ſometimes uſed for a memorandum-book, in which is ſet down all the buſineſs to be tranſacted during the day, either at home or abroad.

AGENDA, among eccleſiaſtical writers, denotes the ſervice or office of the church. We meet with *agenda matutina & veſpertina*, "morning and evening prayers;" *agenda mortuorum*, called alſo ſimply *agenda*, "the ſervice of the dead;" &c.

AGENDA is alſo applied to certain church-books, compiled by public authority, preſcribing the order of the principal ceremonies and devotions of the church. In which ſenſe *agenda* amounts to the ſame with what is otherwiſe called *ritual*, *liturgy*, *acaloutbia*, *miſſal*, *formulary*, *directory*, &c.

AGENHINE, in our old writers, ſignified a gueſt that had lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his hoſt was anſwerable for him. It is alſo written HOGENHINE and HOGENHYNE.

AGENT, in a general ſenſe, denotes any active power or cauſe. Agents are either natural or moral. Natural agents are ſuch inanimate bodies as have a power to act upon other bodies in a certain and determinate manner; as, gravity,

fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

AGENT is alſo uſed to denote a perſon intruſted with the management of an affair, whether belonging to a ſociety, company, or private perſon.

AGENTES *in rebus*, one of the ranks of officers in the court of the Conſtantinopolitan emperors, whoſe buſineſs was that of a courier and meſſenger, and alſo of a general inſpector or comptroller of the provinces. In caſe of plots or diſturbances he was to give early notice thereof to the emperor.—The *agentes in rebus* are by ſome made ſynonymous with our poſtmaſters, but their functions were of greater extent. They correſpond to what the Greeks call περιφοροι and the Latins *veredarii*.—There were various degrees of them; as, *tribuni*, *primiceriі*, *ſenatores*, *ducenarii*, *biarchi*, *circuitores*, *equites*, *tyrones*, &c.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See AGRARIAN LAW.

AGERATUM, BASTARD HEMP-AGRIMONY: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The characters are: The common *calyx* oblong, with many ſcales. The compound *corolla* uniform; the corollets hermaphrodite, tubular, and numerous: the proper corolla is funnel-ſhaped; the border 4-cleft, and expanded. The *ſtamina* conſiſt of 5 capillary very ſhort filaments; the anthera is cylindric and tubular. The *piſtillum* is an oblong germen; with a filiform ſtylus, and two ſlender erect ſtigmata. There is no *pericarpium*; the *calyx* unchanged. The *ſeeds* are ſolitary, oblong, and angular. The *receptaculum* is naked, convex, and very ſmall. Of this genus there are three

Species; the conyzoides, the houſtonianum, and the altiſſimum. All theſe are natives of warm climates. The two firſt are annual plants, and conſequently can be propagated only by ſeeds; which, however, come to perfection in this country. The third ſpecies will bear the ſevereſt cold of this country, but its ſeeds do not ripen in it.

AGERATUM, or MAUDLIN. See ACHILLÆA.

AGGA, or AGGONNA, a Britiſh ſettlement on the gold coaſt of Guinea; ſituated under the meridian of London, in 6 degrees of N. lat.

AGGER, in the ancient military art, a work of fortification, uſed both for the defence and the attack of towns, camps, &c. In which ſenſe it is the ſame with what was otherwiſe called *vallum*, and in latter times *aggeſtum*; and among the moderns *lines*, ſometimes *cavaliers*, *terraſſes*, &c. The agger was uſually a bank, or elevation of earth or other matter, bound and ſupported with timber; having ſometimes turrets on the top, wherein the workmen, engineers, and ſoldiery were placed. It was alſo accompanied with a ditch, which ſerved as its chief defence. The uſual materials of which it was made were earth, boughs, faſcines, ſtakes, and even trunks of trees, ropes, &c. variouſly croſſed, and interwoven ſomewhat in the figure of ſtars; whence they were called *ſtellati axes*. The beſiegers uſed to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken on the other ſide, to defeat them, were by fire, eſpecially if the agger were of wood; by ſapping and undermining, if of earth; and in ſome cafes, by erecting a counter agger. Cæſar tells us of one he made, which was 30 feet high and 330 feet broad.

AGGER, in ancient writers, denotes the middle part of a military road, raiſed into a ridge, with a gentle ſlope on either ſide, to make a drain for the water, and keep the way dry.—The term is alſo uſed for the whole road or military way—Our *cauſeways* are the *aggeres calceati* of the Romans.

AGGERHUYS, a city of Norway, capital of the province of the ſame name. E. long. 28. 35. and N. lat. 59. 30.

AGGERS-HERRED, a diſtrict of Chriſtianſand, and a dioceſe of Norway. It conſiſts of three juridical places.

AGGLUTINANTS, in pharmacy; medicines of a glutinous or viſcid nature, which have been erroneouſly ſuppoſed to adhere to and ſtrengthen the ſolids.

AGGLUTINATION, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among medical men, implies the action of re-uniting the parts of a body, as a freſh wound is united by what is called the firſt intention. It is alſo applied to the action of internal medicines which have been called Agglutinants.

AGGREGATE, in a general ſenſe denotes the ſum of ſeveral things added together, or the collection of them into one whole. It differs from a mixed or compound, inaſmuch as the union of theſe laſt is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term uſed to expreſs thoſe flowers, which are compoſed of parts or florets, ſo united by means either of the receptacle or calyx, that no one of them can be taken away without deſtroying the form of the whole. They are oppoſed to ſimple flowers, and are uſually divided into ſeven kinds, viz. the *aggregate*, properly ſo called, whoſe receptacle is dilated, and whoſe florets are ſupported by foot-ſtalks; the *compound*; the *umbellati*; the *cymoſe*; the *amentaceous*; the *glumoſe*; and the *ſpadiceous*.

AGGREGATION, in phyſics, a ſpecies of union, whereby ſeveral things which have no natural connection are made to conſtitute one. Thus, a heap of ſand, or a maſs of ruins, are bodies by aggregation.

AGHER, a town of Ireland, ſituated in the ſouthern part of Ulſter, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, ſituated about 13 miles ſouth-weſt of Wicklow.

AGIADES, in the Turkiſh armies a kind of pioneers employed in fortifying camps, ſmoothing of roads, &c.

AGILITY, an aptitude of the ſeveral parts of the body to motion.—It was one of the chief objects of the inſtitution of games and exerciſes.

AGINCOURT, a village of the French Netherlands, E. long. 2. 10. N. lat. 50. 35; famous for the victory of Henry V. in 1415.

AGIO, in commerce, is a term chiefly uſed in Holland, and at Venice, to ſignify the difference between the value of bank-ſtock and the current coin.

AGIOSYMANDRUM, a wooden inſtrument uſed by the Greek and other churches under the dominion of the Turks, to call together aſſemblies of the people. The *agioſymandrum* was introduced in the place of bells, which the Turks prohibited their Chriſtian ſubjects the uſe of, leſt they ſhould make them ſubſervient to ſedition.

AGISTMENT, AGISTAGE, or AGISTATION, in law, the taking in other people's cattle to graze at ſo much *per* week. The term is peculiarly uſed for the taking cattle to feed in the king's foreſts, as well as for the profits ariſing from that practice. It is alſo uſed, in a metaphorical ſenſe, for any tax, burden, or charge; thus, the tax levied for repairing the banks of Romney-marſh was called *agiſtamentum*.

AGISTOR, or AGISTATOR, an officer belonging to foreſts, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are gene-

rally called *queſt-takers* or *giſt-takers*, and are created by letters-patent. Each royal foreſt has four agiſtors.

AGITATION, in phyſics, an inteſtine commotion of the parts of a natural body.—It is one of the chief inſtruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, ſanguification is in a good meaſure effected.—Agitation is alſo uſed in medicine for a ſpecies of exerciſe popularly called *ſwinging*.

AGITATOR, in antiquity, a term uſed for a charioteer, eſpecially one who drove in the circus at the curule games.

Agitators, in the Engliſh hiſtory, certain officers ſet up by the army in 1647, to take care of its intereſts.—Cromwell, after having joined the agitators, got them aboliſhed.

AGLAIA, the name of the youngeſt of the three Graces, eſpouſed to Vulcan.

AGMEN, in antiquity, properly denotes a Roman army in march: in which ſenſe it ſtands contradiſtinguiſhed from *acies*, which denoted the army in battle array; though, on ſome occaſions, we find the two words uſed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anſwering to our vanguard; *medium agmen*, our main-body; and *poſtremum agmen*, the rear-guard.

AGNATE, in law, any male relation by the father's ſide.

AGNEL, an ancient French gold coin, firſt ſtruck under the reign of St. Louis, worth about twelve ſols ſix deniers. The agnel is alſo called ſometimes *mouton d'or*, and *agnel d'or*, from the figures ſtruck on one ſide.

AGNELET, an ancient French ſilver coin, worth about 20 ſols, firſt ſtruck under Philip le Bel.

AGNO, a river of Naples, which falls into the Mediterranean, about 7 miles north of Puzzuoli.

AGNOETÆ, from ἀγνοεω to be *ignorant* of; in church-hiſtory, a ſect of ancient heretics, who maintained that Chriſt, conſidered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a perſon on account of ſome extraordinary action, virtue, or accompliſhment. Thus the agnomen *Africanus* was beſtowed on Publius Cornelius Scipio, on account of his great achievements in Africa.—The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the *agnomen*.

AGNUS, or Lamb, in zoology, the young of the ovis or ſheep. See Ovis.

Agnus *Caſtus*, in botany, the trivial name of a ſpecies of the Vitex. The Greeks call it ἁγνὸς *chaſte*. It was famous among the ancients as a ſpecific for the preſervation of chaſtity, and the Athenian ladies, who made profeſſion of chaſtity, lay upon leaves of *agnus caſtus* during the feaſts of Ceres.

Agnus *Dei*, in the church of Rome, a cake of wax ſtamped with the figure of a lamb ſupporting the banner of the croſs. Theſe being conſecrated by the pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; as, to preſerve thoſe who carry them worthily and with faith, from all manner of accidents; to expel evil ſpirits, &c. The name literally ſignifies *Lamb of God*; this being ſuppoſed an image or repreſentation of the Lamb of God who took away the ſins of the world. It is one among the many exiſting engines of Romiſh prieſtcraft. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *præmunire*; 13 Eliz. cap. 2.

Agnus *Dei* is alſo a popular name for that part of the maſs wherein the prieſt, ſtriking his breaſt three times, rehearſes, with a loud voice, a prayer beginning with the words *Agnus Dei*.

Agnus *Scythicus*. See *Scythian* Lamb.

AGOGE, among ancient muſicians, a ſpecies of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any diſpute or conteſt, whether it had regard to bodily exerciſes, or the accompliſhments of the mind; and therefore poets, muſicians, painters, &c. had their agones, as well as the athletæ. Games of this kind were celebrated at moſt of the heathen feſtivals, with great ſolemnity, either annually, or at certain periods of years.

Agon alſo ſignifies one of the miniſters in the Heathen ſacrifices, whoſe buſineſs it was to ſtrike the victim. Standing ready to give the ſtroke, he aſked, *Agon'?* or *Agone?* Shall I ſtrike?

AGONALES, an epithet given to the Salii.

AGONALIA, in Roman antiquity, feſtivals, in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or diſpute.

AGONISTARCHA, from ἀγων combat, and ἀρχος chief, in antiquity, ſeems to have been much the ſame with *agonotheta*; though ſome ſuggeſt a difference, making it the office of the former to preſide at and direct the preliminary exerciſes of the athletæ.

AGONISTICI, in church hiſtory, a name given by Donatus to ſuch of his diſciples as in public places propagated his doctrines; for which reaſon they were alſo called *Circuitores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome *Montenſes*.

AGONIUM, in Roman antiquity, was uſed for the day on which the *rex ſacrorum* ſacrificed a victim; and for the place where the games were celebrated otherwiſe called *agon*.

AGONOTHETA, or Agonothetes, in Grecian antiquity, the preſident or ſuperintendant of the ſacred games; who defrayed the expences attending them, inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONYCLITÆ, or Agonyclites, in church-hiſtory, a ſect of Chriſtians, in the 7th century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to ſuch deities as had ſtatues in the market places; particularly Mercury, whoſe ſtatue was to be ſeen in almoſt every public place.

AGORANOMUS, in Grecian antiquity, a magiſtrate of Athens who had the regulation of weights and meaſures, the prices of proviſions, &c. To the *agoranomi* a certain toll or tribute was paid by all who brought any thing to ſell in the market.

AGOUTI, or Aguti. See Mus.

AGRA, the capital town of a province of the ſame name, in Indoſtan; E. long. 79. 12. N. lat. 26. 29.

AGRARIAN laws, among the Romans, were thoſe relating to the diviſion and diſtribution of lands, of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbance.—Several have pleaded for the ne-

ceſſity of agrarian laws among us: but no author has entered ſo deeply into the ſubject as Mr. Harrington in his *Oceana*.

AGREDA, a town of Spain, in Old Caſtile, near the frontiers of Arragon; about 3 leagues S. W. of Taracon.

AGRIA, called by the Germans *Eger*, is a ſmall but ſtrong town in Upper Hungary; 47 miles N. E. of Buda, and 55 S. W. of Caſſovia. E. long. 20. 10. N. lat. 48. 10.

AGRICULTURE. The cloſe connexion between this ſubject and HUSBANDRY, induces us to refer the reader to the latter article for a complete treatiſe on both ſubjects. We are indeed led to this determination from the proſpect we have of being favoured, in the interim, with a valuable ſupply of original matter.

AGRIFOLIUM, or AQUIFOLIUM. See ILEX.

AGRIMONIA, AGRIMONY: A genus of the digynia order, belonging to the dodecandria claſs of plants; and in the natural method ranking under the 35th order, *Senticoſæ*. The characters are: The *calyx*, a monophyllous perianthium, divided into five acute ſegments, perſiſtent, and fenced with another calyx: The *corolla* conſiſts of five petals, flat, and crenated at the ends: The *ſtamina* have ten capillary filaments, ſhorter than the corolla, and inſerted into the calyx: the antheræ are ſmall, didymous, and compreſſed: The *piſtillum* has a germen beneath; the ſtyli are two, ſimple, and the length of the ſtamina: There is no *pericarpium*; the calyx is contracted in the neck, and indurated: The *ſeeds* are two, and roundiſh. Of this genus there are five ſpecies enumerated by botanical writers; but none of them have any remarkable properties except the two following. Theſe ſpecies are: 1. The eupatoria, or common agrimony, which grows naturally in ſeveral parts of Britain by the ſides of hedges, and of woods. 2. The odorata, or ſweet-ſcented agrimony. This grows near four feet high; the leaves have more pinnæ than the former; the ſerratures of the leaves are alſo ſharper, and, when handled, they emit an agreeable odour. Both theſe may be propagated either by ſeed, or by parting the roots in autumn when the leaves begin to decay; but the plants ſhould not be placed nearer one another than two feet. To common agrimony ſome have attributed great medical virtues, but the uſe of it is entirely laid aſide.

Hemp-AGRIMONY. See EUPATORIUM.

Water Hemp-AGRIMONY. See BIDENS.

AGRIONIA, in Grecian antiquity, feſtivals annually celebrated by the Bœotians in honour of Bacchus.

AGRIOPHAGI, in antiquity, a name given to thoſe who fed on wild beaſts. The word is Greek, compounded of αγριος wild, ſavage, and φαγω I eat.

AGRIPPA, in Midwifery, a term anciently applied to children brought forth with their feet foremoſt.

AGRIPPINIANS, in church-hiſtory, the followers of Agrippinus biſhop of Carthage, in the third century, who firſt introduced and defended the practice of re-baptization.

AGROM, a diſeaſe frequent in Bengal and other parts of the Eaſt Indies, wherein the tongue chaps, cleaves in ſeveral places, and is ſometimes covered with white ſpots. The Indians, by way of a remedy, chew the black-ſeeded baſilica, or drink ſome chalybeate liquor, or the juice of mint.

AGROSTEMA, WILD LYCHNIS, or CAMPION: A genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* a ſingle-leaved perianthium, leathery, tubular, quinquedentated, and perſiſtent: The *corolla* conſiſts of five ungulated petals: The *ſtamina* have ten ſubulated filaments; the antheræ are ſimple: The *piſtillum* has an egg-ſhaped germen; the ſtyli are five, filiform, erect, and the length of the ſtamina; the ſtigmata are ſimple: The *pericarpium* is an oblong covered capſule, having two cells and five valves: The *ſeeds* are numerous and kidney-ſhaped; the receptacula are as many as the ſeeds, the interior ones gradually longer.—The moſt remarkable ſpecies are, 1. The githago, hairy wild lychnis, or common campion, which grows naturally in corn-fields in moſt parts of Britain. 2. The coronaria, or ſingle roſe campion, of which ſpecies there are 4 varieties. 3. The flos jovis, or umbelliferous mountain-campion, which grows naturally upon the Helvetian mountains.

AGROSTIS, BENT-GRASS, in botany: A genus of the triandria order, belonging to the digynia claſs of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are: The *calyx* a one-flowered, two-valved, pointed gluma, rather leſs than the corolla. The *corolla* is two-valved and pointed. The *ſtamina* have 3 capillary filaments, which are larger than the corolla. The *antheræ* are forked. The *piſtillum* has a roundiſh germen; the ſtyli are two, reflected, and villous; the ſtigmata hiſpid longitudinally. The *pericarpium* is the corolla growing to the ſeed, not gaping. The *ſeed* is one, globular, and pointed at both ends. There are 15 ſpecies; 8 of them natives of Britain.

AGROSTOGRAPHIA, ſignifies the hiſtory or deſcription of graſſes. See GRASS.

AGROUND, the ſituation of a ſhip whoſe bottom hangs or reſts upon the ground, ſo as to render her immoveable.

AGRYPNIA, αγρυπνια, a privation of ſleep; otherwiſe called vigiliæ, pervigilium, &c.

AGRYPNIA, in the Greek church, implies the vigil of any of the greater feſtivals of the monks and clergy.

AGUE, a general name for all periodical fevers, which, according to the returns of the feveriſh paroxyſm, are denominated tertian, quartan, or quotidian.

AGUE-*Cake*, the vulgar name for a hard tumour on one ſide of the belly, ſaid to be the effect of intermittent fevers.

AGUE-*Tree*, a name given to the ſaſſafras, on account of its febrifuge qualities.

AGUEPERSE, a town of France, ſituated on the Lyonnois, about 15 miles north of Clermont.

AGUILLANEUF, or AUGILLANEUF, a form of rejoicing uſed among the ancient Franks on the firſt day of the year. The word is compounded of the French *a* to, *gui* miſſeto, and *l'an neuf* the new year. Its origin is traced from a druid ceremony; in which the prieſts uſed to go yearly in December, with them a ſacred month, to gather miſſeto of the oak. In latter times the name *Aguillaneuf* was alſo given to a ſort of begging, practiſed in ſome dioceſes, for church-tapers, on new year's day, by a troop of young people of both ſexes, having a chief. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occaſioned its ſuppreſſion.

AGUILLAR, a town of Spain, in the province of Navarre, about 24 miles weſt of Eſtella.

AGUILLAR *Del Campo*, a town of Old Caſtile with the title of marquiſate, about 15 leagues N. of the city of Burgos.

AGUL, in botany, a ſynonime of the hedyſarum. See HEDYSARUM.

AGURAH, in Jewiſh antiquity, the name of a ſilver coin, otherwiſe called *gerah* and *keſhita*.

AGUSADURA, anciently, a fee due from vaſſals to their lord for ſharpening their ploughing tackle. The tenants in ſome manors were not allowed to have their rural implements ſharpened by any but whom the lord appointed, and for which an acknowledgment was to be paid, called *Agu ſadura*, in ſome places *Aguſage*; which ſome take to be the ſame with what was otherwiſe called *Reillage*, from the ancient French *reille*, a ploughſhare.

AGUTI, in zoology, the trivial name of a ſpecies of

mouſe, belonging to the mammalia glires of Linnæus. See Mus.

AGYEI, in antiquity, a kind of obeliſks, ſacred to Apollo, erected in the veſtibules of houſes, by way of ſecurity.

AGYNIANI, in church-hiſtory, a ſect who condemned all uſe of fleſh, and marriage, as not inſtituted by God, but introduced at the inſtigation of the devil. The word is compounded of the privative α and γυνη *woman*. They are ſometimes alſo called *Agynnenſes*, and *Agynii*; and are ſaid to have appeared about the year 694.

AGYRTÆ, in antiquity, a kind of fortune tellers who pretended to cure diſeaſes by charms, ſacrifices, and religious myſteries; alſo to expiate the crimes of their deceaſed anceſtors, by virtue of certain odours and fumigations; to torment their enemies, by the uſe of magical verſes, &c. The word is Greek Α γύρτης, formed of the verb ἀγύρω *I congregate*; alluding to the crowds they gathered about them. *Agyrtæ*, among the Greeks, amount to the ſame with *Æruſcatores* among the Latins, and differ not much from Gypſies among us.

AHÆTULA, the trivial name of a ſpecies of the coluber. See Coluber.

AHEAD, a ſea-term, ſignifying further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip. See Astern.

AHICCYATLI, in zoology, the Indian name of a ſerpent, reſembling the rattleſnake, only it wants the rattles. It is as fatal in the effect of its poiſon as any known ſpecies of ſerpent.

AHMELLA, in botany. See Bidens.

AHOUAI, in botany, a ſynonime and alſo the trivial name of a ſpecies of Cerbera.

A-HULL, in the ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when, having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AHUN, a town in France, in the Upper Marche and generality of Moulins. E. long. 2. 8. N. lat. 49. 5.

AHUYS, a town of Sweden; about 18 miles from Chriſtianſtadt. E. long. 14. 10. N. lat. 56. 20.

AJAN, a coaſt and country of Africa. The whole ſea-coaſt, from Zanguebar to the Streight of Babelmandel, is called the coaſt of Ajan; and a conſiderable part of it is ſtyled the Deſert-coaſt.

AJAX, in antiquity, a furious kind of dance, in uſe among the Grecians; intended to repreſent the madneſs of that hero after his defeat by Ulyſſes, to whom the Greeks had given the preference in his conteſt for Achilles's arms. Lucian, in his treatiſe of Dancing, ſpeaks of dancing the *Ajax*.

AJAZZO, a ſea-port town of the iſland of Corſica, in the Mediterranean. Long. 26. 35. lat. 41. 40.

Ajazzo, a ſea-port town of Natolia, in the province of Caramania, anciently Sileſia, on the coaſt of the Mediterranean. Long. 33. 10. lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia. E. long. 11. 10. N. lat. 49. 0.

AICUROUS, a ſpecies of parrot. See Psittacus.

AID, in law, denotes a petition made in court to call in help from another perſon who has intereſt in land, or any other thing conteſted:

Aid-*de-camp*, in military affairs, an officer employed to receive and carry the orders of a general.

Aid, *Auxilium*, in ancient cuſtoms, a ſubſidy paid by vaſſals to their lords on certain occaſions. Such were the aid of relief, paid upon the death of the lord meſne to his heir; the *aid cheval*, or capital aid, due to the chief lord on ſeveral occaſions, as to make his eldeſt ſon a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French cuſtoms, certain duties paid on all goods exported or imported into that kingdom.

Court of Aids, in France, a ſovereign court exiſting before the revolution, in ſeveral cities, which had cognizance of all cauſes relating to the taxes, gabells, and aids, impoſed on different commodities, eſpecially wine.

Aids, in the manege, are the ſame with what ſome writers called *cheriſhings*, and uſed to avoid the neceſſity of corrections—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIGHENDALE, the name of a liquid meaſure uſed in Lancaſhire, containing ſeven quarts.

AIGLE, a bailiwick in the territory of Romand in Switzerland, through which is the great road from Vallais into Italy.

Aigle, a ſmall town, in France, in Upper Normandy, 23 miles from D'Evereux, and 38 from Rouen. E. long. 1. 5. N. lat. 48. 35.

AIGUILLON, a ſmall town of France in the province of Guienne, ſituated at the conflux of the rivers Garonne and Lot.

AIGUISCE, in heraldry, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles. It differs from the croſs fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AILE, in law, a writ which lies where a perſon's grandfather or great-grandfather was ſeiſed of lands, &c. in fee-ſimple, the day that he died, and a ſtranger abates and enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AILESBURY, Aylesbury, or Alesbury, a borough town in Buckinghamſhire; 60 miles S. E. of Buckingham, and 44 N. W. of London. W. long. 0. 40. N. lat. 51. 40.

AIR, in natural philoſophy. See Aerology, Atmosphere, Pneumatics, &c.

Impregnation of Water with Fixed Air, *and with Sulphureous* Air. *See* Mineral *Waters*.

Air, in medicine, conſtitutes one of the ſix non-naturals. A new ſyſtem of treating diſeaſes by applying different kinds of air to the lungs has lately been introduced under the name of pneumatic medicine; but experience has not yet decided on its merits.

Circulation of Air *in Rooms*. To render the circulation of air ſenſible, let the air of a room be heated by a ſtrong fire, whilſt the air of a contiguous room is cold; then let the door between theſe two rooms be opened, in which caſe the hot air of one room being lighter, will paſs through the upper part of the opening of the door into the cold room; and, on the contrary, the cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; whilſt in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the ſame reaſon that when the fire is lighted in a chimney, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall opening, if the doors and windows are ſhut; for the air over the fire being heated, becomes lighter, and aſcends into the chimney, conſequently other

colder air muſt ſupply its place, which forces its way through all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome; ſo that thoſe perſons miſtake who expect to benefit a convaleſcent, by accurately ſtopping all the openings that admit freſh air. When the current of air indeed falls immediately upon the perſon in queſtion, it is no doubt injurious; but at the ſame time a proper degree of ventilation ſhould be allowed.

AIR Balloons, a general name given to bags of any light ſubſtance filled with inflammable air, or other permanently elaſtic fluid, whoſe ſpecific gravity is conſiderably leſs than that of common atmoſpheric air. See Aerostation.

Air-*Bladder*, in fiſhes. See Comparative Anatomy, and Ichthyology.

Air-*Gun*, a pneumatic machine for exploding bullets, &c. The common air-gun is made of braſs, and has two barrels; the inſide barrel A, (pl. 2, fig. 10.) which is of a ſmall bore, from whence the bullets are exploded; and a large barrel ECDR on the outſide of it. There is a ſyringe SMP fixed in the ſtock of the gun, by which the air is injected into the cavity between the two barrels through the valve EP. The ball K is put down into its place in the ſmall barrel, with the rammer, as in any other gun. At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, ſo as to drive it forwards. If this valve be opened and ſhut ſuddenly, one charge of condenſed air may be ſufficient for ſeveral diſcharges of bullets; but if the whole air be diſcharged on one ſingle bullet, it will drive it out with a greater force. This diſcharge is effected by means of a lock, fig. 13. placed as in other guns; for the trigger being pulled, the cock will go down and drive the lever O, fig. 10, which will open the valve, and let in the air upon the bullet K.

Air-guns of late years have been much improved in their conſtruction. Fig. 11. repreſents one made by the late Mr. B. Martin, which, for ſimplicity and perfection, exceeds all others. A is the barrel, with the lock, ſtock, ram-rod, &c. of the ſize and weight of a common fowling-piece. Under the lock at *b*, is a round ſteel tube, having a ſmall moveable pin in the inſide, which is puſhed out when the trigger *a* is pulled, by the ſpring-work within the lock; to this tube *b*, a hollow copper ball *c* ſcrews, perfectly air-tight. This copper ball is fully charged with condenſed air by the ſyringe B (fig. 9.) previous to its being applied to the tube *b* of fig. 11. It is then evident, that if a bullet be rammed down in the barrel, the copper ball ſcrewed faſt at *b*, and the trigger *a* be pulled, that the pin in *b* will, by the action of the ſpring-work within the lock, forcibly ſtrike out into the copper ball: and thereby puſhing in ſuddenly a valve within the copper ball, let out a portion of the condenſed air; which air will ruſh up through the aperture of the lock, and forcibly act againſt the bullet, driving it to the diſtance of 60 or 70 yards, or further. If the air is ſtrongly condenſed, at every diſcharge only a portion of the air eſcapes from the ball; therefore, by re-cocking the piece, another diſcharge may be made; and this repeated to the amount of 15 or 16 times. An additional barrel is ſometimes made, and applied for the diſcharge of ſhot, inſtead of the one above deſcribed.

The air in the copper ball is condenſed by means of the ſyringe B (fig. 9.), in the following manner. The ball *c* is ſcrewed quite cloſe on the top of the ſyringe. At the end of the ſteel-pointed rod *a*, is a ſtout ring, through which paſſes the rod *k*: upon this rod the feet ſhould be firmly ſet; then the hands are to be applied to the two handles *ii*, fixed on the ſide of the barrel of the ſyringe. Now by moving the barrel B ſteadily up and down on the rod *a*, the ball *c* will become charged with condenſed air; and it may be eaſily known when the ball is as full as poſſible, by the irreſiſtible action that the air makes againſt the piſton when you are working the ſyringe. At the end of the rod *k* is uſually a four ſquare hole, which with the rod ſerves as a key to faſten the ball *c* faſt on the ſcrew *b* of the gun and ſyringe cloſe to the orifice in the ball *c*. In the inſide is fixed a valve and ſpring, which gives way for the admiſſion of air; but upon its emiſſion comes cloſe up to the orifice, ſhutting up the internal air. The piſton-rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn up, the air will ruſh in at the hole *b*. When the barrel is puſhed down, the air therein contained will have no other way to paſs from the preſſure of the piſton but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condenſation is ſo ſtrong as to reſiſt the action of the piſton.

Sometimes the ſyringe is applied to the end of the barrel C (ſee fig. 12.); the lock and trigger ſhut up in a braſs caſe *d*; and the trigger pulled, or diſcharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condenſed air at the end of the ſyringe at *e*, and it has a valve acting in a ſimilar manner to that of the copper ball. When this inſtrument is not in uſe, the braſs caſe *d* is made to ſlide off, and the inſtrument then becomes a walking-ſtick; from which circumſtance, and the barrel being made of cane, braſs, &c. it has received the appellation of the *Air-cane*. The head of the cane unſcrews and takes off at *a*, where the extremity of the piſton-rod in the barrel is ſhown: an iron rod is placed in a ring at the end of this, and the air condenſed in the barrel in a ſimilar manner to that of the gun as above; but its force of action is not near ſo ſtrong and permanent as that of the latter.

The *Magazine Air-gun* was invented upon the ſame principle as the foregoing, by that ingenious artiſt L. Colbe. By this contrivance ten bullets are ſo lodged in a cavity, near the place of diſcharge, that they may be drawn into the ſhooting-barrel, and ſucceſſively diſcharged ſo faſt as to be nearly of the ſame uſe as ſo many different guns.

Air-*Jacket*, a ſort of jacket made of leather, in which are ſeveral bags or bladders, compoſed of the ſame materials, and communicating with each other. By the help of theſe bladders, which are placed near the breaſt, the wearer is ſupported in any water, without making any effort to ſwim.

Air-*Pipes*, an invention for drawing foul air out of ſhips, or any other cloſe places, by means of fire. Theſe pipes were firſt found out by one Mr. Sutton, a brewer in London; and from him have got the name of *Sutton's Air-Pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is neceſſary for the ſupport of fire; and, if it has not acceſs from the places moſt adjacent, will not fail to come from thoſe that are more remote. The account of this machine communicated to the Royal Society by Doctor Mead, amounts to this:—"As, in every ſhip of any bulk, there is already provided a copper or boiling-place proportionable to the ſize of the veſſel; it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling-places for the neceſſary uſes of the ſhip.

"It is well known, that, under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fire, and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire-place upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip.

"It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the conſtant draught of air through the fore-mentioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out.

" But if, after ſhutting up the above-mentioned holes, another hole be opened, communicating with any other room or airy place, and with the fire, it is clear, the ſaid fire muſt again be raiſed and burn as before, there being a like draught of air through the ſame as there was before the ſtopping up of the firſt holes: this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place.

" It is therefore propoſed, that in order to clear the holds of ſhips of the bad air therein contained, the two holes abovementioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron doors; and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air therein contained; and conſequently, that that air, ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold: whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration.

" And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively either with the well or lower decks, it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."

This account is ſo plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned through thoſe places where it would otherwiſe be moſt apt to ſtagnate. Several other contrivances have been recommended for the ſame purpoſe, by Doctor Hales, Mr. Deſaguliers, and others; but none of them poſſeſs the advantages of Mr. Sutton's invention.

AIR-*Pump*, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. See PNEUMATICS.

AIR-*Trunk*; a contrivance of Doctor Hales to prevent the ſtagnation of putrid effluvia in places where a great number of people are crowded together in a ſmall ſpace. It conſiſts only of a long ſquare trunk, open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on; and the reaſon why vapours of this kind aſcend more ſwiftly through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to their different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. See HYDROSTATICS. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing on the upper end of the trunk, and that which preſſes on the lower end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter.—One pan of a ſingle pair of ſcales, which was two inches in diameter, being held within one of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than 12 grains were requiſite to reſtore the equilibrium; which clearly ſhows that theſe trunks muſt be of real and very great efficacy.

AIR-*Sacs*, in birds. See COMPARATIVE ANATOMY.

AIR-*Shafts*, among miners, denote holes or ſhafts let down from the open air to meet the adits and furniſh freſh air. The damps, want and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air-ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard of their vaſt depths, hardneſs of the rock, drawing of water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit.

AIR-*Threads*, in natural hiſtory, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air. Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field-ſpider; which, having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting it in the air.

AIR-*Veſſels*, are ſpiral ducts in the leaves of a plant ſuppoſed to be analogous to the lungs of an animal, in ſupplying it with air. See the article PLANTS.

AIR, in painting, &c. denotes the manner and very life of action; or it is that which expreſſes the diſpoſition of the agent. It is ſometimes alſo uſed in a ſynonymous ſenſe with geſture or attitude.

AIR, in muſic, is taken in different ſenſes. It is ſometimes contraſted with harmony, and made ſynonymous with melody in general. Its proper meaning is, a tune ſet to words, or to ſhort pieces of poetry called *ſongs*. In operas, we give the name of *air* to ſuch pieces of muſic as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an *air*, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone. If the ſubject admits of harmony, and is ſet in parts, the *air* is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. The curious may conſult the *Dictionnaire de Muſique*, by M. Rouſſeau, on this ſubject.

AIR, or *Ayr*, in geography, a town of Scotland, capital of an extenſive county of the ſame name.

AIRA, in botany: a genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx*, a two flowered double-valved glume: The *corolla* is two-valved, and no rudiment of a flower between the florets: The *ſtamina* conſiſt of three capillary filaments the length of the flower; the antheræ are oblong, and forked at both ends: The *piſtillum* is an egg-ſhaped germen; the ſtyli are two, briſtly, and expanding; the ſtigmata are pubeſcent: There is no *pericarpium*; the including corolla grows to the ſeed: The *ſeed* is egg-ſhaped and covered. There are 14 ſpecies of the aira, nine of which are natives of Britain. The Engliſh name is *Hair-graſs*.

AIRANI, in church-hiſtory, an obſcure ſect of Arians, in the fourth century, who denied the conſubſtantiality of the Holy Ghoſt with the Father and the Son.

AIRE, a town of France, ſeated on the river Adour, on the declivity of a mountain. E. long. 0. 3. N. lat. 43. 47.

AIRE, a ſtrong town in the Netherlands, ſeated on the river Lis, 22 miles ſouth of Dunkirk. E. long. 2. 31. N. lat. 50. 38.

AIRING; the act of walking or riding gently in fine weather for the benefit of health; but this term is peculiarly uſed for the exerciſing horſes in the ſame way.

AIRS, in the manege, are the artificial motions of taught horſes; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among ſportſmen, a term expreſſing the neſt of a hawk or eagle.

AIRY *Triplicity*, among aſtrologers denotes the three ſigns, gemini, libra, and aquarius.

AISNE, a river of France, which riſes in Champaign, and falls into the river Oiſe, a little above Campeigne.

AITOCZU, a conſiderable river of Leſſer Aſia.

AJUGA, Bugle: A genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Aſperifoliæ*. The characters are: The *calyx*, a ſhort perianthium, monophyllous and perſiſtent: The *corolla* is monopetalous and grinning: The *ſtamina* conſiſt of four erect ſubulated filaments; the antheræ are dimidiated: The *piſtillum* has a four-cleft germen, a filiform ſtylus, and two ſlender ſtigmata: There is no *pericarpium*; the calyx converging, and containing the ſeeds in its boſom: The *ſeeds* are four, and oblong. The *ſpecies* enumerated by Linnæus are, 1. The orientalis, with inverted flowers, which is a native of the Eaſt. 2. The genevenſis, with woolly leaves and hairy cups, a native of Switzerland and of the ſouthern parts of Europe. 3. The pyramidalis, or mountain bugle, a native of Sweden, Germany, Switzerland, and the hilly parts of Britain. 4. The reptans, common or paſture bugle, with creeping ſuckers, and blue, red, or white bloſſoms, in long leafy ſpikes, a native of the ſouthern parts of Europe, and met with in woods and moiſt places in many parts of Britain. The roots are aſtringent, and ſtrike a black colour with vitriolated iron.

AJUTAGE, or Adjutage, a kind of tube fitted to the mouth of the veſſel through which the water of a fountain is to be played. To the different form and ſtructure of ajutages is owing the great variety of fountains. See Fountain and Hydrostatics.

AIX, a ſmall but ancient town in the duchy of Savoy. E. long. 7. 10. N. lat. 45. 40.

Aix, an ancient city, the capital of Provence, in France. The warm ſprings from which it is now known and frequented induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. E. long. 5. 32. N. lat. 43, 32.

Aix, a ſmall iſland on the coaſt of France, between the iſle of Oleron and the continent. W. long. 1. 4. N. lat. 46. 5.

Aix-la-chapelle, a fine city of Germany, in the circle of Weſtphalia and duchy of Juliers; famous for having been the ſpot where ſeveral councils and treaties of peace were concluded; particularly between France and Spain in 1688, and between Great Britain and France in 1748.—The hot ſulphureous waters for which this place has ſo long been celebrated, ariſe from ſeveral ſources, which ſupply eight baths conſtructed in different parts of the town. Theſe waters reſemble in ſome degree thoſe of Harrowgate. Near their ſources they are clear and pellucid, and have a ſtrong ſulphureous ſmell reſembling the waſhings of a foul gun; but they loſe this ſmell by expoſure to air. Their taſte is ſaline, bitter, and urinous. They do not contain iron. They are alſo neutral near the fountain, but afterwards are manifeſtly and pretty ſtrongly alkaline, inſomuch that clothes are waſhed with them without ſoap. The hotteſt ſpring raiſes the quickſilver of Fahrenheit's thermometer to 136, and the fountain, where viſitors commonly drink, to 112. Aix-la-Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. long. 5. 48. N. lat. 51. 55.

AIZOON, called by Mr. Miller *ſempervive*; though the name Aizoon has been by ſome writers applied to the houſeleek, and alſo to the aloes: A genus of the pentagynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters are: The *calyx*, a ſingle-leaved perianthium, divided into five ſegments, and perſiſtent: There is no *corolla*: The *ſtamina* conſiſt of very numerous capillary filaments; the antheræ are ſimple: The *piſtillum* has a five-cornered germen above, with five ſimple ſtyli; and the ſtigmata are ſimple: The *pericarpium* is a bellied, retuſe, five-cornered capſule, having five cells and five valves: The *ſeeds* are many and globular.—Linnæus mentions 3 ſpecies; the canarienſe, hiſpanicum, and paniculatum.

AKISSAT, the ancient Thyatira, a city in Natolia, in Aſia, ſeated on the river Hermus, 50 miles from Pergamos. E. long. 28. 30. N. lat. 38. 50.

AKOND, an officer of juſtice in Perſia, who takes cognizance of the cauſes of orphans and widows; of contracts, and other civil concerns. He is the head of the ſchool of law, and gives lectures to all the ſubaltern officers; he has his deputies in all the courts of the kingdom, who, with the ſecond *ſadra*, make all contracts.

AL, an Arabic particle prefixed to words, and ſignifying much the ſame with the Engliſh particle *the*: Thus they ſay, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

Al, or Ald, a Saxon term prefixed to the names of places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a term uſed by botaniſts for the hollow of a ſtalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or ſinus, placed between the ſtalk or branch of a plant and the leaf, whence a new offſpring uſually iſſues. Sometimes it is uſed for thoſe parts of leaves otherwiſe called *lobes* or *wings*.—Thoſe petals of papilionaceous flowers, placed between thoſe other petals called the *vexillum* and *carina*, and which make the top and bottom of the flower, are alſo called *alæ*.

ALÆ is likewiſe uſed for thoſe extremely ſlender and membranaceous parts of ſome ſeeds, which appear as wings placed on them; it likewiſe ſignifies thoſe membranaceous expanſions running along the ſtems of ſome plants, which are therefore called *alated ſtalks*.

Alæ, in anatomy, a term applied to the lobes of the liver, the cartilages of the noſtrils, &c.

Alæ, in the Roman art of war, were the two wings or extreme parts of the army drawn up in order of battle.

ALABA, one of the three ſmalleſt diſtricts of Biſcay, in Spain.

ALABARCHA, in antiquity, a kind of magiſtrate among the Jews of Alexandria, whom the emperors allowed them to elect, for the ſuperintendency of their police, and to decide their differences and diſputes.

ALABASTER, in natural hiſtory; a ſpecies of that genus of ſtones whoſe baſe is calcareous earth. It differs from marble in being combined, not with the aerial, but with vitriolic acid; therefore, when mixed with any acid, no effervescence appears. It is ſoluble in about 500 times its weight of water at the temperature of 60 It is fuſible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture granular, with ſhining particles. In compoſition, and conſequently in its chemical properties, it does not differ from gypſum, ſelenite, and plaſter of Paris.

There are 3 ſpecies of alabaſter. 1. The ſnow-white ſhining alabaſter, or lygdinum of the ancients. 2. The yellowiſh alabaſter, or phengites of Pliny, found in Greece, Germany, France, and England. 3. Variegated, yellow, and reddiſh alabaſter; which is the common alabaſter of the ancients, and ſo ſoft that it may be cut with a knife. The alabaſters are frequently uſed by ſtatuaries for ſmall ſtatues, vaſes, and columns. After being calcined and mixed with water, they may be caſt in any mould like plaſter of Paris. See Gypsum. Alabaſter, Mr. Boyle obſerves, being finely powdered, and thus ſet in a baſon over the fire, will, when hot, aſſume the appearance of a fluid, by rolling in waves, yielding to the ſmalleſt touch, and emitting vapour; all which properties it loſes again on the departure of the heat, and diſcovers itſelf a mere incoherent powder. The fineneſs and clearneſs of this ſtone render it in ſome meaſure tranſparent; whence it has been ſometimes alſo em-

ployed for windows. There is a church at Florence ſtill illuminated by alabaſter-windows. Inſtead of panes of glaſs, there are ſlabs of alabaſter near 15 feet high, each of which forms a ſingle window, through which the light is conveyed. The countries in Europe which abound moſt in alabaſter, are Germany, toward Coblentz; the province of Maconnois, in the neighbourhood of Chuni in France; Italy, toward Rome; where that of Montaiout is particularly remarkable not only for its whiteneſs, but alſo for the bigneſs of its blocks, ſome of which are ſo large, that ſtatues as big as the life may eaſily be cut out of them.

ALABASTER, in antiquity, a term uſed for a vaſe wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter ſtone, which Pliny and others repreſent as peculiarly proper for the purpoſe. Alabaſter is alſo ſaid to have been uſed for an ancient liquid meaſure, containing 10 ounces of wine, or 9 of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABASTRUM DENDROIDE, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to free-thinkers among us.

ALADULIA, a conſiderable province of Turkey in Aſia.

ALAIS, a conſiderable town of France, 34 miles N. of Montpelier, and 340 from Paris. E. long. 4. 20. N. lat. 44. 8.

ALAMODALITY, in ageneral ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

ALAMODALITY *of writing*, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode.

ALAMODE, in commerce, a thin gloſſy black ſilk chiefly uſed for women's cloaks and men's mourning ſcarfs.

ALAND, an iſland of the Baltic ſea, between 17 and 19 deg. E. long. and between 59 and 61 deg. of lat. at the entrance of the gulph of Bothnia.

ALARAF, in the Mahometan theology, the partition wall that ſeparates heaven from hell. The word is plural, and properly written *al araf*; in the ſingular it is written *al arf*. It is derived from the Arabic verb *arafa*, to diſtinguiſh.

ALARBES, a name given to thoſe Arabians who live in tents, and diſtinguiſh themſelves by their dreſs from others who live in towns.

ALARES, in Roman antiquity an epithet given to the cavalry on account of their being placed in the two wings of the army.

ALARM, in the military art, denotes either the apprehenſion of being ſuddenly attacked; or the notice thereof, ſignified by firing a cannon, firelock, or the like. Falſe alarms are frequently raiſed to haraſs an enemy, by keeping them conſtantly under arms. Sometimes alſo this method is taken to try the vigilance of the piquet-guard.

ALARM-*Bell*, that rung upon any ſudden emergency, as a fire, mutiny, or the like.

ALARM-*Poſt*, or ALARM-*place*, the ground for drawing up each regiment in caſe of an alarm. This is otherwiſe called *the rendezvous*.

ALARM, in fencing, is the ſame with what is otherwiſe called an appeal, or challenge.

ALASCANI, in church-hiſtory, a ſect of Antilutherans, whoſe diſtinguiſhing tenet, beſides their denying baptiſm, is ſaid to have been this, that the words, *This is my body*, in the inſtitution of the euchariſt, are not to be underſtood of the bread, but of the whole action or celebration of the ſupper.

ALATAMAHA, a large river of North America, which runs S. E. through the province of Georgia, and falls into the Atlantic.

ALATERNUS, in botany, the trivial name of a ſpecies of the rhamnus. See RHAMNUS.

ALAVA, a diſtrict of Spain, about 20 miles in length, and 17 in breadth, containing very good iron mines.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of paſſeres; the characters of which are theſe: The beak is cylindrical, ſubulated, ſtraight; and the two mandibles or chaps are of equal ſize. The tongue is bifid, and the hinder claw is ſtraight, and longer than the toe. There are 28 ſpecies of the alauda, of which the following are the moſt remarkable. 1. The arvenſis, or common ſky-lark. This and the wood-lark are the only birds that ſing as they fly; this raiſing its note as it ſoars, and lowering it till it quite dies away as it deſcends. 2. The pratenſis, or tit-lark, has the two outward feathers of the wing edged with white, and frequents the meadows. Like the wood-lark, it ſits on trees, and has a moſt remarkably fine note. 3. The arborea, or wood-lark, a native of Europe, and diſtinguiſhed by an annular white fillet about the head. It is inferior in ſize to the ſky-lark, and is of a ſhorter thicker form; the colours are paler, and its note is leſs ſonorous and leſs varied, though not leſs ſweet. 4. The campeſtris has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breaſt yelloviſh. 5. The trivialis, whoſe chief feathers on the tail are brown, only half of the outermoſt is white, and the ſecond is white at the end, in the ſhape of a wedge; there is likewiſe a double whitiſh line on the wings. It is a native of Sweden. 6. The criſtata; the chief tail-feathers black, but the two outermoſt edged with white, and the head creſted. It is a native of Europe, and ſings well, like the ſky-lark. 7. The ſpinoletta; the chief tail-feathers black, only the outermoſt two obliquely half white. It is a native of Italy. 8. The alpeſtris; the chief wing-feathers are half white, the throat yellow, and it has a black ſtreak under the eyes and on the breaſt. It inhabits North America, where it is migratory. 9. The magna, yellow on the belly, with a crooked black ſtreak on the breaſt, and the three ſide-feathers of the tail white. It is a native of Africa and America. 10. The New Zealand lark (pl. 5) is 7½ inches in length: the bill is half an inch, of a pale aſh-colour, with the upper part black: the upper parts of the body are duſky, edged with pale aſh-colour: the breaſt and belly are white; the legs reddiſh aſh-colour, and the claws black. It inhabits Charlotte Sound, and is called *kogoo aroùre*.

ALAUTA, a conſiderable river of Turkey in Europe, which, after watering the north-eaſt part of Tranſylvania and part of Wallachia, falls into the Danube.

ALAY, ſignifying in the Turkiſh language, "The Triumph," is a ceremony which accompanies the aſſembling together the forces of that vaſt empire upon the breaking out of a war.

ALB, or ALBE, in the Romiſh church, a veſtment of white linen hanging down to the feet, and anſwering to the ſurplice of the Engliſh clergy. In the ancient church, it was uſual, with thoſe newly baptized, to wear an alb, or white veſtment; and hence the Sunday after Eaſter was called *dominica in albis*, on account of the albs worn by thoſe baptized on eaſter-day.

ALB is also a name of a Turkish coin, otherwise called *asper*. See ASPER.

ALBA *Firma*, or ALBUM, in our old customs, denoted rent paid in silver, and not in corn, which was called *black mail*.

ALBA *Terra*, one of the numerous names for the philosopher's stone.

ALBANENSES, in church-history, the same with ALBIGENSES, which see.

ALBANI, in Roman antiquity, a college of the *salii*, or priests of Mars; so called from Albanus, their residence.

ALBANIA, a province of Turkey in Europe, on the gulph of Venice; long. from 28 to 31. E. lat. from 39. to 43. N.

ALBANIA, a country of Asia, remarked by ancient historians for the strength, stature, and comeliness of its inhabitants.

ALBANO, a town of Italy, on a lake of the same name, in the Campagnia of Rome. E. long. 13. 10. N. lat. 41. 43.

ALBANS (St.), a market-town of Hertfordshire, on the N. W. road from London, at the distance of 21 miles. This town sends two members to parliament, gives the title of *duke* to the noble family of Beauclerc, and has one of the best markets for wheat in England. Its market days are Wednesdays and Saturdays. W. long. 0. 12. N. lat. 51. 44.

ALBANY, a British fortress on the S. W. of Hudson's bay. W. long. 84. 20. N. lat. 53. 20.

ALBANY, a town of North America, the capital of one of the ten counties of the province of New York. W. long. 44. 29. N. lat. 42. 30.

ALBARAZIN, a strong town of Aragon in Spain; about 100 miles E. of Madrid. E. long. 2. 10. N. lat. 40. 32.

ALBARII, in antiquity, those who gave the whitening to earthen vessels, &c. in which sense they stood distinguished from *Dealbatores*, who whitenened walls.

ALBARIUM OPUS, in the ancient building, the incrustation or covering of the roofs of houses with white plaster made of mere lime; otherwise called *opus album*.

ALBATI EQUI, an appellation given to such horses, in the games of the ancient circus, as wore white furniture.

ALBATROS, in ornithology, a species of the diomedea. See DIOMEDEA.

ALBAZIN, a town of Greater Tartary, seated on the river Amur; E. long 103 30. N. lat. 54. 0.

ALBE, a small piece of money, current in Germany, worth only a French sol and seven deniers.

ALBEMARLE, or AUMARLE, a town of France, on the confines of Picardy, 35 miles N. E. of Rouen, and 70 N. W. of Paris. E. long. 2. 21. N. lat. 49. 50.

ALBEMARLE, the most northern part of the province of North Carolina in America.

ALBENGUA, a sea-port town of Italy, about 38 miles S. W. of Genoa. E. long. 8. 13. N. lat. 44. 4.

ALBERNUO, a kind of camblet brought from the Levant by the way of Marseilles.

ALBERTISTS, a sect of scholastics, so named from their leader Albertus Magnus.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the administration of Albertus archduke of Austria.

ALBESIA, in antiquity, a kind of shields otherwise called *Decumana*. See DECUMANA.

ALBI, a city of France, the capital of the Albigeois, in Languedoc, seated on the river Tarn, 35 miles N. by W. of Toulouse, and 250 S. of Paris. E. long. 0. 52. N. lat. 43. 56.

ALBIGENSES, in church history, a sect or party of reformers, about Toulouse and the Albigeois in Languedoc, who sprung up in the 12th century, and distinguished themselves by their opposition to the discipline and ceremonies of the Romish church. The *Albigenses* were also called *Albiani*, *Albigesei*, *Albii*, and *Albanenses*, though some distinguish these last from them.

ALBIGENSES is also a name sometimes given to the followers of Peter Vaud, or Waldo; and hence synonymous with what we more properly call *Waldenses*, or Poor Men of Lyons.

ALBINTEMELIUM, ALBINTIMILIUM, now *Vintimiglia*, situated in the S. W. of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean. E. long. 7. 40. lat. 43. 17.

ALBIOECE, or ALEBECE, now *Riez*, in Provence, about 18 leagues to the N. E. of Toulon. E. long. 1. 0. lat. 43. 20.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium*. They make a different profession from the *dealbatores* or *whitners*.

ALBINOS, the name by which the Portuguese call the white Moors, who are looked upon by the negroes as monsters. They at a distance might be taken for Europeans; but, when near, their white colour appears like that of persons affected with a leprosy. It is said this singular appearance is owing to a want of the *rete mucosum*. In Saussure's *Voyages dans les Alpes*, a curious account is given of these people.

ALBINUS (Bernhard Siegfried), a celebrated physician and anatomist, was born at Francfort on the Oder in 1697. Though distinguished in every branch of literature, his attention was particularly turned to anatomy and surgery; and his peculiar attachment to these branches of knowledge, which he cultivated under the eye of his father, who was Professor of Anatomy and Surgery at Leyden, gained him the intimate friendship of Ruysch and Raw. From Leyden, he went to Paris, where he attended the lectures of Du-Verney, Vaillant, and other celebrated professors. But he had scarce spent a year there, when he was invited by the curators of the university of Leyden to be a lecturer in anatomy and surgery at that place. In 1721, upon the death of his father, he succeeded to the professorship; in which capacity, he not only paid the greatest attention to the pupils entrusted to his care, but laboured greatly in the improvement of the medical art. His numerous and splendid publications soon extended his reputation over Europe; and the societies of London, Petersburgh and Harlem cheerfully received him as an associate. In 1745 he was appointed professor of the practice of medicine at Leyden, and was succeeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the university, and as often refused that high honour when it was voluntarily offered him. At length, worn out by long service and intense study, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of BRITAIN.

New ALBION, a name given by Sir Francis Drake to California.

ALBIREO, in astronomy, a star of the third or fourth magnitude, in the constellation CYGNUS.

ALBISOLA, a small town belonging to the Genoese; E. long. 8. 20. N. lat. 43. 15.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, amongst the Mahometan writers, the beast on which Mahomet rode in his journeys to heaven. The Arab commentators represented it as of an intermediate shape and size between an ass and a mule.

ALBORO, in zoology, a name by which the erythrinus is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the diocese of the same name, and a bishop's see. E. long. 29. 16. N. lat. 56. 35.

ALBUCA, Bastard Star-of-Bethlehem: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *calyx* wanting; the *corolla* consisting of 6 oval oblong petals, which are persistent; the *stamina* 6 three-sided filaments the length of the *corolla*; of these, 3 are fertile, with versatile antheræ; 3 are barren, without antheræ. The *pistillum* has an oblong three-sided germen; the stylus is three-sided; the *pericarpium* an oblong obtuse triangular capsule, having three cells and three valves. The *seeds* are numerous, flat, and incumbent. Of this genus Linnæus reckons only two. The species are, 1. The major, or star-flower, with spear-shaped leaves; a native of Canada, and some other parts of North America. 2. The minor, or African star-flower, a native of the Cape of Good Hope.

ALBUGINEA tunica, in anatomy, the third or innermost coat or covering of the testes. It is likewise the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term sometimes applied to the aqueous humour of the eye.

ALBUGO, or Leucoma, in medicine, a disease occasioned by a white opaque spot growing on the *cornea* of the eye, and obstructing vision.

ALBUM, in antiquity, a kind of white table, or register, wherein the names of certain magistrates, public transactions, &c. were entered. Of these there were various sorts; as the *album decurionum*, *album senatorum*, *album judicum*, *album prætoris*, &c.—Album *decurionum* was the register wherein the names of the decuriones were entered. This is otherwise called *matriculatio decurionum*.—Album *senatorum*, the list of senators' names, which was first introduced by Augustus, and renewed yearly.—Album *judicum*, that wherein the names of the persons of those *decuriæ* who judged at certain times were entered.—Album *prætoris*, that wherein the *formulæ* of all actions, and the names of such judges as the prætor had chosen to decide causes, were written.—The high priest entered the chief transactions of each year into an *album*, or table, which was hung up in his house for the public use.

Album, in later times, denoted a kind of table, or pocket-book, wherein the men of letters with whom a person had conversed, inscribed their names with some sentence or motto.

Album *Græcum*, among physicians, the white dung of dogs, formerly prescribed for inflammations of the throat, &c. but now justly despised.

ALBUMEN, the white of an egg. See Egg.

ALBUQUERQUE, a small city in Spain, in the province of Estremadura, 9 miles from the frontiers of Portugal. W. long. 7. 0. N. lat. 38. 52.

ALBURN, or Auburn, the name of a compound colour, of white and red, or reddish brown.

ALBURNUM, the soft white substance which in trees is found between the liber or inner bark and the wood. It is frequently preyed upon by insects that lodge in its substance.

ALBURNUS, in zoology, a species of the *cyprinus* of Linnæus. See Cyprinus.

ALCA, or Auk, in ornithology, a genus of the order of anseres. The beak of this genus is without teeth, short, convex, compressed, and frequently furrowed transversely. The inferior mandible is gibbous near the base; the feet have generally three toes. The species of the alca are 12; of which the most remarkable are; 1. The impennis, northern penguin, or great auk, with a compressed bill furrowed on each side, and an oval spot on each side of the eyes. 2. The alle, little auk, or black and white diver, with a smooth conical bill, a white streak on the belly, and wings and black feet. 3. The arctica, or puffin, with a compressed bill and four furrows; the orbit of the eyes and temples are white. The legs of th species are very small; and placed so far behind as to disqualify it from standing except quite erect, resting not only on the foot, but the whole length of the leg. 4. The torda, or razor-bill, with 4 furrows on the bill, and a white line on each side running from the bill to the eyes. 5. The pica, or black-billed auk, has the bill of the same form with the torda, but is entirely black. The cheeks, chin, and throat are white: in all other respects it agrees with the former species. 6. The cirrhata of Dr. Pallas, or tufted auk, somewhat bigger than the common puffin, and the colours much the same: the bill is an inch and three-quarters in length, the same in depth at the base, and crossed with three furrows: over each eye arises a tuft of feathers four inches in length, which falls elegantly on each side of the neck, reaching almost to the back; and are white as far as they are attached to the head, but afterwards of a fine buff yellow: the legs are of a bright red; the claws black. The female is principally distinguished by having the bill crossed only with two furrows instead of three. 7. The psittacula, or perroquet auk, of Dr. Pallas, is about the size of the little auk. The bill is much compressed on the sides, in shape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very slender tuft of fine white feathers, hanging down the neck: the head and upper part of the body are dusky; the lower whitish, varied with black edges: the legs are of a dirty yellow; and the webs dusky. This species is found at Kamtschatka, in the isles towards Japan, and on the western shores of America.

ALCAICS, in ancient poetry, a denomination given to several kinds of verse, from Alcæus, their inventor. The first kind consists of five feet, viz. a spondee, or iambic; an iambic; a long syllable; a dactyle; another dactyle. The second kind consists of two dactyles and two trochees: as, *Exilium impositura cymbæ*. Besides these two, which are called *dactylic Alcaics*, there is another styled simply *Alcaic*; consisting of an epitrite; a choriambus; another choriambus; and a bacchius.

Alcaic *Ode*, a kind of manly ode composed of several strophes, each consisting of four verses; the two first of which are always Alcaics of the first kind; the third verse is a diameter hypercatalectic, or consisting of 4 feet and a long syllable; and the fourth verse is an Alcaic of the second kind.

ALCAID, Alcayde, or Alcalde, in the polity of the Moors, Spaniards, and Portuguese, a magistrate, or officer of justice, answering nearly to the French provost and the British justice of peace.

ALCALA de Guadeira, a small town of Spain, in Andalusia; W. long. 6. 16. N. lat. 37. 25.

Alcala *de Henares*, a beautiful and large city of Spain, in New Castile, seated upon the river Henares, which washes its walls. It is 10 miles S. W. of Guadalaxara, and 13 miles E. of Madrid. W. long. 4. 20. N. lat. 40. 30.

Alcala-*Real*, a small city of Spain, in Andalusia, with a fine abbey. W. long. 4. 15. N. lat. 37. 18.

ALCALY, or Alcali, or Alkali. See Chemistry.

ALCANIS, a town of Arragon in Spain, seated on the river Guadaloupe. W. long. 0. 5. N. lat. 41. 0.

ALCANNA, in commerce, a powder prepared from the leaves of the Egyptian privet, and much used by the Turkish women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when steeped with common water, and a red one when infused in vinegar. There is also an oil extracted from the berries of Alcanna, and used in medicine as a sedative.

ALCANTARA, a small, but very strong city of Estremadura, in Spain, which gives name to one of the three orders of knighthood. It is seated on the banks of the Tajo,

or Tagus, 21 miles from Coria, in a very fruitful country. W. long. 7. 12. N. lat. 39. 30.

Alcantara, *Knights of*; a military order of Spain, which took its name from the above-mentioned city. They make a very conſiderable figure in the hiſtory of the expeditions againſt the Moors.

ALCARES, a ſmall city of La Mancha, in Spain; 25 miles N. of the confines of Andaluſia, 108 S. of Cuenza, and 138 S. by E. of Madrid. W. long. 1. 50. N. lat. 38. 28.

ALCASSAR do sal, a town of Portugal in Eſtremadura; W. long. 9. 10. N. lat. 38. 18.

Alcassar, a city of Barbary, ſeated about two leagues from Larache, in Afga, a province of the kingdom of Fez. W. long. 12. 35. N. lat. 35. 15.

ALCAVALA, in the Spaniſh finances, was at firſt a tax of 10 per cent. afterwards of 14 per cent. and is at preſent of only 6 per cent. upon the ſale of every ſort of property, whether moveable or immoveable; and it is repeated every time the property is ſold. The levying of this tax requires a multitude of revenue officers, and is no leſs impolitic than oppreſſive.

ALCAZAR leguer, a town of Africa, near the ſtraits of Gibraltar. W. long. 5. 30. N. lat. 38. 0.

ALCAZER, a town of Spain, in New Caſtile; 100 miles N. W. of Carthagena. W. long. 2. 10. N. lat. 38. 15.

ALCE, Alces, or Elk, in zoology, the trivial name of a ſpecies of the cervus, belonging to the order of mammalia pecora. See Cervus.

ALCEA, the Holly-Hock: A genus of the polyandria order, belonging to the monadelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* a double perianthium, monophyllous and perſiſtent; the exterior one ſix-cleft, the interior half five-cleft: The *corolla* conſiſts of five petals, coaleſced at the baſe, heart-ſhaped inverſely, and expanding: The *ſtamina* conſiſt of numerous filaments, coaleſced below into a five-cornered cylinder, looſe above, and inſerted into the corolla; the antheræ are kidney-ſhaped: The *piſtillum* has a roundiſh germen; a ſhort cylindric ſtylus; and numerous briſtly ſtigmata the length of the ſtylus: The *pericarpium* conſiſts of many arilli, jointed into a verticillum about a columnar depreſſed receptacle. The *ſeeds* are ſolitary, reniform, and depreſſed. Although Linnæus mentions two diſtinct ſpecies of this genus, viz. the *roſea* and *ficifolia*, he thinks, that the latter may perhaps be only a variety of the former; but Mr Miller affirms them to be diſtinct ſpecies, whoſe difference in the form of their leaves always continues. The leaves of the firſt ſort are roundiſh, and cut at their extremities into angles; thoſe of the ſecond are deeply cut into ſix or ſeven ſegments, ſo as to reſemble a hand. Cultivation produces an almoſt infinite variety of this plant, ſuch as double-flowered, ſingle-flowered, deep red, pale red, blackiſh red, white, purple, yellow, and fleſh-colour. The firſt ſpecies is a native of China, the ſecond grows alſo in Iſtria; but though natives of warm countries, they thrive well in Britain.—The holly-hock is propagated by ſeeds, which ſhould be carefully ſaved from thoſe plants whoſe flowers are double and of the beſt colours. They ſhould be ſown in drills, about the middle of April, on a bed of light earth, and covered with earth of the ſame kind about half an inch deep. When the plants have put out leaves, they ſhould be tranſplanted into nurſery-beds, kept clean from weeds till October, and afterwards tranſplanted to the ſpot where they are to remain.

ALCEDO, or Kingsfisher, in ornithology, a genus of the order of picæ. The alcedo has a long, ſtraight, thick, triangular bill; with a fleſhy, plain, ſhort, flat tongue.—Of this genus there are more than 30 ſpecies, with one or other of which almoſt every part of the world is furniſhed. Moſt of them frequent rivers, and live on fiſh, the ſingularity of catching which is admirable: ſometimes hovering over the water, where a ſhoal of ſmall fiſhes is ſeen playing near the ſurface; at other times waiting with attention, on ſome low branch hanging over the water, for the approach of a ſingle one that is ſo unlucky as to ſwim thereabouts. In either caſe it drops like a ſtone, or rather darts with rapidity on its prey, and ſeizing it croſſwiſe in its bill, retires to a reſting-place to feaſt on it; which it does piecemeal, bones and all, without reſerve, afterwards bringing up the indigeſtible parts in pellets, as birds of prey do. The wings of moſt of the genus are very ſhort; yet theſe birds fly rapidly, and with great ſtrength. It may be remarked, that throughout this genus, blue, in different ſhades, is the moſt predominant colour.—The ſpecies found in the South Sea Iſlands are held in a kind of ſuperſtitious veneration by the natives of the places they ſeverally inhabit, perhaps on account of their being frequently ſeen flying about the morais or burial-places. That which inhabits Otaheite, where it is called *Erooro*, is accounted particularly ſacred, and not allowed to be taken or killed.

ALCHEMILLA, or Ladies-Mantle: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 35th order *Senticoſæ*. The *calyx* is a ſingle-leaved perianthium, tubular, and perſiſtent; the mouth flat, and eight-parted. There is no *corolla*. The *ſtamina* conſiſt of four ſmall erect ſubulated filaments placed in the mouth of the calyx; the antheræ are roundiſh: The *piſtillum* has an egg-ſhaped *germen*: The *ſtylus* is filiform, the length of the ſtamina, and inſerted at the baſe of the germ: The ſtigma is globular. There is no *pericarpium*, but the neck of the calyx cloſed. The *ſeed* ſolitary, elliptical, and compreſſed. Of this genus there are three ſpecies: 1. The vulgaris, or common ladies-mantle, with leaves plated like a fan, and yelloviſh-green bloſſoms. 2. The alpina, or cinque-foil ladies-mantle, with finger-ſhaped ſawed leaves, and greeniſh bloſſoms. 3. The minor, or leaſt ladies-mantle, with 5 ſmooth leaves growing at a joint and cut into many ſegments. Theſe plants have perennial roots, and annual ſtalks; and are eaſily propagated by parting their roots, or ſowing their ſeed in autumn.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemiſtry which had for its principal objects the tranſmutation of metals into gold; the panacea, or univerſal remedy; an alkaheſt, or univerſal menſtruum; an univerſal ferment, &c. Kircher, inſtructed in all the ſecrets of chemiſtry, has fully expoſed the artifices and impoſtures of alchemiſts, which now indeed are the ſubject of general ridicule.

ALCIBIADES, a noted Athenian general; a man of admirable accompliſhments, though but indifferent principles; of great parts, and of an amazing verſatility of genius.

ALCMAER, a city of the United Provinces, ſituated in North Holland, about four miles from the ſea, 15 from Haerlem, and 18 from Amſterdam. E. long. 4. 26. N. lat. 52. 28.

ALCMANIAN, in ancient lyric poetry, a kind of verſe conſiſting of two dactyles and two trochees; as, *Virgini|bus pue|riſque | canto*. The word is formed from *Alcman*, the name of an ancient Greek poet, in great eſteem for his erotics or amorous compoſitions.

ALCOHOL, or Alkool, in chemiſtry, pure ſpirit of wine highly rectified. See Chemistry. This term was formerly uſed alſo for any fine impalpable powder.

ALCOHOLIZATION, the proceſs of rectifying any ſpirit. It is alſo uſed for pulverization.

ALCOR, in aſtronomy, a ſmall ſtar adjoining to the large bright one in the middle of the tail of *urſa major*.

ALCORAN, or Al-koran, the ſcripture, or bible of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly ſignifies, *the reading*; or rather *that which ought to be read*. The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *ſowar*. Theſe chapters are not, in the manuſcript copies, diſtinguiſhed by their numerical order, but by particular titles, which are taken ſometimes from a particular matter treated of, or perſon mentioned therein; and ſome chapters have two or more titles, occaſioned by the difference of the copies. Every chapter is ſubdivided into ſmaller portions of very unequal length, with us called *verſes*, but in Arabic *ayat*; the ſame with the Hebrew *ototh*, ſignifying *ſigns* or *wonders*; ſuch as are the ſecrets of God, his attributes, &c. Many of theſe have their particular titles alſo.

Beſides theſe unequal diviſions of chapter and verſe, the Mahometans have alſo divided their Koran into 60 equal portions, which they call *Ahzab*, in the ſingular *Hizb*, each ſubdivided into 4 equal parts; which is an imitation of the Jews, who have an ancient diviſion of their Miſhna into 60 portions called *Maſſicoth*.

Next after the title, at the head of every chapter, except only the 9th, is prefixed the following ſolemn form, by the Mahometans called the *Biſmallah*, In the name of the most merciful God; which form they conſtantly place at the beginning of all their books and writings in general, as a peculiar mark or diſtinguiſhing characteriſtic of their religion, it being counted a ſort of impiety to omit it. Mahomet probably took this form, as he did many other things, from the Perſian Magi, who uſed to begin their books in theſe words, *Benam Yezdan hakſhaiſhgher dadar*; that is, *In the name of the moſt merciful juſt* God.—There are 29 chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, ſome with a ſingle one, others with more. Theſe letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal ſeveral profound myſteries; but they have been explained by writers in many different ways;

The Koran is univerſally allowed to be written with the utmoſt elegance and purity of language, and is confeſſedly the ſtandard of the Arabic tongue. Indeed the more orthodox believe, and are taught by the book itſelf to conſider it inimitable by any human pen; a permanent miracle; greater than that of raiſing the dead, and alone ſufficient to convince the world of its divine original. To this miracle, in fact, did Mahomet himſelf chiefly appeal for the confirmation of his miſſion, publicly challenging the moſt learned men in Arabia to produce even a ſingle chapter that might be compared with it.

The general deſign of the Koran was to unite the profeſſors of the three different religions, then followed in the populous country of Arabia, in the knowledge and worſhip of one God, under the ſanction of certain laws, and the outward ſigns of ceremonies partly of ancient and partly of novel inſtitution, enforced, by the conſideration of rewards and puniſhments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambaſſador of the deity.

The great doctrine then of the Koran is the unity of God; to reſtore which point Mahomet pretended was the chief end of his miſſion; it being laid down by him as a fundamental truth, That there never was, nor ever can be, more than one true orthodox religion. Whenever this religion became neglected, or corrupted in eſſentials, God, he aſſerted, had the goodneſs to re-inform and re-admoniſh mankind thereof, by ſeveral prophets, of whom Moſes and Jeſus were the moſt diſtinguiſhed, till the appearance of Mahomet, who is their ſeal, and no other to be expected after him. The more effectually to enforce this idea, great part of the Koran is employed in relating examples of dreadful puniſhments formerly inflicted by God on thoſe who rejected and abuſed his meſſengers; ſeveral of which ſtories, or ſome circumſtances of them, are taken from the Old and New Teſtaments, but many more from the apocryphal books and traditions of the Jews and Chriſtians of thoſe ages. Indeed, few or none of the relations or circumſtances in the Koran were invented by Mahomet, as is generally ſuppoſed, it being eaſy to trace the greateſt part of them much higher, as the reſt might be, were more of thoſe books extant, and was it worth while to make the enquiry.

The reſt of the Alcoran is taken up in preſcribing neceſſary laws and directions, frequent admonitions to moral and divine virtues, the worſhip and reverence of the Supreme Being, and reſignation to his will. One of their moſt learned commentators diſtinguiſhes the contents of the Alcoran into *allegorical* and *literal*; under the former are comprehended all the obſcure, parabolical, and enigmatical paſſages, with ſuch as are repealed, or abrogated; the latter, ſuch as are clear, and in full force.

The moſt excellent moral in the whole Alcoran, interpreters ſay, is that in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and diſpute not with the ignorant. Mahomet, according to the authors of the *Keſchaf*, having begged of the angel Gabriel a more ample explication of this paſſage, received it in theſe terms: "Seek him who turns thee out, give to him "who takes from thee, pardon him who injures thee; for "God will have you plant in your ſoul the roots of his "chief perfections." It is evident, this commentary is copied from the goſpel. (See Exodus xxxiii. 4, 5.) But it matters not ſo much who had it firſt, as he who obſerves it beſt. The caliph Haſſan, ſon of Hali, being at table, a ſlave unfortunately let fall a diſh of meat reeking hot, which ſcalded him ſevcrely. The ſlave fell on his knees, rehearſing theſe words of the Alcoran, "Paradiſe is for thoſe who re- "ſtrain their anger." I am not angry with thee, anſwered the caliph—"And for thoſe who forgive offences againſt them," continues the ſlave. I forgive thee thine, replies the caliph—"But above all, for thoſe who return good for evil," adds the ſlave. I ſet thee at liberty, rejoined the caliph; and I give thee ten dinars.

The Mahometans believe, that the Koran is of divine original; nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God: that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the *preſerved table*, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was by the miniſtry of the angel Gabriel ſent down to the loweſt heaven, in the month of Ramadan, on the night of *power*: from whence Gabriel revealed it to Mahomet by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of 23 years, as the exigency of affairs required; giving him, however, the conſolation to ſhow him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a-year; but in the laſt year of his life he had the favour to ſee it twice. They ſay, that few chapters were delivered entire, the moſt part being revealed piecemeal, and written down from time to time by the prophet's amanuenſis in ſuch a part of ſuch and ſuch a chapter, till they were completed, according to the directions of the angel.

After the new-revealed paſſages had been from the prophet's mouth taken down in writing by his ſcribe, they were publiſhed to his followers; ſeveral of whom took copies for their pri-

vate uſe, but the far greater number got them by heart. The originals, when returned, were put promiſcuouſly into a cheſt, obſerving no order of time; for which reaſon it is uncertain when many paſſages were revealed. When Mahomet died, he left his revelations in the ſame diſorder, and not digeſted into the form in which we now find them. This was the work of his ſucceſſor Abu Becr; who ordered the whole to be collected, not only from the palm-leaves and ſkins on which they had been written, and which were kept between two boards or covers, but alſo from the mouths of ſuch as had gotten them by heart. From this it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mahomet left the chapters complete as we now have them, excepting ſuch paſſages as his ſucceſſor might add or correct from thoſe who had gotten them by heart.

However, in the 30th year of the Hegira, Othman being then caliph, and obſerving the great diſagreement in the copies of the Koran in the ſeveral provinces of the empire, ordered a great number of copies to be tranſcribed from that of Abu Becr; which copies were afterwards diſperſed in the ſeveral provinces of the empire, and the old ones burnt. Yet though many irregularities were corrected by this means, ſome few various readings ſtill exiſt.

With ſo much eſteem and reverence do Muſſulmans regard the book of the Alcoran that they dare not ſo much as touch it without being firſt waſhed, or legally purified; to prevent which, an inſcription is put on the cover or label, *Let none touch but they who are clean.* It is read with great care and reſpect; being never held below the girdle. They ſwear by it; take omens from it on all weighty occaſions; carry it with them to war; write ſentences of it in their banners; adorn it with gold and precious ſtones; and knowingly ſuffer it not to be in the poſſeſſion of any of a different religion. Some ſay that it is puniſhable even with death, in a Chriſtian, to touch it; others, that the veneration of the Muſſulmans leads them to condemn the tranſlating it into any other language as a profanation: but theſe ſeem to be aggravations. The Mahometans have taken care to have their ſcripture tranſlated into the Perſian, the Javan, the Malayan, and other languages; though, out of reſpect to the original, theſe verſions are generally, if not always, interlineated.

By the advocates of Mahometaniſm, the Koran, as already obſerved, has always been held forth as the greateſt of miracles, and equally ſtupendous with the act of raiſing the dead. The miracles of Moſes and Jeſus, they ſay, were tranſient and temporary; but that of the Koran is permanent and perpetual; and therefore far ſurpaſſes all the miraculous events of preceding ages. We will not detract from the real merit of the Koran: we allow it to be generally elegant, and often ſublime: but at the ſame time we reject with diſdain its arrogant pretence to any thing ſupernatural; all the real excellence of the work being eaſily referable to natural and viſible cauſes.

We ſhall conclude this article by obſerving, that writers differ as to the cauſes to which the force and effect of the Koran are to be attributed. Some reſt this circumſtance on the pomp and harmony of its language, others to the frequent mention in it of future rewards and puniſhments, and not a few, to the promiſe of ſenſual pleaſures in paradiſe. With regard to the latter, which is the prevailing opinion, authors have diſputed whether it is to be taken in a literal or figurative ſenſe.

ALCORAN is alſo figuratively applied to certain other books full of impieties and impoſtures, particularly the Alcoran of the Cordeliers, which placed St. Francis on a level with Jeſus Chriſt. Eraſmus Albertus expoſed the folly and abſurdity of it, in a publication, entitled, The *Alcoran* of the Franciſcans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, thoſe who adhere ſtrictly to the letter or text of the Alcoran, from an opinion of its ultimate ſufficiency and perfection.

ALCOVE, among builders, a receſs, or part of a chamber ſeparated by an eſtrade, or partition of columns, and other correſponding ornaments, in which is placed a bed of ſtate, or ſeats to entertain company.

ALCYON, the trivial name of a ſpecies of alcedo. See ALCEDO.

ALCYONIUM, an obſolete name of a ſubmarine plant. It is alſo uſed for a kind of coral, or aſtroites, frequently found foſſile in England.

ALDBOROUGH, a ſea-port town in Suffolk, 88 miles N. E. from London. E. long. 1. 32. N. lat. 52. 50.

ALDBOROUGH, a market-town in the W. riding of Yorkſhire, 15 miles N. W. of York, and 200 miles N. of London. W. long. 0. 20. N. lat. 54. 15.

ALDEBARAN, in aſtronomy, a ſtar of the firſt magnitude, called in Engliſh the *bull's eye*, as making the eye of the conſtellation Taurus. Its longitude is 6 deg. 32 min. 9 ſec. of Gemini, and its latitude 5 deg. 29 min. 40 ſec. ſouth.

ALDER-TREE, in botany. See BETULA.

ALDERHOLM, a pleaſant iſland of Sweden, formed by the three arms of a river running through Gentle, a town of Nordland, in Sweden.

ALDERMAN, in the Britiſh policy, a magiſtrate ſubordinate to the lord-mayor of a city or town-corporate. The number of theſe magiſtrates varies according to the magnitude of the place. London has 26; each having the care of one of the wards of the city. This office is for life; ſo that when one of them dies, or reſigns, a ward-mote is called, who return two perſons, one of whom the lord-mayor and aldermen chooſe to ſupply the vacancy. All the aldermen are juſtices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from ſerving inferior offices; nor ſhall they be put upon aſſizes, or ſerve on juries, ſo long as they continue to be aldermen.

ALDERMAN, among our Saxon anceſtors, was a degree of nobility anſwering to earl or count at preſent.

ALDERMAN was alſo uſed, in the time of king Edgar, for a judge or juſtice. Thus we meet with the titles of *Aldermannus totius Angliæ*, *aldermannus regis*, *comitatus*, *civitatis*, *burgi*, *caſtelli*, *hundredi ſive wapentachii*, *et novemdecimorum.*

ALDERNEY, an iſland in the Britiſh channel, ſubject to the crown of Great Britain. It is about 8 miles in compaſs, and is ſeparated from Cape la Hogue, in Normandy, by a narrow ſtreight, called the *Race of Alderney*, which is a very dangerous paſſage in ſtormy weather. To the weſt lie the range of rocks called the *Caſkets*, ſo dangerous to mariners. W. long. 2. 17. N. lat. 49. 50.

ALDPORT, an ancient name for Mancheſter; which ſee.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia claſs of plants; of which there is but one ſpecies. The calyx is divided into five parts; the petals are five; and the capſule has five valves, with ten ſeeds. It is a native of Italy and the Indies; and has no Engliſh name.

ALE, a fermented liquor obtained from an infuſion of malt, and differing from beer chiefly in having a leſs proportion of hops. (See BREWING.) This liquor, the natural ſubſtitute of wine in ſuch countries as could not produce the grape, was originally made in Egypt, the firſt planted kingdom, on the diſperſion from the eaſt, that was ſuppoſed unable to produce grapes. And, as the Noachian colonies pierced further into the weſt, they found, or thought they found, the ſame defect, and ſupplied it in the ſame manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all uſed an infuſion of barley for their ordinary liquor: and it was called by the various names of *Celia* and *Ceria* in the firſt coun-

try, *Cereviſia* in the ſecond, and *Curmi* in the laſt; all literally importing only *the ſtrong water*.

Anciently the Welch and Scots had alſo two kinds of ale, called *common ale* and *ſpiced ale*; and their value was differently aſcertained by law. Wine indeed ſeems to have been quite unknown even to the kings of Wales in this period, as it is not ſo much as once mentioned in their laws; though Giraldus Cambrenſis, who flouriſhed about a century after the conqueſt, acquaints us, that there was a vineyard in his time at Macnarper, near Pembroke. Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their anceſtors the ancient Germans. Before their converſion to Chriſtianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which thoſe heroes enjoyed who were admitted into the hall of Odin.

Various ſorts of ale are known in Britain, particularly *pale* and *brown*: the former is brewed from malt ſlightly dried; and is eſteemed more viſcid than the latter, which is made from malt more highly dried or roaſted.

Some have a method of brewing ale ſo that it will keep if carried to the Eaſt or Weſt Indies. The conſumption of ale in theſe kingdoms was computed, 20 years ago, at the annual value of 4 millions.

If malt-liquor, of any degree of ſtrength, is become flat and tartiſh; as it is uſed, it ſhould be drawn out of the caſk into a jug, in which a few grains of alkaline ſalt are put, by which a new fermentation will be raiſed, a ſprightly taſte reſtored to the liquor, and its acidity deſtroyed. More of this indeed ſhould not be uſed than is *exactly* required to correct the acid, otherwiſe the alkali will be taſted unpleaſantly. Tart liquors of this kind are apt to produce a dyſury, ſtrangury, or a diarrhœa; in which caſes, a ſmall quantity of brandy may be taken.

Medicated Ales, thoſe wherein medicinal herbs have been infuſed, or added during the fermentation.

Gill Ale, is that in which the dried leaves of gill or ground-ivy have been infuſed.

Ale-*Conner*, an officer in London, who inſpects the meaſures uſed in public-houſes. There are 4 ale-conners, who are all choſen by the common council of the city.

Ale-*Houſes* muſt be licenſed by juſtices of the peace, who take recognizances of the perſons licenſed, and of their ſureties, viz. 10l. each, that they will not ſuffer unlawful gaming, nor other diſorderly practices in their houſes. Every perſon, excepting thoſe who ſell ale in fairs, neglecting to procure a licenſe, is liable to a penalty of 40s. for the firſt offence, 4l. for the ſecond, and 6l. for the third, with all coſts. The licenſe is granted on the firſt of September, or within 20 days after, at a general meeting of the juſtices for the diviſion to which he belongs, upon his producing a certificate to his character, unleſs, by living in a city or town-corporate, this laſt circumſtance is diſpenſed with, and continues in force for one year only. Ale-houſe keepers, ſelling ale in ſhort meaſure, are liable to a penalty not exceeding 40s. and not leſs than 10s. and likewiſe to a fine of 10s. for permitting tipling, &c.

Ale-*Silver*, a tax paid annually to the lord-mayor of London, by all who ſell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more reſtricted ſenſe, was uſed for a particular game played with dice and tables, not unlike our backgammon.

ALECTO, one of the Furies, daughter of Acheron and Night, or, as others have it, of Pluto and Proſerpine.

ALECTORIA, a ſtone ſaid to be formed in the gall-bladders of old cocks, to which the antients aſcribed many fabulous virtues. This is otherwiſe called *Alectorius Lapis*, ſometimes *Alectorolithos*, in Engliſh the *cock-ſtone*. Modern naturaliſts however ſuppoſe it to be originally ſwallowed down, and not generated.

ALECTOROMANTIA, in antiquity, a ſpecies of divination ſaid to have been performed by means of a cock. The term is derived from αλεκτωρ, a *cock*, and μαντια, *divination*.

A-LEE, in the ſea-language, a term only uſed when the wind, croſſing or flanking the line of a ſhip's courſe, preſſes upon the maſts and ſails ſo as to make her incline to one ſide, which is called the lee-ſide: hence, when the helm is moved over to this ſide, it is ſaid to be *a-lee*, or *hard-a-lee*.

ALEGRETTE, a ſmall town of Portugal, in Alentejo; W. long. 5. 20. N. lat. 39. 6.

ALEMBDAR, an officer in the court of the Grand Signior, who bears the green ſtandard of Mahomet, when the ſultan appears in public on any ſolemn occaſion.

ALEMBERT (John le Rond d'), an eminent French philoſopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was expoſed as a foundling. He received his firſt education in the College of the Four Nations, among the Janſeniſts; but, on leaving it, found himſelf alone and unconnected in the world, and ſought an aſylum in the houſe of his *nurſe*. Here, he applied himſelf to the ſtudy of geometry, and lived, during the ſpace of 40 years, with the greateſt ſimplicity, diſcovering the augmentation of his means only by increaſing diſplays of his beneficence; concealing his growing reputation and celebrity from theſe honeſt people, and making their plain and uncouth manners the ſubject of good-natured pleaſantry and philoſophical obſervation. His good nurſe perceived his ardent activity, and heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compaſſion. "*You will never*," ſaid ſhe to him one day, "*be any thing but a philoſopher—and what is a philoſopher?—a fool, who toils and plagues himſelf during his life, that people may talk of him when* HE IS NO MORE."

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modeſty, diſintereſtedneſs, and beneficence, in his moral character; which are very fully detailed in M. Condorcet's eulogium, *Hiſt. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical veſſel, uſually made of glaſs or copper, formerly uſed for diſtillation. The bottom part, which contains the ſubject for diſtillation, is called, from its ſhape, the *cucurbit*; the upper part, which receives and condenſes the ſteam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm-ſtill*, are now more generally employed.

ALEMBROTH, in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alkaheſt, in diſſolving bodies, and opening the pores of all known ſubſtances. It is alſo uſed for a compound of corroſive mercury and ſal ammoniac.

ALENTEJO, a province of Portugal, between the rivers of Tajo and Guadiana.

ALENZON, a large handſome town of France; 20 miles N. of Mans, 63 S. by W. of Rouen, and 88 S. W. of Paris. Lon. 0. 10. N. lat. 48. 25.

ALEPPO, or Halab, the capital of the Pachalic, and of all Syria, and the ordinary reſidence of the pacha, is ſituated in the vaſt plain which extends from the Orontes to the Euphrates, and which towards the ſouth terminates in the deſert. It is built on 8 hills or eminences, on the higheſt of which the caſtle is erected, and is ſuppoſed to be the ancient Beræa. Aleppo is 70 miles E. of Scandaroon, on the ſea-coaſt, and 175 N. by E. of Damaſcus. E. long. 37. 40. N. lat. 36. 12.

Aleppo *(the Pachalic of)* one of the five governments into which Syria is divided. It comprehends the country extending

from the Euphrates to the Mediterranean, between two lines, one drawn from Scanderoon to Beer, along the mountains; the other from Beles to the sea, by Mara and the bridge of Shoger.

ALESHAM, a small neat town in Norfolk; 15 miles N. of Norwich, and 121 N. E. by N. of London. E. long. 0. 30. N. lat. 52. 53.

ALET, a town of France, in the department of Aude, and seated on the river Aude, 15 miles S. of Carcassone, and 37 N. W. of Narbonne. E. long. 2. 5. N. lat. 42. 59.

ALETRIS, in botany; a genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *corolla* monopetalous, funnel-shaped, hexangular, much corrugated, semiquinquefid, and perfistent: The *stamina* consist of 6 subulated filaments, the length of the corolla, and inserted into the base of the divisions of the corolla; the antheræ are oblong and erect: The *pistillum* has an ovate germen; the stylus subulated, and the length of the stamina; the stigma is trifid: The *pericarpium* is an ovated capsule, triquetrous, pointed, and trilocular: The *seeds* are numerous. Of this genus botanical writers enumerate 5 species. 1. The farinosa, a native of North America. 2. The capensis, a native of the Cape of Good Hope. 3. The hyacinthoides, or Guinea aloe. 4. The zeylanica, or Ceylon aloe. 5. The fragrans, or tree-aloe, a native of Africa. Of these only the first is so hardy as to outlive the winter in Britain, unless placed in a stove.

ALEUROMANCY, the same with *alphitomantia*, and *crithomanthia*; an antient kind of divination performed by means of meal or flower.

ALEXANDER THE GREAT, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards executed. The character and exploits of this hero are however so familiar to every body, that it is needless labour to dwell on them. All the world knows, says Mr. Bayle, that he was a composition of very great virtues and very great vices. He had no mediocrity in any thing but his stature: in his other properties, whether good or bad, he was all extremes. His ambition rose even to madness; and his father was not at all mistaken in supposing the bounds of Macedon too small for his son: for how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass; since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough, was, after all, to be praised by the Athenians: for it is related, that the difficulties which he encountered in order to pass the Hydaspes, forced him to cry out, "O Athenians, could you "believe to what dangers I expose myself for the sake of being "celebrated by you?" Hence it is evident, he wanted to make all future time his own, and to be deemed an object of admiration to the latest posterity; yet did not expect this from the conquest of worlds, but from books. He was perfectly right, says Bayle; "for if Greece had not furnished him with good "writers, he would long ago have been as much forgotten as "the kings who reigned in Macedon before Amphitryon."

ALEXANDERS, in botany. See SMYRNIUM.

ALEXANDRETTA, by the Turks called *Scanderoon*; a town in Syria, at the extremity of the Mediterranean sea.

ALEXANDRIA, now *Scanderia*, by Athenæus called Χρυσή; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, soon after the overthrow of Tyre, about 333 years before Christ. It is situated on the Mediterranean, about 50 leagues N. of Cairo, 12 miles W. of that mouth of the Nile anciently called *Canopicum*. E. long. 30. 19. N. lat. 31. 10.

ALEXANDRIA, a strong and considerable city of Italy, belonging to the duchy of Milan. It is 15 miles S. E. of Cassal, 35 N. by W. of Genoa, and 40 S. by W. of Milan. E. long. 8. 40. N. lat. 44. 53. The country about this town is called the *Alexandrin*.

ALEXANDRIAN, in a general sense, is applied to all those who professed or taught the sciences in the school of Alexandria. ALEXANDRIAN is more particularly understood of a college of priests, consecrated to the service of Alexander Severus after his deification.

ALEXANDRIAN *Library*. This famous library was founded by Ptolemy Soter, for the use of an academy he instituted in Alexandria; and, by continual additions by his successors, became at last the finest library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to seize all those which were brought into Egypt by Greeks or other foreigners. The books were transcribed in the museum by persons appointed for that purpose; the copies were then delivered to the proprietors, and the originals laid up in the library.

ALEXANDRIAN *Manuscript*, a famous copy of the Scriptures, consisting of four volumes, in a large quarto size; which contains the whole Bible in Greek, including the Old and New Testament, with the Apocrypha, and some smaller pieces, but not quite complete. This manuscript is now preserved in the British Museum. It was sent as a present to King Charles I. from Cyrillus Lucaris, patriarch of Constantinople, by Sir Thomas Rowe, ambassador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written.

ALEXANDRIAN, or *Alexandrine*, in poetry, a kind of verse consisting of twelve, or of twelve and thirteen syllables alternately; so called from a poem on the life of Alexander, written in this kind of verse by some French poet. It is little used, except by the French, whose tragedies are generally composed of Alexandrines.

ALEXICACUS, something that preserves the body from harm or mischief. The word amounts to much the same as *alexiterial*.

ALEXICACUS, in antiquity, was an attribute of Neptune, whom the tunny-fishers used to invoke under this appellation, that their nets might be preserved from the ξιφίας, or sword-fish, which used to tear them; and that he might prevent the assistance which it was pretended the dolphins used to give the tunnies on this occasion.

ALEXIPHARMICS, in medicine; supposed remedies for expelling the poison of certain diseases by the cutaneous pores, in the form of sweat. The term is now disused.

ALEXITERIAL, among physicians, a term of much the same import with *alexipharmic*; though sometimes used in a synonymous sense with amulet.

ALFANDIGA, the name of the custom-house at Lisbon.

ALFAQUES, among the Moors, the name generally used for their clergy, or those who teach the Mahometan religion; in opposition to the Morabites, who answer to monks among Christians.

ALFDOUCH, a name given by the Moors to a sort of vermicelli, which they make of flour and water.

ALFET, in our old customs, denotes a caldron full of boiling water, wherein an accused person, by way of trial or purgation, plunged his arm up to the elbow.

ALFORD, a town in Lincolnshire, 6 miles from the sea, and 20 N. of Boston. E. long. 0. 15. N. lat. 53. 30.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngest son of Æthelwolf king of the West Saxons, and was born at Wantage in Berkshire in 849. He succeeded his brother Ethelred, in the year 871, and the 22d of his age. On ascending the throne he found himself involved in a dan-

gerous war with the Danes, whoſe ambitious projects drew from him many exploits which are amply recorded in hiſtory. In the latter part of his reign, he exerted himſelf in eſtabliſhing and regulating his government, for the ſecurity of himſelf and his ſucceſſors, as well as the eaſe and benefit of his ſubjects in general. After a troubleſome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Wincheſter, in Hyde-abbey, under a monument of porphyry.—All our hiſtorians agree in diſtinguiſhing him as one of the moſt valiant, wiſeſt, and beſt of kings that ever reigned in England; and it is alſo generally allowed, that he not only digeſted ſeveral particular laws ſtill in being, but that he laid the firſt foundation of our preſent happy conſtitution.

ALGA, in botany, the trivial name of the lichen, fucus, and many other plants of the cryptogamia claſs.

ALGÆ, FLAGS; one of the ſeven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus, in his *Philoſophia Botanica*. They are defined to be plants, whoſe root, leaf, and ſtem, are all one. Under this deſcription are comprehended all the ſea weeds, and ſome other aquatic plants. In the ſexual ſyſtem, they conſtitute the 3d order of the 24th claſs *Cryptogamia*; in Tournefort, the ſecond genus of the ſecond ſection, *Marinæ, aut fluviatiles*, of the 17th claſs, *Aſpermæ vulgo habitæ*; and the 57th order in Linnæus's Fragments of a Natural Method. The attempts to arrange flags by the parts of their fructification have not been attended with great ſucceſs.

ALGAGIOLA, a ſmall fortified ſea-port town in Corſica; E. long. 9. 45. N. lat. 42. 20.

ALGAROT, in chemiſtry, an Arabic term for an emetic powder, prepared from regulus of antimony, diſſolved in acids, and ſeparated by repeated lotions in warm water.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length, and 20 in breadth; bounded on the W. and S. by the ſea, on the E. by the river Guadiana, and on the N. by Alentejo.

ALGEBRA.

A GENERAL method of computation, by means of ſigns and ſymbols, commonly the letters of the alphabet, by which numbers or any other quantities are repreſented, and hence it is called univerſal arithmetic, literal arithmetic, and the arithmetic of ſigns.

Very fanciful etymologies are given of the word Algebra. It is an Arabic word, and by the Arabians is coupled with the word *macabelah*, ſignifying oppoſition and compariſon, to expreſs what we properly call algebra; and which is explained to be the act of reſtitution and compariſon, or oppoſition and compariſon, or reſolution and equation. Some derive it from Gebar, a celebrated philoſopher, chemiſt, and mathematician, whom the Arabs call *Giaber*, and who is ſuppoſed to have been the inventor. Others, with more probability, derive it from *geber*, by prefixing the article *al*, which properly ſignifies the reduction of fractions to a whole number.

Diaphantus was the firſt known writer of algebra; who publiſhed 13 books in Greek, about the year 350, though only ſix of them were tranſlated into Latin, by Xylander, in 1575; and afterwards, 1621, in Greek and Latin, by M. Bachet and Fermat. This algebra of Diaphantus only extends to the ſolution of arithmetical indeterminate problems.

Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, having previouſly given ſmall treatiſes, publiſhed at Venice, in the year 1494, his principal work in Italian on algebra. He makes mention of Leonardus Piſanus, and ſome others, of whom he had learned the art, and adds, that ebra came originally from the Arabs; but as he never mentions Diaphantus, it is probable that that author was not known then in Europe. His algebra goes no farther than ſimple and quadratic equations, and poſitive roots only are uſed.

After him came Stifelius, Scipio Ferreus, Cardan, Tartaglia, and ſome others, who reached as far as the ſolution of ſome cubic equations. Bombelli followed theſe, and went a little farther. Nunnius, Ramus, Schoner, Salignac, Clavius, &c. all took different courſes, but made very little progreſs in the art.

In 1590, Vieta introduced his *Specious Arithmetic*, denoting the quantities, both known and unknown, by ſymbols or letters. He alſo gave an ingenious method of extracting the roots of equations, by approximations; ſince greatly improved and facilitated by Raphſon, Halley, Maclaurin, Simpſon, and others.

Oughtred, in his *Clavis Mathematica*, printed in 1631, improved Vieta's method, and invented ſeveral compendious characters, to ſhow the ſums, differences, rectangles, ſquares, cubes, &c.

Harriot, another Engliſhman, cotemporary with Oughtred, left at his death an Analyſis, or Algebra, printed in 1631, in which Vieta's method is brought into a ſtill more commodious form.

In 1637, Des Cartes publiſhed his geometry, in which he applied Harriot's method to the higher geometry, explaining the nature of curves by equations, and adding the conſtructions of cubic, biquadratic, and other higher equations.

From the time of Des Cartes, continual improvements have been made in the ſcience, by Schooten, Sluſius, Wallis, Newton, Mercator, Demoivre, Maclaurin, Landen, Euler, Waring, Lorgna, &c. &c.

PART I.

DEFINITIONS.

1. KNOWN Quantities are generally repreſented by the firſt letters of the alphabet, as a, b, c, &c. Unknown by the laſt letters, as x, y, z, &c.
2. The ſign + *(plus)* is a mark of addition. Thus $a + b$ denotes the ſum of a and b; $3 + 5$ denotes the ſum of 3 and 5, or 8. When no ſign is expreſſed, + is underſtood.
3. The ſign − *(minus)* denotes ſubtraction. Thus $a - b$ denotes the exceſs of a above b; $6 - 2$ is the exceſs of 6 above 2, or 4.
4. Quantities with the ſign + prefixed to them are called *poſitive* or *affirmative*; with the ſign − prefixed to them are called *negative*.

5. The sign × denotes multiplication. Thus 5 × 4 gives 5 multiplied into 4, or 20; $a \times b$ means a multiplied by b; and when two letters are adjacent without any mark, multiplication is understood. Thus ab means $a \times b$.

6. ÷ is the mark of division; thus $a \div b$ means a divided by b: or the *quotient* of two quantities is denoted by placing the *dividend* above a small line, and the divisor below it. Thus $\frac{18}{3}$ is the quotient of 18 divided by 3, or 6; which is also called a *fraction*.

7. A number prefixed to a letter is called a *numeral coefficient*, and expresses the product of the quantity by that number. When no number is prefixed, unit is understood.

8. A *simple* quantity consists of one part or *Term*, as $+a$, $-abc$; a *compound* quantity consists of more than one term, connected by the signs + or −. Thus $a + b$, $a - b + c$, are compound quantities. If there are two terms, it is called a *binomial*; if three, a *trinomial*, &c.

9. *Like* quantities consist of the same letter or letters, equally repeated. Thus $+ab$, $-5ab$, are like quantities; but $+ab$, and $+aab$ are unlike.

10. The sign = is the mark of equality. Thus $x + a = b - c$ means, that the sum of x and a is equal to the excess of b above c.

CHAP. I.

SECT. I. *Fundamental Operations.*

THE fundamental operations in algebra are performed by *Addition*, *Subtraction*, *Multiplication*, and *Division*.

PROB. I. *To add Quantities.*

Simple quantities, or the terms of compound quantities, to be added together, may be *like with like signs*, *like with unlike signs*, or they may be *unlike*.

Case 1. To add terms that are like and have like signs.

Rule. Add together the coefficients, to their sum prefix the common sign, and subjoin the common letter or letters.

Examp.		
To	$5ab$	$3aa - ab$
Add	$4ab$	$7aa - 2ab$
Sum	$9ab$	$4aa - 5ab$
		$14aa - 8ab$

Case 2. To add terms that are like, but have unlike signs.

Rule. Subtract the less coefficient from the greater, prefix the sign of the greater to the remainder, and subjoin the common letter or letters.

Examp.			
	$-4a$	$+7bc$	$-5ab$
	$+7a$	$-3bc$	$+2ab$
	$+3a$	$+bc$	$+3ab$
		$+5bc$	0

Case 3. To add terms that are unlike.

Rule. Set them all down, one after another, with their signs and coefficients prefixed.

$$2a + 3b - 5c + 8$$

Compound quantities are added together, by uniting the several terms of which they consist by the preceding rules.

Examp. The sum of $\left\{\begin{array}{l} 5ab - 3xy - 12cd \\ 7xy - ab + 15 \\ 9cd - 4xy - 4mn \end{array}\right.$

is $4ab - 3cd + 15 - 4mn$

PROB. II. *To subtract Quantities.*

General Rule. Change the signs of the quantity to be subtracted into the contrary signs, and then add it, so changed, to the quantity from which it was to be subtracted; the sum arising by this addition is the remainder.

Examp.		
From	$+5a$	$7ab - 16bc$
Subtract	$+3a$	$3ab + mb$
Rem.	$+2a$	$4ab - 16bc - mb$

When a positive quantity is to be subtracted, the rule is obvious. In order to show it, when the negative part of a quantity is to be subtracted, let $c - d$ be subtracted from a, the remainder, according to the rule, is $a - c + d$. For if c is subtracted from a, the remainder is $a - c$; but this is too small, because c is subtracted instead of $c - d$, which is less than it by d; the remainder therefore is too small by d; and d being added, it is $a - c + d$, according to the rule.

PROB. III. *To multiply Quantities.*

General Rule for the Signs. When the signs of the two terms to be multiplied are like, the sign of the product is +; but when the signs are unlike, the sign of the product is −.

Case 1. To multiply two terms.

Rule. Find the sign of the product by the general rule; after it place the product of the numeral coefficients, and set down the letters one after another.

Mult. By			
	$+a$	$+5b$	$-5ax$
	$+b$	$-3c$	$-7ab$
	$+ab$	$-15bc$	$+35aabx$

The reason of this rule is derived from Def. 5. and from the nature of multiplication, which is a repeated addition of one of the quantities to be multiplied as often as there are units in the other. Hence also the letters in two terms multiplied together may be placed in any order, and therefore the order of the alphabet is generally preferred.

Case 2. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, according to the preceding rule, and then collect all the products into one sum: that sum is the product required.

Examp. Mult. $2a + 3b$ By $3ax - 4by$

$$\begin{array}{r} 6aax + 9abx \\ - 8aby - 12bby \\ \hline \text{Prod. } 6aax + 9abx - 8aby - 12bby \end{array}$$

Mult. $m + x$ By $m - x$

$$\begin{array}{r} mm + mx \\ - mx - xx \\ \hline mm - xx \end{array}$$

Mult. $a - b$ By $c - d$

$$\begin{array}{r} ac - cb \\ - ad + db \\ \hline \text{Prod. } ac - cb - ad + db \end{array}$$

Of the general Rule for the Signs.

The reason of the rule will appear from the last mentioned example of $a - b$ multiplied by $c - d$, in which every case of it occurs.

Since multiplication is a repeated addition of the multiplicand as often as there are units in the multiplier, if $a - b$ is to be multiplied by c, $a - b$ must be added to itself as often as

there are units in c, and the product therefore must be $ca - cb$.

But this product is too great; for $a - b$ is to be multiplied, not by c, but by $c - d$ only, which is the excess of c above d; d times $a - b$ therefore, or $da - ab$, has been taken too much; hence this quantity must be subtracted from the former part of the product, and the remainder, which is $ca - cb - da + db$, will be the true product required.

Def. 11. When several quantities are multiplied together, any of them is called a *factor* of the product.

12. The products arising from the continual multiplication of the same quantity are called the *powers* of that quantity, which is the root. Thus, aa, aaa, $aaaa$, &c. are powers of the root a; and are expressed, by placing above the root, to the right hand, a figure, called the *index* or *exponent*, denoting how often the root is repeated. Thus,

a	is called the	1st	Power of the root	a^1 or a
aa		2d	a, and is other-	a^2
aaa		3d	wise expressed	a^3
$aaaa$		4th	by	a^4

The 2d and 3d powers are generally called the *square* and *cube*; and the 4th, 5th, and 6th, are sometimes respectively called the *biquadrate*, *surfolid*, and *cubocube*.

Cor. Powers of the same root are multiplied by adding their exponents. Thus, $a^2 \times a^3 = a^5$, or $aaa \times aa = aaaaa$, $b^3 \times b = b^4$.

Scholium.

Sometimes the multiplication of quantities is expressed by setting them down with the sign ($\times$) between them, without performing the operation according to the preceding rules; thus $\overline{a - b} \times \overline{c - d}$ expresses the product of $a - b$, multiplied by $c - d$; and the line drawn over any number of terms of a compound quantity, is called a *vinculum*, to denote the quantity affected by the particular sign connected with it.

Thus, in the last example, it shows that the terms $+ a$ and $- b$, and also c and $- d$ are all affected by the sign ($\times$). Thus also, $\overline{a + b}^2$ expresses the second power of $a + b$, or the product of that quantity multiplied by itself; whereas $a + b^2$ would express only the sum of a and b^2. By some writers a parenthesis ( ) is used as a vinculum, and $(a + b)^2$ is the same thing as $\overline{a + b}^2$.

Prob. IV. *To divide Quantities.*

General Rule for the Signs. If the signs of the divisor and dividend are like, the sign of the quotient is $+$; if they are unlike, the sign of the quotient is $-$.

This rule is easily deduced from that given in Prob. III.; for, from the nature of division, the quotient must be such a quantity as, multiplied by the divisor, shall produce the dividend with its proper sign.

Case I. When the divisor is simple, and is a factor of all the terms of the dividend.

Rule. The letter or letters in the divisor are to be expunged out of each term in the dividend, and the coefficients of each term to be divided by the co-efficient of the divisor; the quantity resulting is the quotient.

Ex. $a)ab(b.\quad 2aab)\,6a^3bc - 4a^2bdm\;(3ac - 2dm.$

The reason of this is evident from the nature of division, and from Def. 5. *Note.* It is obvious that powers of the same root are divided by subtracting their exponents.

Thus $a^2)\,a^3\,(a\quad a^3)\,a^7\,(a^4$. Also $a^2b)\,a^3b^6\,(ab^5$.

Case II. When the divisor is simple, but not a factor of the dividend.

Rule. The quotient is expressed by placing the dividend above a line, and the divisor below it.

Thus, the quotient of $3ab$ divided by $2mc$ is the fraction $\frac{3ab}{2mc}$.

Case III. When the divisor is compound.

Rule 1. The terms of the dividend are to be ranged according to the powers of some one of its letters; and those of the divisor, according to the powers of the same letter.

Thus, if $a^2 + 2ab + b^2$ is the dividend, and $a + b$ the divisor, they are ranged according to the powers of a.

2. The first term of the dividend is to be divided by the first term of the divisor; and this quotient being set down as a part of the quotient wanted, is to be multiplied by the whole divisor, and the product subtracted from the dividend. If nothing remain, the division is finished: the remainder, when there is any, is a new dividend.

Thus, a^2 divided by a, gives a, which is the first part of the quotient wanted: and the product of this part by the whole divisor $a + b$, viz. $a^2 + ab$ being subtracted from the given dividend, there remains in this example $ab + b^2$.

3. Divide the first term of this new dividend by the first term of the divisor as before, and join the quotient to the part already found, with its proper sign: then multiply the whole divisor by this part of the quotient, and subtract the product from the new dividend; and thus the operation is to be continued till no remainder is left.

Thus, $+ ab$, the first term of the new dividend divided by a, gives b; the product of which, multiplied by $a + b$, being subtracted from $ab + b^2$, nothing remains, and $a + b$ is the true quotient.

$$
\begin{array}{l}
a + b)\; a^2 + 2ab + b^2\;(a + b \\
\quad a^2 + ab \\
\quad \overline{\qquad\qquad} \\
\qquad\quad ab + b^2 \\
\qquad\quad ab + b^2 \\
\qquad\quad \overline{\qquad\qquad}
\end{array}
$$

$$
\begin{array}{l}
1 - a)\; 1\;(1 + a + a^2 + a^3, \text{ \&c.} \\
\quad 1 - a \\
\quad \overline{\qquad} \\
\qquad + a \\
\qquad + a - a^2 \\
\qquad \overline{\qquad\qquad} \\
\qquad\quad + a^2 \\
\qquad\quad + a^2 - a^3 \\
\qquad\quad \overline{\qquad\qquad} \\
\qquad\qquad + a^3, \text{ \&c.}
\end{array}
$$

As in the last example there is a remainder, from which the operation may be continued without end, the quotient is called *an infinite series*. By comparing a few of the first terms, the law of the series may be discovered, and it may be continued to any number of terms wanted.

§ 2. Of Fractions.

Definitions.

1. In a fraction, the quantity above the line is called the *numerator*; and that below it is called the *denominator*.

If both the numerator and denominator of the fraction be either multiplied or divided by the same quantity, the value of that fraction is the same.

Thus, let $\frac{a}{b} = c$, then $\frac{ma}{mb} = c$. For, from the nature of

diviſion, if the quotient $\frac{a}{b}$ $(=c)$ be multiplied by the diviſor b, the product muſt be the dividend a. Hence $\left(\frac{a}{b} \times b =\right) bc = a$, and likewiſe $ma = mbc$, and dividing both by mb, $\frac{ma}{mb} = c$. Converſely, if $\frac{ma}{mb} = c$, then alſo $\frac{a}{b} = c$.

Cor. 1. Hence a fraction may be reduced to another of the ſame value, but of a more ſimple form, by dividing both numerator and denominator by any common meaſure.

$$\text{Thus, } \frac{30ax - 54ay}{12ab} = \frac{5x - 9y}{2b}.$$

Cor. 2. A fraction is multiplied by any integer, by multiplying the numerator, or dividing the denominator by that integer; and converſely, a fraction is divided by any integer, by dividing the numerator, or multiplying the denominator by that integer.

PROB. I. *To find the greateſt common Meaſure of two Quantities.*

1. Of pure numbers.

Rule. Divide the greater by the leſs; and, if there is no remainder, the leſs is the greateſt common meaſure required. If there is a remainder, divide the laſt diviſor by it; and thus proceed, continually dividing the laſt diviſor by its remainder, till no remainder is left, and the laſt diviſor is the greateſt common meaſure required.

The greateſt common meaſure of 45 and 63 is 9; the greateſt common meaſure of 187 and 391 is 17. Thus,

45)63(1
45
18)45(2
36
9)18(2
18
0

The rule depends on the two following principles:

1. A quantity which meaſures both diviſor and remainder muſt meaſure the dividend.

2. A quantity which meaſures both diviſor and dividend muſt alſo meaſure the remainder.

For a quantity which meaſures two other quantities, muſt alſo meaſure both their ſum and difference; and, from the nature of diviſion, the dividend conſiſts of the diviſor repeated a certain number of times, together with the remainder. By the firſt it appears, that the number found by this rule is a common meaſure; and, by the ſecond, it is plain there can be no greater common meaſure; for, if there were, it muſt neceſſarily meaſure the quantity already found leſs than itſelf, which is abſurd.

When the greateſt common meaſure of algebraical quantities is required, if either of them be ſimple, any common ſimple diviſor is eaſily found by inſpection. If they are both compound, any common ſimple diviſor may alſo be found by inſpection. But when the greateſt compound diviſor is wanted, the preceding rule is to be applied; only,

2. The ſimple diviſors of each of the quantities are to be taken out, the remainders in the ſeveral operations are alſo to be divided by their ſimple diviſors, and the quantities are always to be ranged according to the powers of the ſame letter.

The ſimple diviſors in the given quantities, or in the remainders, do not affect a compound diviſor which is wanted; and hence alſo, to make the diviſion ſucceed, any of the dividends may be multiplied by a ſimple quantity. Beſides, the ſimple diviſors in the remainders not being found in the diviſors from which they ariſe, can make no part of the common meaſure ſought; and for the ſame reaſon, if in ſuch a remainder there be any compound diviſor which does not meaſure the diviſor from which it proceeds, it may be taken out.

EXAMPLES.

$$a^2 - b^2)a^2 - 2ab + b^2(1$$
$$a^2 - b^2$$
$$-2ab + 2b^2$$

Remainder which divided by $-2b$ is $2ba - b$)

$$a^2 - b^2(a + b$$
$$a^2 - b^2$$
$$* \quad *$$

If the quantities given are $8a^2b^2 - 10ab^3 + 2b^4$, and $9a^4b - 9a^3b^2 + 3a^2b^3 - 3ab^4$. The ſimple diviſors being taken out, *viz.* $2b^2$ out of the firſt, it becomes $4a^2 - 5ab + b^2$, and $3ab$ out of the ſecond, it is $3a^3 - 3a^2b + ab^2 - b^3$. As the latter is to be divided by the former, it muſt be multiplied by 4, to make the operation ſucceed, and then it is as follows:

$$4a^2 - 5ab + b^2)12a^3 - 12a^2b + 4ab^2 - 4b^3(3a$$
$$12a^3 - 15a^2b + 3ab^2$$
$$3a^2b + ab^2 - 4b^3.$$

This remainder is to be divided by b, and the new dividend multiplied by 3, to make the diviſion proceed. Thus,

$$3a^2 + ab - 4b^2)12a^2 - 15ab + 3b^2(4$$
$$12a^2 + 4ab - 16b^2$$
$$-19ab + 19b^2$$

and this remainder, divided by $-19b$, gives $a - b$, which being made a diviſor, divides $3a^2 + ab - 4b^2$ without a remainder, and therefore $a - b$ is the greateſt compound diviſor; but there is a ſimple diviſor b, and therefore $\overline{a - b} \times b$ is the greateſt common meaſure required.

PROB. II. *To reduce a Fraction to its loweſt Terms.*

Rule. Divide both numerator and denominator by their greateſt common meaſure.

Thus, $\frac{75abc}{125bcx} = \frac{3a}{5x}$, $25bc$ being the greateſt common meaſure, $\frac{a^4 - b^4}{a^5 - a^3b^2} = \frac{a^2 + b^2}{a^3}$.

PROB. III. *To reduce an Integer to a Fraction.*

Rule. Multiply the given integer by any quantity for a numerator, and ſet that quantity under the product for a denominator.

$$\text{Thus, } a = \frac{ma}{m}, \; a + b = \frac{a^2 - b^2}{a - b}.$$

The denominator of an integer is unity.

PROB. IV. *To reduce Fractions with different Denominators to Fractions of equal Value, that shall have the same Denominator.*

Rule. Multiply each numerator, separately taken, into all the denominators but its own, and the products shall give the new numerators. Then multiply all the denominators into one another, and the product shall give the common denominator.

Example. Let the fractions be $\frac{a}{b}, \frac{c}{d}, \frac{e}{f}$; they are respectively equal to $\frac{adf}{bdf}, \frac{bcf}{bdf}, \frac{bde}{bdf}$.

The reason of the operation appears from the preceding proposition; for the numerator and denominator of each fraction are multiplied by the same quantities; and the value of fractions therefore is the same.

PROB. V. *To add and subtract Fractions.*

Rule. Reduce them to a common denominator, then add or subtract the numerators; and the sum or difference set over the common denominator is the sum or remainder required.

Ex. Add together $\frac{a}{b}\ \frac{c}{d}\ \frac{e}{f}$ the sum is $\frac{adf + cbf + bde}{bdf}$.

From $\frac{a}{b}$ subt. $\frac{c}{d}$ the difference is $\frac{ad - bc}{bd}$.

Cor. 1. Integers and fractions may be added and subtracted by this rule, by considering unity as the denominator of the integers.

Thus, $b + \frac{c}{d} = \frac{bd + c}{d}$ and $a - \frac{a^2 - b^2}{2a} = \frac{2a^2 - a^2 + b^2}{2a}$ $= \frac{a^2 + b^2}{2a}$.

Cor. 2. A fraction, whose numerator is a compound quantity, may be distinguished into parts, by dividing the numerator into several parts, and setting each over the original denominator, and uniting the new fractions by the signs of their numerators.

Thus, $\frac{a^2 - 2ab + b^2}{2a} = \frac{a^2}{2a} - \frac{2ab}{2a} + \frac{b^2}{2a} = \frac{a}{2} - b + \frac{b^2}{2a}$.

PROB. VI. *To multiply Fractions.*

Rule. Multiply their numerators into one another, for the numerator of the product; and the denominators into one another, for the denominator of the product.

Ex. $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ $\qquad \frac{a+b}{c} \times \frac{a-b}{d} = \frac{a^2 - b^2}{cd}$.

Proof. Let $\frac{a}{b} = m$, and $\frac{c}{d} = n$. Then $a = bm$, and $c = dn$, and $ac = bdmn$, and $(mn =) \frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$.

PROB. VII. *To divide Fractions.*

Rule. Multiply the numerator of the dividend by the denominator of the divisor, for a new numerator; and the denominator of the dividend by the numerator of the divisor, for a new denominator.

Thus, $\frac{a}{b} \Big) \frac{c}{d} \Big(\frac{bc}{ad} = \frac{c}{d} \times \frac{b}{a}$.

Proof. Let $\frac{a}{b} = m$, and $\frac{c}{d} = n$; then $a = bm$, and $c = dn$; also $ad = bdm$ and $bc = bdn$; therefore $\Big(\frac{bdn}{bdm} =\Big) \frac{m}{n} = \frac{bc}{ad}$.

CHAP. II.

SECT. I. *Of Equations.*

Definitions.

1. AN Equation is a proposition asserting the equality of two quantities, and is expressed by placing the sign = between them.

2. Equations containing only one unknown quantity and its powers, are divided into *orders*, according to the highest power of the unknown quantity to be found in any of its terms.

If the highest power of the unknown quantity in any term be the { 1st, 2d, 3d, &c. } The Equation is called { *Simple*, *Quadrat*, *Cubic*, &c. }

But the exponents of the unknown quantities are supposed to be integers, and the equation is supposed to be cleared of fractions, in which the unknown quantity, or any of its powers, enter the denominators. Thus, $x + a = \frac{3x - b}{c}$ is a simple equation; $3x - \frac{5}{2x} = 12$, when cleared of the fraction by multiplying both sides by $2x$, becomes $6x^2 - 5 = 24x$ a quadratic, $x^3 - 2x^4 = x^6 - 20$ is an equation of the sixth order, &c.

To resolve an equation is to find the value of the unknown term in known terms.

§ 1. *Of simple Equations, and their Resolution.*

Rule 1. Any quantity may be transposed from one side of an equation to the other, by changing its sign.

Thus, if $3x - 10 = 2x + 5$
Then, $3x - 2x = 10 + 5$ or $x = 15$
Thus also, $5x + b = a + 2x$
By transp. $3x = a - b$.

For equal quantities are thus added to or subtracted from both sides.

Cor. The signs of all the terms of an equation may be changed into the contrary signs, and it will continue to be true.

Rule 2. Any quantity by which the unknown quantity is multiplied may be taken away, by dividing all the other quantities of the equation by it.

Thus, if $ax = b$
$x = \frac{b}{a}$
Also, if $mx + nb = am$
$x + \frac{nb}{m} = a$

For if equal quantities are divided by the same quantity, the quotients are equal.

Rule 3. If a term of an equation is fractional, its denominator may be taken away by multiplying all the other terms by it.

Thus if $\frac{x}{a} = b + c$ Alſo, if $a - \frac{b}{x} = c$

$x = ab + ac$ $ax - b = cx$

And by tranſ. $ax - cx = b$

And by div. $x = \frac{b}{a - c}$.

For if all the terms of the equation are multiplied by the ſame quantity, the quantities on each ſide will be equal.

Corollary.

If any quantity be found on both ſides of the equation, with the ſame ſign, it may be taken away from both.

Alſo, if all the terms in the equation are multiplied or divided by the ſame quantity, it may be taken out of them all.

Ex. If $3x + a = a + b$, then $3x = b$.

If $2ax + 3ab = ma + a^2$, then $2x + 3b = m + a$.

If $\frac{x}{3} - \frac{4}{3} = \frac{16}{3}$, then $x - 4 = 16$.

By theſe rules the unknown term may be ſeparated from the known, and the equation is reſolved.

Examples of ſimple Equations reſolved by theſe Rules.

If $3x + 5 = x + 9$

$2x = 4$

$x = \frac{4}{2} = 2$.

If $5x - \frac{5x}{2} + 12 = \frac{4x}{3} + 26$

$5x - \frac{5x}{2} - \frac{4x}{3} 26 - 12 = 14$

$30x - 15x - 8x = 84$.

Or $7x = 84$

$x = \frac{84}{7} = 12$.

If $\frac{5}{x} + \frac{9}{4} = 16$

$\frac{20}{x} + 9 = 64$

$20 + 9x = 64x$

$20 = 64x - 9x = 55x$

$x = \frac{20}{55} = \frac{4}{11}$.

§ 2. *Solution of Queſtions producing ſimple Equations.*

General Rule. The unknown quantities in the queſtion propoſed muſt be expreſſed by letters, and the relations of the known and unknown quantities contained in it, or the conditions of it, as they are called, muſt be expreſſed by equations. Theſe equations being reſolved give the anſwer of the queſtion.

For example, if the queſtion is concerning two numbers, they may be called x and y, and the conditions from which they are to be inveſtigated muſt be expreſſible by equations.

Thus, if it be required that the ſum of two numbers ſought be 60, that condition is expreſſed thus : $x + y = 60$

If their difference muſt be 24, then $x - y = 24$

If their product is 1640, then $xy = 1640$

If their quotient muſt be 6, then $\frac{x}{y} = 6$.

Caſe I. When there is only one unknown quantity to be found.

Rule. An equation involving the unknown quantity muſt be deduced from the queſtion; and it is obvious, that, when there is only one unknown quantity, there muſt be only one independent equation contained in the queſtion; for any other would be unneceſſary, and might be contradictory to the former.

Example. 1. To find a number, to which if there be added a half, a third part, and a fourth part of itſelf, the ſum will be 50.

Let it be z: then half of it is $\frac{z}{2}$, a third of it is $\frac{z}{3}$, &c.

Therefore, $z + \frac{z}{2} + \frac{z}{3} + \frac{z}{4} = 50$

$24z + 12z + 8z + 6z = 1200$

$50z = 1200$

$z = 24$.

Caſe II. When there are two unknown quantities.

Rule. Two independent equations involving the two unknown quantities, muſt be derived from the queſtion. A value of one of the unknown quantities muſt be derived from each of the equations; and theſe two values being put equal to each other, a new equation will ariſe, involving only one unknown quantity.

Example 2. Two perſons, A and B, were talking of their ages: ſays A to B, Seven years ago I was juſt three times as old as you were, and ſeven years hence I ſhall be juſt twice as old as you will be. I demand their preſent ages.

Let the ages of A and B be reſpectively	1	x and y
Seven years ago they were	2	$x - 7$ and $y - 7$
Seven years hence they will be	3	$x + 7$ and $y + 7$
Therefore	4	$x - 7 = 3 \times \overline{y - 7} = 3y - 21$
	5	$x + 7 = 2 \times y + 7 = 2y + 14$
	6	$x = 3y - 14$
	7	$x = 2y + 7$
	8	$3y - 14 = 2y + 7$
	9	$y = 21$
	10	$x = 49$

The ages of A and B then are 49 and 21.

Example 3. A gentleman diſtributing money among ſome poor people, found he wanted 10s. to be able to give 5s. to each; therefore he gives each 4s. only, and finds he has 5s. left.—To find the number of ſhillings and poor people.

If any queſtion ſuch as this, in which there are two quantities ſought, can be reſolved by means of one letter, the ſolution is in general more ſimple than when two are employed. There muſt be, however, two independent conditions; one of which is uſed in the notation of one of the unknown quantities, and the other gives an equation.

Let the number of poor be	1	z
The number of ſhillings will be	2	$5z - 10$
The number of ſhillings is alſo	3	$4z + 5$
	4	$5z - 10 = 4z + 5$.
	5	$z = 15$.

The number of poor therefore is 15, and the number of ſhillings is $(4z + 5 =)$ 65.

Caſe III. When there are three or more unknown quantities.

Rule. When there are three unknown quantities, there muſt be three independent equations ariſing from the queſtion; and from each of theſe a value of one of the unknown quantities muſt be obtained. By comparing theſe three values, two equations will ariſe, involving only two unknown quantities; and in like manner may the rule be extended to ſuch queſtions as contain four or more unknown quantities. Hence it may be inferred, That when juſt as many independent equations may be derived from a queſtion as there are unknown quantities in it, theſe quantities may be found by the reſolution of equations.

Examp. 4. To find three numbers, ſo that the firſt, with half the other two, the ſecond with one-third of the other two, and the third with one-fourth of the other two, may each be equal to 34.

Let the numbers be x, y, z, and the equations are

	1	$x + \frac{y+z}{2} = 34$
	2	$y + \frac{x+z}{3} = 34$
	3	$z + \frac{x+y}{4} = 34$
From the 1ſt	4	$x = \frac{68-y-z}{2}$
From the 2d	5	$x = 102 - 3y - z$
From the 3d	6	$x = 136 - 4z - y$
From 4th and 5th	7	$\frac{68-y-z}{2} = 102 - 3y - z$
7th reduced	8	$y = \frac{136-z}{5}$
5 = 6, and reduced	9	$y = \frac{3z-34}{2}$
8 and 9	10	$\frac{3z-34}{2} = \frac{136-z}{5}$
10th reduced	11	$15z - 170 = 272 - 2z$
	12	$17z = 442$ or $z = 26$
By 8 and 5.	13	$y = 22$ and $x = 10$

Scholium.

On many occaſions, by particular contrivances, the operations by the preceding rules may be much abridged. This, however, muſt be left to the ſkill and practice of the learner. A few examples are the following.

1. It is often eaſy to employ fewer letters than there are unknown quantities, by expreſſing ſome of them from a ſimple relation to others contained in the conditions of the queſtion.

2. Sometimes it is convenient to expreſs by letters, not the unknown quantities themſelves, but ſome other quantities connected with them, as their ſum, difference, &c. from which they may be eaſily derived.

3. In the operation, alſo, circumſtances will ſuggeſt a more eaſy road than that pointed out by the general rules. Two of the original equations may be added together, or may be ſubtracted; ſometimes they muſt be previouſly multiplied by ſome quantity, to render ſuch addition or ſubtraction effectual, in exterminating one of the unknown quantities, or otherwiſe promoting the ſolution. Subſtitutions may be made of the values of quantities, in place of quantities themſelves, and various other ſuch contrivances may be uſed, which will render the ſolution much leſs complicated.

Sect. II. *General Solution of Problems.*

In the ſolutions of the queſtions in the preceding part, the given quantities (being numbers) diſappear in the laſt concluſion, ſo that no general rules for like caſes can be deduced from them. But if letters are uſed to denote the known quantities, as well as the unknown, a general ſolution may be obtained, becauſe, during the whole courſe of the operation, they retain their original form. Hence alſo the connection of the quantities will appear in ſuch a manner as to diſcover the neceſſary limitations of the data, when there are any, which is neceſſary to the perfect ſolution of a problem.

Examp. 8. To find two numbers, of which the ſum and difference are given.

Let s be the ſum given, and d the given difference. Alſo, let x and y be the two numbers ſought.

$$x + y = s$$
$$x - y = d$$

Whence $\begin{cases} x = s - y \\ x = d + y \end{cases}$

$$d + y = s - y$$
$$2y = s - d$$
$$y = \frac{s-d}{2}$$

$$\text{And } x = \frac{s+d}{2}$$

Thus, let the given ſum be 100, and the difference 24.

Then $x = \left(\frac{s+d}{2} = \frac{124}{2} =\right) 62$ & $y = \left(\frac{s-d}{2} = \frac{76}{2} =\right) 38$.

CHAP. III.

Of Involution and Evolution.

Lemma.

The reciprocals of the powers of a quantity may be expreſſed by that quantity, with negative exponents of the ſame denomination. That is, the ſeries a, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^m}$, &c. may be expreſſed by a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-m}, &c.

For the rule for dividing the powers of the ſame root was to ſubſtract the exponents; if then the index of the diviſor be greater than that of the dividend, the index of the quotient muſt be negative.

Thus, $\frac{a^2}{a^3} = a^2 - a^3 = a^{-1}$. Alſo, $\frac{a^2}{a^3} = \frac{1}{a^1}$.

$\frac{m}{a^m} = a^{m-m} = a^0$. Alſo, $\frac{a^m}{a^m} = 1$. and ſo on of others.

Cor. Theſe *negative powers*, as they are called, are multiplied by adding, and divided by ſubtracting their exponents.

Thus, $a^{-2} \times a^{-3} = a^{-5}$.

Or, $\frac{1}{a^2} \times \frac{1}{a^3} = \frac{1}{a^5} = a^{-5}$.

$\frac{a^{-2}}{a^{-3}} = a^2$. Or, $\frac{1}{a^3}\Big)\frac{1}{a}\Big(\frac{a^3}{a} = a^2$.

I. *Of Involution.*

To find any power of a quantity is the buſineſs of Involution.

Caſe 1. When the quantity is ſimple.

Rule. Multiply the exponent of the letters by the index of the power required, and raiſe the coefficient to the ſame power.

Thus, the ſecond power of a is $a^{1\times 2} = a^2$.

The 3d power of $2a^2$ is $8a^{2\times 3} = 8\,a^6$.

For the multiplication would be performed by the continual addition of the exponents; and this multiplication of them is equivalent.

If the ſign of the given quantity is +, all its powers muſt be poſitive. If the ſign is —, then the powers whoſe exponents are even numbers are poſitive; and thoſe whoſe exponents are odd numbers are negative.

This is obvious from the rule for the ſigns in multiplication.

Caſe 2. When the quantity is compound.

Rule. The powers muſt be found by a continual multiplication of the quantity by itſelf.

Thus the ſquare of $x + \frac{a}{2}$ found by multiplying it into itſelf is $x^2 + ax + \frac{a^2}{4}$. The cube is got by multiplying the ſquare already found by the root, &c.

The involution of compound quantities is rendered much eaſier by the binomial theorem; for which ſee Chap. VII.

II. *Of Evolution.*

Evolution is the reverſe of Involution, and by it powers are reſolved into their roots.

Def. The root of any quantity is expreſſed by placing before it $\sqrt{\ }$ (called a *radical ſign*) with a ſmall figure above it, denoting the denomination of that root.

Thus, the ſquare root of a is $\sqrt[2]{a}$ or $\sqrt{a}$.

The cube root of bc is $\sqrt[3]{bc}$.

The 4th root of $a^2b - x^3$, is $\sqrt[4]{a^2b - x^3}$.

The mth root of $c^2 - dx$ is $\sqrt[m]{c^2 - dx}$.

General Rule for the Signs.

1. The root of any poſitive power may be either poſitive or negative, if it is denominated by an even number; if the root is denominated by an odd number, it is poſitive only.
2. If the power is negative, the root alſo is negative, when it is denominated by an odd number.
3. If the power is negative, and the denomination of the root even, then no root can be aſſigned.

This rule is derived from the change of ſigns in multiplication. When the quantity whoſe root is to be found is negative; it is convenient to ſet the radical ſign before the negative quantity, and then it is called an *impoſſible* or *imaginary* root.

Thus the ſquare root of $-a^2$ is denoted $\sqrt{-a^2}$.

The root of a poſitive power, denominated by an even number, has often the ſign $\pm$ before it, denoting that it may have either + or —.

Caſe I. When the quantity is ſimple.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient.

1. The exponents of the letters may be multiples of the index of the root, and the root of the coefficient may be extracted.

Thus, the ſquare root of $a^4 = a^{\frac{4}{2}} = \pm a^2$

$$\sqrt[3]{27\,a^6} = 3\,a^{\frac{6}{3}} = 3\,a^2$$

2. The exponents of the letters may not be multiples of the index of the root, and then they become fractions; and when the root of the coefficient cannot be extracted, it may alſo be expreſſed by a fractional exponent, its original index being underſtood to be 1.

Thus, $\sqrt{16\,a^3\,b^2} = 4\,a^{\frac{3}{2}}\,b$

$$\sqrt[3]{7\,ax^3} = 7^{\frac{1}{3}}\,a^{\frac{1}{3}}\,x = \sqrt[3]{7}\;a^{\frac{1}{3}}\,x.$$

Caſe II. When the quantity is compound.

1. To extract the ſquare root.

Rule. 1. The given quantity is to be ranged according to the powers of the letters, as in diviſion.

2. The ſquare root is to be extracted out of the firſt term, which gives the firſt part of the root ſought. Subtract its ſquare from the given quantity, and divide the firſt term of the remainder by double the part already found, and the quotient is the ſecond term of the root.

3. Add this ſecond part to double of the firſt, and multiply the ſum by the ſecond part: Subtract the product from the laſt remainder, and if nothing remain, the ſquare root is obtained. But if there is a remainder, it muſt be divided by the double of the parts already found, and the quotient will give the third part of the root; and ſo on.

The operation is as follows.

$$\begin{array}{l|l} a^2 + 2\,ab + b^2 & a + b \\ a^2 & \\ \hline 2\,a + b & + 2\,ab + b^2 \\ \times\ b & 2\,ab + b^2 \\ \hline & \\ * & \end{array}$$

$$\begin{array}{l|l} x^4 - ax^2 + \frac{a^2}{4} & x^2 - \frac{a}{2} \\ x^4 & \\ \hline 2x^2 - \frac{a}{2} & -ax^2 + \frac{a^2}{4} \\ \times\ -\frac{a}{2} & -ax^2 + \frac{a^2}{4} \\ \hline & \\ * & \end{array}$$

The reaſon of this rule appears from the compoſition of a ſquare.

2. To extract any other root.

Rule. Range the quantity according to the dimenſions of its letters, and extract the ſaid root out of the firſt term, and that ſhall be the firſt member of the root required. Then raiſe this root to a dimenſion lower by unit than the number that denominates the root required, and multiply the power

that arises by that number itself. Divide the second term of the given quantity by the product, and the quotient shall give the second member of the root required.—In like manner are the other parts to be found, by considering those already got as making one term.

Thus, the fifth root of

$a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$ ($a + b$

a^5

$5a^4$) $5a^4b$

And $a + b$ raised to the 5th power is the given quantity, and therefore it is the root sought.

It often happens, that the operation will not terminate, and the root will be expressed by a series.

Thus the square root of $a^2 + x^2$ becomes a series.

$$a^2 + x^2 \left(a + \frac{x^2}{2a} - \frac{x^4}{8a^3} + \frac{x^6}{16a^5}, \text{ \&c.}\right.$$

a^2

$2a + \frac{x^2}{2a}$ ($+ x^2$

$\times \frac{x^2}{2a}$ ($= x^2 + \frac{x^4}{4a^2}$

$2a + \frac{x^2}{a} - \frac{x^4}{8a^3}$ ($- \frac{x^4}{4a^2}$

$\times - \frac{x^4}{8a^3}$ ($= - \frac{x^4}{4a^2} - \frac{x^6}{8a^4} + \frac{x^8}{64a^6}$,

$+ \frac{x^6}{8a^4} - \frac{x^8}{64a^6}$, &c.

III. *Of Surds.*

Def. Quantities with fractional exponents are called *surds*, or *imperfect powers*.

Such quantities are also called *irrational*; in opposition to others with integral exponents, which are called *rational*.

The operations concerning surds depend on the following principle: If the numerator and denominator of a fractional exponent be both multiplied or both divided by the same quantity, the value of the power is the same. Thus

$a^{\frac{m}{n}} = a^{\frac{mc}{nc}}$: for let $a^{\frac{m}{n}} = b$; then $a^m = b^n$, and $a^{mc} = b^{nc}$

and extracting the root nc, $a^{\frac{mc}{nc}} = b^{\frac{nc}{nc}} = b = a^{\frac{m}{n}}$.

Lem. A rational quantity may be put into the form of a surd, by reducing its index to the form of a fraction of the same value.

Thus, $a = a^{\frac{2}{2}} = \sqrt{a^2}$

$a^2b = a^{\frac{6}{3}}b^{\frac{3}{3}} = \sqrt[3]{a^6b^3}$

PROB. I. *To reduce surds of different denominators to others of the same value and of the same denomination.*

Rule. Reduce the fractional exponents to others of the same value and having the same common denominator.

Ex. $\sqrt{a}$, $\sqrt[3]{b^2}$ or $a^{\frac{1}{2}}$, $b^{\frac{2}{3}}$

but $a^{\frac{1}{2}} = a^{\frac{3}{6}}$ and $b^{\frac{2}{3}} = b^{\frac{4}{6}}$.

therefore $\sqrt{a}$, and $\sqrt[3]{b^2}$ are respectively equal to $\sqrt[6]{a^3}$ and $\sqrt[6]{b^4}$.

PROB. II. *To multiply and divide surds.*

1. When they are surds of the same rational quantity, add and subtract their exponents.

Thus, $a^{\frac{1}{3}} \times a^{\frac{3}{4}} = a^{\frac{1}{3}+\frac{3}{4}} = a^{\frac{13}{12}} = \sqrt[12]{a^{13}}$

2. If they are surds of different rational quantities, let them be brought to others of the same denomination. Then, by multiplying or dividing these rational quantities, their product or quotient may be set under the common radical sign.

Thus, $\sqrt[m]{a} \times \sqrt[n]{b} = a^{\frac{1}{m}}b^{\frac{1}{n}} = \sqrt[mn]{a^n b^m}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt{a+b}} = \sqrt{\frac{a^2-b^2}{a+b}} = \sqrt{a-b}.$$

If the surds have any rational coefficients, their product or quotient must be prefixed. Thus $a\sqrt{m} \times b\sqrt{n} = ab\sqrt{mn}$.

Cor. If a rational coefficient be prefixed to a radical sign, it may be reduced to the form of a surd by the lemma; and conversely, if the quantity under the radical sign be divisible by a perfect power of the same denomination, it may be taken out, and its root prefixed as a coefficient.

$$a\sqrt{b} = \sqrt{a^2b}\,; \quad 2 \times \sqrt[3]{a} = \sqrt[3]{8a}.$$

Conv. $\sqrt{a^2b^3} = ab\sqrt{b}$; $\sqrt{4a^2 - 8a^2b} = 2a\sqrt{1-2b}$.

Even when the quantity under the radical sign is not divisible by a perfect power, it may be useful sometimes to divide surds into their component factors, by reversing the operation of this problem.

Thus $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$, $\sqrt[3]{a^2b - bx^2} = \sqrt[3]{ba - bx}$

$\times \sqrt[3]{a + x} = b^{\frac{1}{3}} \times \sqrt[3]{a - x} \times \sqrt[3]{a + x}$.

PROB. III. *To involve or evolve surds.*

This is performed by the same rules as in other quantities, by multiplying or dividing their exponents by the index of the power or root required.

Scholium.

If a member of an equation be a surd root, then the equation may be freed from any surd, by bringing that member first to stand alone upon one side of the equation, and then taking away the radical sign from it, and raising the other side to the power denominated by the index of that surd.

Example. If $3\sqrt{x^2-a^2} + 2y = a + y$

Then $3\sqrt{x^2-a^2} = a - y$

and $9 \times x^2 - a^2 = a^2 - 2ay + y^2$.

If the unknown quantity be found only under the radical sign, and only of the first dimension, the equation becomes simple.

Thus, if $\sqrt[3]{4x+16}+5=9$
Then $\sqrt[3]{4x+16}=4$
And $4x+16=64$
$4x=48$
And $x=12$

If $\sqrt[m]{a^2x-b^2x}=a$
Then $a^2x-b^2x=a^m$

$$x=\frac{a^m}{a^2-b^2}$$

In general, if $x^{\frac{p}{q}}+x^{\frac{m}{n}}=a$, by reducing the furds to the ſame denomination $x^{\frac{pn}{qn}}+x^{\frac{qm}{qn}}=a$, and making $x^{\frac{1}{qn}}=z$, the equation is $z^{pn}+z^{qm}=a$, in which the exponents of z are integers; and z being found, x is to be found from the equation $x^{\frac{1}{qn}}=z$.

CHAP. V.

Equations are either *pure* or *adfected*.

Def. 1. A *pure equation* is that in which only one power of the unknown quantity is found.

2. An *adfected equation* is that in which different powers of the unknown quantity are found in the ſeveral terms.

Thus, $a^2+ax^2=b^3$, $ax^2-b^2=m^2+x^2$ are pure equations. $x^2-ax=b^2$, $x^3+x^2=17$, are adfected equations.

Solution of Pure Equations.

Rule. Make the power of the unknown quantity to ſtand alone by the rules formerly given, and then extract the root of the ſame denomination out of both ſides, which will give the value of the unknown quantity.

EXAMPLES.

If $a^2+ax^2=b^3$
$ax^2=b^3-a^2$
$x^2=\frac{b^3-a^2}{a}$
$x=\sqrt{\frac{b^3-a^2}{a}}$

$ax^m-b=x^m-c$
$ax^m-x^m=b-c$
$x^m=\frac{b-c}{a-1}$
$x=\sqrt[m]{\frac{b-c}{a-1}}$

Solution of Adfected Quadratic Equations.

An adfected quadratic equation (commonly called a quadratic) involves the unknown quantity itſelf, and alſo its ſquare:

Rule. 1. Tranſpoſe all the terms involving the unknown quantity to one ſide, and the known terms to the other; and ſo that the term containing the ſquare of the unknown quantity may be poſitive.

2. If the ſquare of the unknown quantity is multiplied by any coefficient, all the terms of the equation are to be divided by it, ſo that the coefficient of the ſquare of the unknown quantity may be 1.

3. Add to both ſides the ſquare of half the coefficient of the unknown quantity, and the ſide of the equation involving the unknown quantity will be a complete ſquare.

4. Extract the ſquare root from both ſides of the equation, and by tranſpoſing the above-mentioned half coefficient, a value of the unknown quantity is obtained in known terms.

The reaſon of this rule is manifeſt from the compoſition of the ſquare of a binomial, for it conſiſts of the ſquares of the two parts, and twice the product of the two parts.

The different forms of quadratic equations, expreſſed in general terms, being reduced by the firſt and ſecond parts of the rule, are theſe:

1. $x^2+ax=b^2$
2. $x^2-ax=b^2$
3. $x^2-ax=-b^2$

Caſe 1. $x^2+ax=b^2$

$$x^2+ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x+\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\pm\sqrt{b^2+\frac{a^2}{4}}-\frac{a}{2}$$

Caſe 2. $x^2-ax=b^2$

$$x^2-ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x-\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\frac{a}{2}\pm\sqrt{b^2+\frac{a^2}{4}}$$

Caſe 3. $x^2-ax=-b^2$

$$x^2-a^2+\frac{a^2}{4}=\frac{a^2}{4}-b^2$$

$$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b^2}$$

$$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b^2}$$

1. Every quadratic equation will have two roots, except ſuch of the third form, whoſe roots become impoſſible.

2. In the two firſt forms, one of the roots muſt be poſitive, and the other negative.

3. In the third form, if $\frac{a^2}{4}$, or the ſquare of half of the coefficient of the unknown quantity, be greater than b^2, the known quantity, the two roots will be poſitive. If $\frac{a^2}{4}$ be equal to b^2, the two roots become equal; but if $\frac{a^2}{4}$ is leſs than b^2, the quantity under the radical ſign becomes negative, and the two roots are impoſſible.

4. If the equation expreſs the relation of magnitudes abſtractly conſidered, where a contrariety cannot be ſuppoſed to take place, the negative roots cannot be of uſe, or rather there are no ſuch roots; for then a negative quantity by itſelf is unintelligible, and therefore the ſquare root of a poſitive quantity muſt be poſitive only.

Solution of Queſtions producing Quadratic Equations.

The expreſſion of the conditions of the queſtion by equations, or the ſtating of it, and the reduction likewiſe of theſe equations, till we arrive at a quadratic equation, involving only one unknown quantity and its ſquare, are effected by the ſame rules which were given for the ſolution of ſimple equations.

One lays out a certain ſum of money in goods, which he

ſold again for L. 24, and gained as much per cent. as the goods coſt him: I demand what they coſt him?

If the money laid out be	1	y
The gain will be	2	$24-y$
But this gain is $(y:24-y::100)$	3	$\frac{2400-100y}{y}$ per cent.
Therefore by queſtion	4	$y=\frac{2400-100y}{y}$
And by mult. and tr.	5	$y^2+100y=2400$
Completing the ſquare	6	$y^2+100y+50)^2=2400+2500=4900$
Extr. the root	7	$y+50=\pm\sqrt{4900}=70$
Tranſ.	8	$y=\pm 70-50=20$ or -120.

The anſwer is 20l. which ſucceeds. The other root, -120, has no place in this example, a negative number being here unintelligible.

To find two numbers whoſe ſum is 100, and whoſe product is 2059.

Let the given ſum $100=a$, the product $2059=b$, and let one of the numbers ſought be x, the other will be $a-x$. Their product is $ax-x^2$.

Therefore	1	$ax-x^2=b$ or $x^2-ax=-b$
Complete the ſquare	2	$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b$
Ext. $\sqrt{\ }$	3	$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b}$
Tranſp.	4	$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b}$
And the other number	5	$a-x=\frac{a}{2}\mp\sqrt{\frac{a^2}{4}-b}$.

By inſerting numbers, $x=71$ or 29 and $a-x=29$ or 71, ſo that the two numbers ſought are 71 and 29.

Here it is to be obſerved, that b muſt not be greater than $\frac{a^2}{4}$, elſe the roots of the equation would be impoſſible; that is, the given product muſt not be greater than the ſquare of half the given ſum of the numbers ſought. This limitation can eaſily be ſhown from other principles; for the greateſt poſſible product of two parts into which any number may be divided, is, when each of them is a half of it. If b be equal to $\frac{a^2}{4}$, there is only one ſolution, and $x=\frac{a}{2}$, alſo $a-x=\frac{a}{2}$.

CHAP. VI.

Of Indeterminate Problems.

It was formerly obſerved, that if there are more unknown quantities in a queſtion than equations, by which their relations are expreſſed, it is indetermined. In other circumſtances, ſuch problems are reſolved by various methods not to be comprehended in general rules.

Examp. 1. To divide a given ſquare number into two parts, each of which ſhall be a ſquare number.

There are two quantities ſought in this queſtion, and there is only one equation expreſſing their relation; but it is required alſo that they may be rational, which circumſtance cannot be expreſſed by an equation: another condition therefore muſt be aſſumed, in ſuch a manner as to obtain a ſolution in rational numbers.

Let the given ſquare be a^2; let one of the ſquares ſought be x^2, the other is a^2-x^2. Let $rx-a$ alſo be a ſide of the laſt ſquare, therefore

$$r^2x^2-2rxa+a^2=a^2-x^2$$

By tranſp. $\quad r^2x^2+x^2=2rxa$

Divide by x $\quad r^2x+x=2ra$

Therefore $\quad x=\frac{2ra}{r^2+1}$

$$\text{And } rx-a=\frac{2r^2a}{r^2+1}-a=\frac{r^2-1}{r^2+1}a.$$

Let r therefore be aſſumed at pleaſure, and $\frac{2ra}{r^2+1}$, $\frac{r^2-1}{r^2+1}a$, which muſt always be rational, will be the ſides of the two ſquares required.

Thus, if $a^2=100$; then if $r=3$, the ſides of the two ſquares are 6 and 8, for $36+64=100$.

Alſo let $a^2=64$. Then if $r=2$, the ſides of the ſquares are $\frac{32}{5}$ and $\frac{24}{5}$; and $\frac{1024}{25}+\frac{576}{25}=\frac{1600}{25}=64$.

The reaſon of the aſſumption of $rx-a$ as a ſide of the ſquare a^2-x^2, is, that being ſquared and put equal to this laſt, the equation manifeſtly will be ſimple, and the root of ſuch an equation is always rational.

Examp. 2. To find two ſquare numbers whoſe difference is given.

Let x^2 and y^2 be the ſquare numbers, and a their difference.

Put $\frac{z+v}{2}=x$, and $\frac{z-v}{2}=y$

$$\frac{z^2+2zv+v^2}{4}=x^2$$

$$\frac{z^2-2zv+v^2}{4}=y^2$$

$$zv=x^2-y^2=a.$$

If x and y are required only to be rational, then take v at pleaſure, and $z=\frac{a}{v}$, whence x and y are known.

But if x and y are required to be whole numbers, take for z and v any two factors that produce a, and are both even or both odd numbers. And this is poſſible only where a is either an odd number greater than 1, or a number diviſible by 4. Then $\frac{z+v}{2}$ and $\frac{z-v}{2}$ are the numbers ſought.

For the product of two odd numbers is odd, and that of two even numbers is diviſible by 4. Alſo if z and v are both odd or both even, $\frac{z+v}{2}$ and $\frac{z-v}{2}$ muſt be integers.

Ex. 1. If $a=27$, take $v=1$, then $z=27$; and the ſquares are 196 and 169. Or z may be 9 and $v=3$, and then the ſquares are 36 and 9.

2. If $a=12$, take $v=2$, and $z=6$; and the ſquares are 16 and 4.

CHAP. VII.

I. *Of Arithmetical Series.*

Def. When a number of quantities increaſe or decreaſe by the ſame common difference, they form an arithmetical ſeries. Thus, a, $a+b$, $a+2b$, $a+3b$, &c. x, $x-b$, $x-2b$, &c. Alſo, 1, 2, 3, 4, 5, 6, &c. and 8, 6, 4, 2, &c.

Prop. In an arithmetical ſeries, the ſum of the firſt and laſt terms is equal to the ſum of any two intermediate terms, equally diſtant from the extremes.

Let the firſt term be a, the laſt x, and b the common difference; then $a + b$ will be the ſecond, and $x - b$ the laſt but one, &c.

Thus, a, $a + b$, $a + 2b$, $a + 3b$, $a + 4b$, &c.
x, $x - b$, $x - 2b$, $x - 3b$, $x - 4b$, &c.

It is plain, that the terms in the ſame perpendicular rank are equally diſtant from the extremes; and that the ſum of any two in it is $a + x$, the ſum of the firſt and laſt.

Cor. 1. Hence the ſum of an arithmetical ſeries is equal to the ſum of the firſt and laſt term multiplied into half the number of terms.

If n be the number of terms, and s the ſum of the ſeries; $s = \overline{a + x} \times \frac{n}{2}$. If $a = 0$, then $s = \frac{nx}{2}$.

Cor. 2. $x = a + \overline{n - 1} \times b$, and $s = \overline{2a + \overline{n - 1} \times b} \times \frac{n}{2}$
or, $s = \frac{2an + n^2b - nb}{2}$.

Cor. 3. Of the firſt term, common difference, ſum and number of terms, any three being given, the fourth may be found by reſolving the preceding equation; a, b, s, and n, being ſucceſſively conſidered as the unknown quantity. In the three firſt caſes the equation is ſimple, and in the laſt it is quadratic.

II. *Of Geometrical Series.*

Def. When a number of quantities increaſe by the ſame multiplier, or decreaſe by the ſame diviſor, they form a geometrical ſeries. This common multiplier or diviſor is called the *common ratio*.

Thus, a, ar, ar^2, &c. a, $\frac{a}{r}$, $\frac{a}{r^2}$, $\frac{a}{r^3}$, &c.
1, 2, 4, 8, &c.

Prop. I. The product of the extremes in a geometrical ſeries is equal to the product of any two terms, equally diſtant from the extremes.

Let a be the firſt term, y the laſt, r the common ratio: then the ſeries is,

a, ar, ar^2, ar^3, ar^4, &c.
y, $\frac{y}{r}$, $\frac{y}{r^2}$, $\frac{y}{r^3}$, $\frac{y}{r^4}$, &c.

Each term in the upper rank is equally diſtant from the beginning as that below it from the end; and the product of any two ſuch is equal to ay, the product of the firſt and laſt.

Prop. II. The ſum of a geometrical ſerics wanting the firſt term, is equal to the ſum of all but the laſt term multiplied by the common ratio.

For, $ar + ar^2 + ar^3$, &c. . . . $+ \frac{y}{r^3} + \frac{y}{r^2} + \frac{y}{r} + y$ the ſeries wanting the firſt term

$= r \times a + ar^2 + ar^2$, &c. . $+ \frac{y}{r^4} + \frac{y}{r^3} + \frac{y}{r^2} + \frac{y}{r}$ the ſeries without the laſt term multiplied into r.

Cor. 1. Let s be the ſum of the ſeries, $\overline{s - y} \times r = s - a$.
And $s = \frac{yr - a}{r - 1}$

Cor. 2. Since the exponent of r in any term is equal to the number of terms preceding it; in the laſt term its exponent will be $n - 1$; the laſt term, therefore, $y = ar^{n-1}$, and $s = \frac{ar^n - a}{r - 1} = a \times \frac{r^n - 1}{r - 1}$. Hence of theſe four, s, a, r, n, any three being given, the fourth may be found. If n is not a ſmall number, it will be moſt conveniently found by logarithms.

Cor. 3. If the ſeries decreaſes, and the number of terms is unlimited, then, according to this notation, $s = \frac{yr}{r - 1}$ a finite ſum, is the limit of the ſeries.

Ex. Required the limit of the ſeries 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c. Here $y = 1$, and $r = 2$. Therefore $s = \frac{1 \times 2}{2 - 1} = 2$.

Repeating and *circulating decimals*, are geometrically decreaſing ſerieſes, and their limits may be found by this rule.

Thus .333, &c. $= \frac{3}{10} + \frac{3}{100} +$, &c. $y = \frac{3}{10}$ and $r = 10$; therefore $s = \frac{yr}{r - 1} = \frac{3 \times 10}{10 \times \overline{10 - 1}} = \frac{1}{3}$.

III. *Of Infinite Series.*

In many caſes, if the diviſion and evolution of compound quantities be actually performed, the quotients and roots can only be expreſſed by a ſeries of terms, to be continued *ad infinitum*. By comparing a few of the firſt terms, the law of the progreſſion of ſuch a ſeries will frequently be diſcovered. When this cannot be done, the work is much facilitated by ſeveral methods; the chief of which is that by the binomial theorem.

THEOREM. *Any binomial* (*as* $a + b$) *may be raiſed to any power* (m) *by the following rules.*

1. From inſpecting a table of the powers of a binomial obtained by multiplication, it appears, that the terms without their coefficients are a^m, $a^{m-1}b$, $a^{m-2}b^2$, $a^{m-3}b^3$, &c.

2. The coefficients of theſe terms will be found by the following rule.

The coefficient of any term multiplied into the exponent of a in it, and divided by the exponent of b increaſed by 1, will give the coefficient of the next following term.

The coefficient of the firſt term is always 1; and the coefficients of the terms in order are as follow: 1, m, $m \times \frac{m-1}{2}$, $m \times \frac{m-1}{2} \times \frac{m-2}{3}$, &c. or more conveniently expreſſed thus: 1, Am, B $\times \frac{m-1}{2}$, C $\times \frac{m-2}{3}$, D $\times \frac{m-3}{4}$, &c. the capitals denoting the preceding coefficient. Hence $\overline{a + b}^m = a^m +$ A$ma^{m-1}b +$ B $\times \frac{m-1}{2} \times a^{m-2}b^2 +$ C $\times \frac{m-2}{3}$ $a^{m-3}b^3$, &c. This celebrated binomial theorem is deduced here by induction only; but it may be rigidly demonſtrated, though upon principles which do not belong to this place.

By this rule $\frac{1}{1 - r}$ may be turned into an infinite ſeries, for $\frac{1}{1 - r} = 1 \times \overline{1 - r}^{-1}$, let $a = 1$, $b = -r$, and $m = -1$; and the ſame ſeries will ariſe as is obtained by diviſion.

This theorem may be applied to quantities which conſiſt of more than two parts, by ſuppoſing them diſtinguiſhed into two, and then ſubſtituting for the powers of theſe compound parts their values. Thus, $\overline{a + b + c}^2 = \overline{a + \overline{b + c}}^2$.

PART II.

Of the General Properties and Reſolution of EQUATIONS of all Orders.

CHAP. I.

Of the Origin and Compoſition of Equations; and of the Signs and Coefficients of their Terms.

THE higher orders of equations, and their general affections, are beſt inveſtigated by conſidering their origin from the combination of inferior equations.

In this general method, all the terms of any equation are brought to one ſide, and the equation is expreſſed by making them equal to 0. Therefore, if a root of the equation be inſerted inſtead of (x) the unknown quantity, the poſitive terms will be equal to the negative, and the whole muſt be equal to 0.

Def. When any equation is put into this form, the term in which (x) the unknown quantity is of the higheſt power is made the *Firſt*, that in which the index of x is leſs by 1 is the ſecond, and ſo on, till the laſt into which the unknown quantity does not enter, and which is called the *Abſolute Term*.

Prop. I. If any number of equations be multiplied together, an equation will be produced, of which the dimenſion (*) is equal to the ſum of the dimenſions of the equations multiplied.

If any number of ſimple equations be multiplied together, as $x - a = 0$, $x - b = 0$, $x - c = 0$, &c. the product will be an equation of a dimenſion, containing as many units as there are ſimple equations. In like manner, if higher equations are multiplied together, as a cubic and a quadratic, one of the fifth order is produced, and ſo on.

Converſely. An equation of any dimenſion is conſidered as compounded either of ſimple equations, or of others, ſuch that the ſum of their dimenſions is equal to the dimenſion of the given one. By the reſolution of equations theſe inferior equations are diſcovered, and by inveſtigating the component ſimple equations, the roots of any higher equation are found.

Cor. 1. An equation admits of as many ſolutions, or has as many roots as there are ſimple equations which compoſe it.

Cor. 2. And converſely, no equation can have more roots than it has dimenſions.

Cor. 3. Imaginary or impoſſible roots muſt enter an equation by pairs; for they ariſe from quadratics, in which both the roots are ſuch. And an equation of an even dimenſion may have all its roots, or any even number of them impoſſible, but an equation of an odd dimenſion muſt at leaſt have one poſſible root.

Cor. 4. The roots are either poſitive or negative, according as the roots of the ſimple equations, from which they are produced, are poſitive or negative.

Cor. 5. When one root of an equation is diſcovered, one of the ſimple equations is found, from which the given one is compounded. The given equation, therefore, being divided by this ſimple equation, will give an equation of a dimenſion lower by 1.

Prop. II. To explain the general properties of the ſigns and coefficients of the terms of an equation.

Let $x - a = 0$, $x - b = 0$, $x - c = 0$, $x - d = 0$, &c. be ſimple equations, of which the roots are any poſitive quantities $+a$, $+b$, $+c$, $+d$, &c. and let $x + m = 0$, $x + n = 0$, &c. be ſimple equations, of which the roots are any negative quantities $-m$, $-n$, &c. and let any number of theſe equations be multiplied together, as in the following table:

$$\begin{array}{l} x - a = 0 \\ \times\ x - b = 0 \\ \hline = x^2 - ax - bx + ab \end{array} \Big\} = 0, \text{ a Quadratic.}$$

$$\begin{array}{l} x^2 - ax - bx + ab \\ \times\ x - c = 0 \\ \hline = x^3 - ax^2 - bx^2 - cx^2 + abx + acx + bcx - abc \end{array} = 0, \text{ a Cubic.}$$

$$\begin{array}{l} x^3 - ax^2 - bx^2 - cx^2 + abx + acx + bcx - abc \\ \times\ x + m = 0 \\ \hline = x^4 - ax^3 - bx^3 - cx^3 + mx^3 + abx^2 + acx^2 + bcx^2 - amx^2 - bmx^2 - cmx^2 - abcx + abmx + acmx + bcmx - abcm \end{array} = 0, \text{ a Biquadratic.}$$

&c.

From this table it is plain,

1. That in a complete equation the number of terms is always greater by unit than the dimenſion of the equation.

2. The coefficient of the firſt term is 1.

The coefficient of the ſecond term is the ſum of all the roots (a, b, c, m, &c.) with their ſigns changed.

The coefficient of the third term is the ſum of all the products that can be made by multiplying any two of the roots together.

The coefficient of the fourth term is the ſum of all the products which can be made by multiplying together any three of the roots with their ſigns changed; and ſo of others.

The laſt term is the product of all the roots, with their ſigns changed.

3. From induction it appears, that in any equation (the terms being regularly arranged as in the preceding example) there are as many poſitive roots as there are changes in the ſigns of the terms from + to −, and from − to +; and the remaining roots are negative. The rule alſo may be demonſtrated.

Note. The impoſſible roots in this rule are ſuppoſed to be either poſitive or negative.

Cor. If a term of an equation is wanting, the poſitive and negative parts of its coefficient muſt then be equal. If there is no abſolute term, ſome of the roots $= 0$, and the equation may be depreſſed by dividing all the terms by the loweſt power of the unknown quantity in any of them. In this caſe alſo, $x - 0 = 0$, $x - 0 = 0$, &c. may be conſidered as ſo many of the component ſimple equations, by which the given equation being divided, it will be depreſſed ſo many degrees.

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* The term *dimenſion*, in this chapter, means either the order of an equation, or the number denoting that order, which was formerly defined to be the higheſt exponent of the unknown quantity in any term of the equation.

CHAP. II.

Of the Transformation of Equations.

Prop. 1. The affirmative roots of an equation become negative, and the negative become affirmative, by changing the ſigns of the alternate terms, beginning with the ſecond.

Thus the roots of the equation $x^4 - x^3 - 19x^2 + 49x - 30 = 0$ are $+1, +2, +3, -5$, whereas the roots of the equation $x^4 + x^3 - 19x^2 - 49x - 30 = 0$, are $-1, -2, -3, +5$.

The reaſon of this is derived from the compoſition of the coefficients of theſe terms, which conſiſt of combinations of odd numbers of the roots, as explained in the preceding chapter.

Prop. 2. An equation may be transformed into another that ſhall have its roots greater or leſs than the roots of the given equation by ſome given difference.

Let e be the given difference; then $y = x \pm e$, and $x = y \mp e$; and if for x and its powers in the given equation, $y \mp e$ and its powers be inſerted, a new equation will ariſe, in which the unknown quantity is y, and its value will be $x \pm e$.

Let the equation propoſed be $x^3 - px^2 + qx - r = 0$, of which the roots muſt be diminiſhed by e. By inſerting for x and its powers $y + e$ and its powers, the equation required is,

$$\left.\begin{array}{r} y^3 + 3ey^2 + 3e^2y + e^3 \\ - py^2 - 2pey - pe^2 \\ + qy + qe \\ - r \end{array}\right\} = 0.$$

Cor. 1. The uſe of this transformation is to take away the ſecond, or any other intermediate term; for as the coefficients of all the terms of the tranſformed equation, except the firſt, involve the powers of e, and known quantities only, by putting the coefficient of any term equal to 0, and reſolving that equation, a value of e may be determined, which being ſubſtituted, will make that term to vaniſh.

Thus, let the coefficient $3e - p = 0$, and $e = \frac{1}{3}p$, which being ſubſtituted for e, the new equation will want the ſecond term. And univerſally, the coefficient of the firſt term of an equation of n dimenſions being 1, the ſecond term may be taken away by ſuppoſing $x = y \pm \frac{1}{n}p$.

Cor. 2. The ſecond term may be taken away by the ſolution of a ſimple equation, the third by the ſolution of a quadratic, and ſo on.

Prop. 3. An equation may be transformed into another, of which the roots ſhall be equal to the roots of the given equation, multiplied or divided by a given quantity.

Let $y = ax$, or $y = \frac{x}{a}$.

Then ſubſtitute for x and its powers, $\frac{y}{a}$ or ye and its powers, and the new equation will have the property required.

Cor. 1. An equation, in which the coefficient of the firſt term is any known quantity, as a, may thus be transformed into another, in which the coefficient of the firſt term ſhall be unit. Thus, let the equation be $ax^3 - px^2 + qx - r = 0$. Suppoſe $y = ax$, or $x = \frac{y}{a}$, and for x and its powers inſert $\frac{y}{a}$ and its powers, and the equation becomes $\frac{y^3}{a^2} - \frac{py^2}{a^2} + \frac{qy}{a} - r = 0$, or $y^3 - py^2 + qay - a^2r = 0$.

Cor. 2. If there are fractions in an equation, they may be taken away, by multiplying the equation by the denominators, and by this propoſition the equation may then be transformed into another, without fractions, in which the coefficient of the firſt term is 1. In like manner may a ſurd coefficient be taken away in certain caſes.

Cor. 3. Hence alſo, if the coefficient of the ſecond term of a cubic equation is not diviſible by 3, the fractions thence ariſing in the tranſformed equation, wanting the ſecond term, may be taken away by the preceding corollary. But the ſecond term alſo may be taken away, ſo that there ſhall be no ſuch fractions in the tranſformed equation, by ſuppoſing $x = \frac{z \mp p}{3}$, $\pm p$ being the coefficient of the ſecond term of the given equation. And if the equation $ax^3 - px^2 + qx - r = 0$ be given, in which p is not diviſible by 3, by ſuppoſing $x = \frac{z + p}{3a}$, the tranſformed equation reduced is $z^3 - \overline{3p^2 + 9aq} \times z - 2p^3 + 9apq - 7a^2r = 0$; wanting the ſecond term, having 1 for the coefficient of the firſt term, and the coefficients of the other terms being all integers, the coefficients of the given equation being alſo ſuppoſed integers.

General Corollary to Prop. 1. 2. 3.

If the roots of any of theſe tranſformed equations be found by any method, the roots of the original equation, from which they were derived, will eaſily be found from the ſimple equations expreſſing their relation. Thus, if 8 is found to be a root of the tranſformed equation $z^3 + 23z - 696 = 0$. Since $x = \frac{z + 2}{5}$, the correſponding root of the given equation $5x^3 - 6x^2 + 7x - 30 = 0$ muſt be $\frac{8 + 2}{5} = 2$. It is to be obſerved alſo, that the reaſoning in Prop. 2. and 3. and the corollaries, may be extended to any order of equations, though in them it is applied chiefly to cubics.

CHAP. III.

Of the Reſolution of Equations.

FROM the preceding principles and operations, rules may be derived for reſolving equations of all orders.

I. CARDAN's *Rule for Cubic Equations.*

The ſecond term of a cubic equation being taken away, and the coefficient of the firſt term being made 1, it may be repreſented by $x^3 \pm 3qx + 2r = 0$; the ſign $+$ in all terms denoting the addition of them, with their proper ſigns. Let $x = m + n$, and alſo $mn = -q$; by the ſubſtitution of theſe values, an equation of the 6th order, but of the quadratic form, is deduced, which gives the values of m and n; and hence,

$$(m + n =)\ x = \sqrt[3]{-r + \sqrt{r^2 + q^3}} - \frac{q}{\sqrt[3]{-r \pm \sqrt{r^2 + q^3}}}.$$

Cor. 1. In the given equation, if $3q$ is negative, and if r^2 is leſs than q^3, this expreſſion of the root involves impoſſible quantities; while, at the ſame time, all the roots of that equation are poſſible. The reaſon is, that in this method of ſolution it is neceſſary to ſuppoſe that the root may be divided into two parts of which the product is q. But it is eaſy to ſhow, that in this, which is called the *irreducible caſe*, it cannot be done.

For example, the equation $x^3 - 156x + 560 = 0$ belongs to the irreducible caſe, and the three roots are $+4, +10, -14$; and it is plain that none of theſe roots can be divided into two parts (m and n), of which the product can be equal to $(-q =)$

$\frac{156}{3} = 52$; for the greateſt product from the diviſion of the greateſt root -14, is $-7 \times -7 = 49$ leſs than 52.

If the cube root of the compound ſurd can be extracted, the impoſſible parts balance each other, and the true root is obtained.

Cor. 2. Biquadratic equations may be reduced to cubics, and may therefore be reſolved by this rule.

Some other claſſes of equations, too, may be reſolved by particular rules; but theſe, and every other order of equations, are commonly reſolved by the general rules, which may be equally applied to all.

II. *Solution of Equations whoſe roots are commenſurate.*

Rule 1. All the terms of the equation being brought to one ſide, find all the diviſors of the abſolute term, and ſubſtitute them ſucceſſively in the equation for the unknown quantity. That diviſor which, ſubſtituted in this manner, gives the reſult $= 0$, ſhall be a root of the equation.

Ex. 1. $\left.\begin{matrix} x^3 - 3ax^2 + 3a^2x - 2a^2b \\ - bx^2 + 3abx \end{matrix}\right\} = 0.$

The ſimple literal diviſors of $-2a^2b$ are $a, b, 2a, 2b$, any of which may be inſerted for x. Suppoſing $x = a$, the equation becomes

$\left.\begin{matrix} a^3 - 3a^3 + 3a^3 - 2a^2b \\ - ba^2 + 3a^2b \end{matrix}\right\}$ which is obviouſly $= 0$.

The reaſon of the rule appears from the property of the abſolute term being the product of all the roots.

To avoid the inconvenience of trying many diviſors, this method is ſhortened by the following

Rule 2. Subſtitute in place of the unknown quantity ſucceſſively three or more terms of the progreſſion, 1, 0, -1, &c. and find all the diviſors of the ſums that reſult; then take out all the arithmetical progreſſions that can be found among theſe diviſors whoſe common difference is 1, and the values of x will be among thoſe terms of the progreſſions which are the diviſors of the reſult ariſing from the ſubſtitution of $x = 0$. When the ſeries increaſes, the roots will be poſitive; and when it decreaſes, the roots will be negative.

Suppoſit.		*Reſult.*	*Diviſors.*	*Ar. pro.*
$x = +1$		-4	1, 2, 4,	4
$x = 0$	$x^3 - x^2 - 10x + 6 =$	$+6$	1, 2, 3, 6,	3
$x = -1$		$+14$	1, 2, 7, 14,	2

In this example there is only one progreſſion, 4, 3, 2; and therefore 3 is a root, and it is -3, ſince the ſeries decreaſes.

It is evident from the rules for transforming equations, that by inſerting for x, $+1$, the reſult is the abſolute term of an equation of which the roots are leſs than the roots of the given equation by 1. When $x = 0$, the reſult is the abſolute term of the given equation. When for x is inſerted -1, the reſult is the abſolute term of an equation whoſe roots exceed the roots of the given equation by 1. Hence, if the terms of the ſeries 1, 0, -1, -2, &c. be inſerted ſucceſſively for x, the reſults will be the abſolute terms of ſo many equations, of which the roots form an increaſing arithmetical ſeries with the difference 1. But as the commenſurate roots of theſe equations muſt be among the diviſors of their abſolute terms, they muſt alſo be among the arithmetical progreſſions found by this rule. The roots of the given equation therefore are to be ſought for among the terms of theſe progreſſions which are diviſors of the reſult, upon the ſuppoſition of $x = 0$, becauſe that reſult is its abſolute term.

If from the ſubſtitution of three terms of the progreſſion, 1, 0, -1, &c. there ariſe a number of arithmetical ſerieſes, by ſubſtituting more terms of that progreſſion, ſome of the ſerieſes will break off, and, of courſe, fewer trials will be neceſſary.

III. *Example of Queſtions producing the higher Equations.*

The ſum of the ſquares of two numbers 208, and the ſum of their cubes 2240 being given, to find them.

Let the greater be $x + y$, and the leſs $x - y$.

Then $\overbrace{x+y}^2 + \overbrace{x-y}^2 = 2x^2 + 2y^2 = 208$

Hence $y^2 = 104 - x^2$

Alſo $\overbrace{x+y}^3 + x - y^3 = 2x^3 + 6xy^2 = 2240$.

Subſtitute for y^2 its value and $2x^3 + 624x - 6x^3 = 2240$.

This reduced gives $x^3 - 156x + 560 = 0$.

The roots of this equation are $+10$, $+4$, -14. If $x = 10$, then $y = 2$; and the numbers ſought are 12 and 8, which give the only juſt ſolution.

IV. *Solution of Equations by Approximation.*

By the former rules, the roots of equations, when they are commenſurate, may be obtained. Theſe, however, more rarely occur; and when they are incommenſurate, we can find only an approximate value of them, but to any degree of exactneſs required. Of various rules for this purpoſe, the following by Sir Iſaac Newton is the moſt ſimple.

Lemma. If any two numbers, being inſerted for the unknown quantity in an equation, give reſults with oppoſite ſigns, an odd number of roots muſt be between theſe numbers.

This appears from the property of the abſolute term, and from this obvious maxim, that if a number of quantities be multiplied together, and if the ſigns of an odd number of them be changed, the ſign of the product is changed. For, when a poſitive quantity is inſerted for x, the reſult is the abſolute term of an equation whoſe roots are leſs than the roots of the given equation by that quantity. If the reſult has the ſame ſign as the given abſolute term, then from the property of the abſolute term either none, or an even number only, of the poſitive roots have had their ſigns changed by the transformation; but if the reſult has an oppoſite ſign to that of the given abſolute term, the ſigns of an odd number of the poſitive roots muſt have been changed. In the firſt caſe, then, the quantity ſubſtituted muſt have been either greater than each of an even number of the poſitive roots of the given equation, or leſs than any of them; in the ſecond caſe, it muſt have been greater than each of an odd number of the poſitive roots. An odd number of the poſitive roots, therefore, muſt lie between them when they give reſults with oppoſite ſigns. The ſame obſervation is to be extended to the ſubſtitution of negative quantities and the negative roots.

From this lemma, by means of trials, it will not be difficult

to find the neareſt integer to a root of a given numeral equation.

Let the equation be $x^3 - 2x - 5 = 0$.

1. In this caſe a root is between 2 and 3; for theſe numbers being inſerted for x, the one gives a poſitive, and the other a negative, reſult. Either the number above the root, or that below it, may be aſſumed as the firſt value; only it will be more convenient to take that which appears to be neareſt to the root.

2. Suppoſe $x = 2 + f$, and ſubſtitute this value of x in the equation.

$$\begin{array}{rl} x^3 = & 8 + 12f + 6ff + f^3 \\ -2x = & -4 - 2f \\ -5 = & -5 \\ \hline x^3 - 2x - 5 = & -1 + 10f + 6f^2 + f^3 = 0. \end{array}$$

If f is leſs than unit, its powers f^2 and f^3 may be neglected in this firſt approximation, and $10f = 1$, or 0.1 nearly, therefore $x = 2.1$ nearly.

3. As $f = 0.1$ nearly, let $f = .1 + g$, and inſert this value of f in the preceding equation.

$$\begin{array}{rl} f^2 = & 0.001 + 0.03g + 0.3g^2 + g^3 \\ 6f^2 = & 0.06 + 1.2g + 6.g^2 \\ 10f = & 1 + 10g \\ -1 = & -1 \end{array}$$

$f^3 + 6f^2 + 10f - 1 = 0.061 + 11.23g + 6.3g^2 + g^3 = 0$ and neglecting g^2 and g^3 as very ſmall $0.61 + 11.23g = 0$, or $g = \frac{-0.061}{11.23} = -.0054$, hence $f = 0.1 + g = .0946$ nearly, and $x = 2.0946$ nearly.

4. This operation may be continued to any length, as by ſuppoſing $g = -.0054 + h$, and ſo on, and the value of $x = 2.09455147$ nearly.

By the firſt operation a nearer value of x may be found thus: ſince $f = .1$ nearly, and $-1 + 10f + 6f^2 + f^3 = 0$, $f = \frac{1}{10 + 6f + f^2}$, that is, $f = \frac{1}{10 + .6 + .01} = .094$ true to the laſt figure, and $x = 2.094$.

In the ſame manner may the root of a pure equation be found, and this gives an eaſy method of approximating to the roots of numbers which are not perfect powers.

This rule is applicable to numeral equations of every order; and, by aſſuming a general equation, general rules may be deduced for approximating to the roots of any propoſed equation. By a ſimilar method we may approximate to the roots of literal equations, which will be expreſſed by infinite ſeries.

PART III.

Of the Application of ALGEBRA to GEOMETRY.

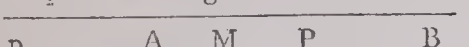
CHAP. I.

A *line* whether known or unknown, may be repreſented by a ſingle letter: a *rectangle* by the product of the two letters repreſenting its ſides: and a *rectangular parallelopiped* by the product of three letters; two of which repreſent the ſides of any of its rectangular baſes, and the third the altitude.

Theſe are the moſt ſimple expreſſions of geometrical magnitudes; and any other which has a known proportion to them, may in like manner be expreſſed algebraically. Converſely, the geometrical magnitudes, repreſented by ſuch algebraical quantities, may be found; only the algebraical dimenſions above the third, not having any correſponding geometrical dimenſions, muſt be expreſſed by proportionals*.

The oppoſite poſition of ſtraight lines may be expreſſed by the ſigns + and −.

Thus, let a point A be given in the line AP, any ſegment AP taken to the right hand being conſidered as a poſitive, a ſegment Ap to the left is properly repreſented by a negative quantity. If a and b repreſent two lines; and if, upon the line AB from the point A, AP be taken towards the right equal to a, it may be expreſſed by a; then PM taken to the left and equal to b, will be properly repreſented by $-b$, for AM is equal to $a - b$. If $a = b$, then M will fall upon A, and $a - b = 0$. By the ſame notation, if b is greater than a, M will fall to the left of A; and in this caſe, if $2a = b$, and if Pp be taken equal to b, then $a - b = -a$ will repreſent Ap, which is equal to a, and ſituated to the left of A.



II. *The Demonſtration of Theorems.*

All propoſitions in which the proportions of magnitudes only are employed, and all propoſitions expreſſing the relations of the ſegments of a ſtraight line, of their ſquares, rectangles, cubes, and parallelopipeds, are demonſtrated algebraically with great eaſe.

This is particularly the caſe in thoſe propoſitions which may be geometrically deduced without any conſtruction of

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* Thus, if the algebraical equation $a^4 + b^4 = c^4 - d^4$, is to be expreſſed geometrically, a, b, c, and d, being ſuppoſed to repreſent ſtraight lines; let $a : b : e : f : g$, in continued proportion, then $a^4 : b^4 :: a : g$, and $a^4 : a^4 + b^4 :: a : a + g$; then let $a : c : h : k : l$, and $a^4 : c^4 :: a : l$; alſo, let $c : d : m : n : p$, and $c^4 : d^4 :: c : p$, or $c^4 : c^4 - d^4 :: c : c - p$. By combining the two former proportions, $c^4 : a^4 + b^4 :: l : a + g$, and combining the latter with this laſt found, $c^4 - d^4 : a^4 + b^4 :: \overline{c - p} \times l : c \times \overline{a + g}$; therefore $\overline{c - p} \times l = c \times \overline{a + g}$, and $c : c - p :: l : a + g$.

If any known line is aſſumed as 1, as its powers do not appear, the terms of an equation, including any of them, may be of very different dimenſions; and before it can be properly expreſſed by geometrical magnitudes, the deficient dimenſions muſt be ſupplied by powers of the 1. When an equation has been derived from geometrical relations, the line denoting 1 is known; and when an aſſumed equation is to be expreſſed by the relations of geometrical magnitudes, the 1 is to be aſſumed.

In this manner may any ſingle power be expreſſed by a line. If it is x^5, then to 1, x find four quantities in continued proportion; ſo that $1 : x : m : n : p : q$, then $1 : q :: 1^5 : x^5$, or $q = x^5$; and ſo of others.

the ſquares, rectangles, &c. to which they refer. From the firſt propoſition of the ſecond book of Euclid, the nine following may be eaſily derived in this manner, and they may be conſidered as proper examples of this moſt obvious application of algebra to geometry.

If certain poſitions are either ſuppoſed or to be inferred in a theorem, we muſt find, according to the preceding obſervations, the connection between theſe poſitions and ſuch relations of magnitude as can be expreſſed and reaſoned upon by algebra. The algebraical demonſtrations of the 12th and 13th propoſitions of the 2d book of Euclid, require only the 47th of the I. El. The 35th and 36th of the 3d book require only the 3. III. El. and 47. I. El.

From a few ſimple geometrical principles alone, a number of concluſions, with regard to figures, may be deduced by algebra; and to this in a great meaſure is owing the extenſive uſe of this ſcience in geometry. If other more remote geometrical principles are occaſionally introduced, the algebraical calculations may be much abridged. The ſame is to be obſerved in the ſolution of problems; but ſuch in general are leſs obvious, and more properly belong to the ſtrict geometrical method.

III. *Of the Solution of Problems.*

Upon the ſame principles are geometrical problems to be reſolved. The problem is ſuppoſed to be conſtructed, and proper algebraical notations of the known and unknown magnitudes are to be ſought for, by means of which their connections may be expreſſed by equations. It may firſt be remarked, as was done in the caſe of theorems, that in thoſe problems which relate to the diviſion of the line and the proportions of its parts, the expreſſion of the quantities, and the ſtating their relations by equations, are ſo eaſy as not to require any particular directions. But when various poſitions of geometrical figures and their properties are introduced, the ſolution requires more attention and ſkill. No general rules can be given on this ſubject, but the following obſervations may be of uſe.

1. The conſtruction of the problem being ſuppoſed, it is often farther neceſſary to produce ſome of the lines till they meet; to draw new lines joining remarkable points; to draw lines from ſuch points perpendicular or parallel to other lines, and ſuch other operations as ſeem conducive to the finding of equations; and for this purpoſe, thoſe eſpecially are to be employed which divide the ſcheme into triangles that are given, right angled or ſimilar.

2. It is often convenient to denote by letters, not the quantities particularly ſought, but ſome others from which they can eaſily be deduced. The ſame may be obſerved of given quantities.

3. The proper notation being made, the neceſſary equations are to be derived by the uſe of the moſt ſimple geometrical principles; ſuch as the addition and ſubtraction of lines or of ſquares, the proportionality of lines, particularly of the ſides of ſimilar triangles, &c.

4. There muſt be as many independent equations as there are unknown quantities aſſumed in the inveſtigation, and from theſe a final equation may be inferred by the rules of Part I.

If the final equation from the problem be reſolved, the roots may often be exhibited geometrically; but the geometrical conſtruction of problems may be effected alſo without reſolving the equation, and even without deducing a final equation.

If the final equation is ſimple or quadratic, the roots being obtained by the common rules, may be geometrically exhibited by the finding of proportionals, and the addition or ſubtraction of ſquares.

By inſerting numbers for the known quantities, a numeral expreſſion of the quantities ſought will be obtained by reſolving the equation. But in order to determine ſome particulars of the problem, beſides finding the unknown quantities of the equation, it may be farther neceſſary to make a ſimple conſtruction; or, if it is required that every thing be expreſſed in numbers, to ſubſtitute a new calculation in place of that conſtruction.

PROP. I. *To divide a given ſtraight line* AB *into two parts, ſo that the rectangle contained by the whole line and one of the parts may be equal to the ſquare of the other part.*



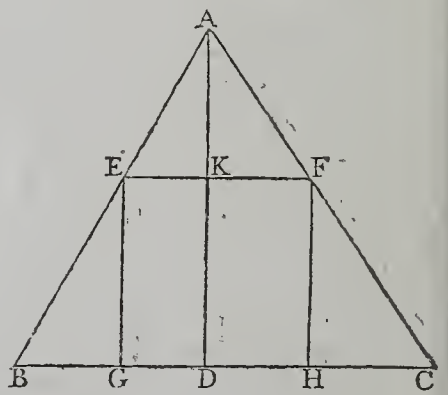
Let C be the point of diviſion, and let $AB = a$, $AC = x$, and then $CB = a - x$. From the problem $a^2 - ax = x^2$; and this equation being reſolved gives $x = \pm\sqrt{a^2 + \frac{a^2}{4}} - \frac{a}{2}$.

The quantity $\sqrt{a^2 + \frac{a^2}{4}}$ is the hypothenuſe of a right angled triangle, of which the two ſides are a and $\frac{a}{2}$, and is therefore eaſily found; $\frac{a}{2}$ being taken from this line, gives $x = AC$, which is the proper ſolution. But if a line Ac be taken on the oppoſite ſide of A, and equal to the above mentioned hypothenuſe, together with $\frac{a}{2}$ it will repreſent the negative root $-\sqrt{a^2 + \frac{a^2}{4}} - \frac{a}{2}$, and will give another ſolution; for in this caſe alſo $AB \times Bc = Ac^2$. But c is without the line AB; and therefore, if it is not conſidered as making a diviſion of AB, this negative root is rejected.

PROB. II. *In a given Triangle* ABC *to inſcribe a Square.*

Suppoſe it to be done, and let it be EFHG. From A let AD be perpendicular on the baſe BC, meeting EF in K.

Let $BC = a$, and $AD = p$, both of which are given becauſe the triangle is given. Let AK be aſſumed as the unknown quantity, becauſe from it the ſquare can eaſily be conſtructed; and let it be called x. Then $(KD = EG =)$ $EF = p - x$.



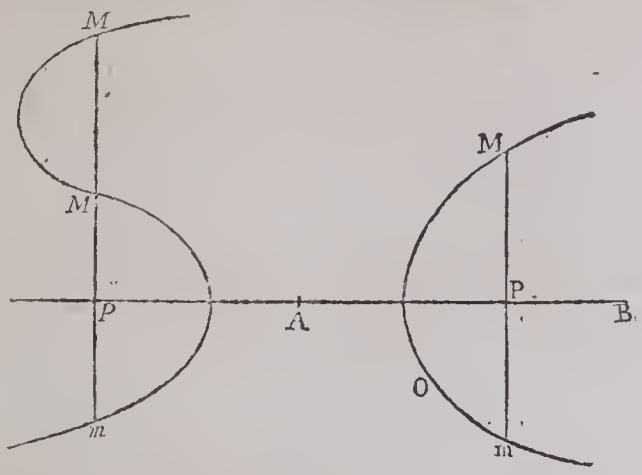
On account of the parallels EF, BC, AD : BC : : AK : EF; that is, $p : a :: x : p - x$, and $p^2 - px = ax$, which equation being reſolved, gives $x = \frac{p^2}{p + a}$.

Therefore x or AK is a third proportional to $p + a$ and p, and the point K being found, the conſtruction of the ſquare is ſufficiently obvious.

CHAP. II.

Of the Definition of Lines by Equations.

1. When curve lines are conſidered algebraically, they are ſuppoſed to be produced by the extremity of one ſtraight line, as PM moving in a given angle along another ſtraight line AB given in poſition, which is called the baſe.



2. The ſtraight line PM moving along the other, is called an *ordinate*, and is uſually denoted by y.

3. The ſegment of the baſe AP between a given point in it A, and an ordinate PM, is called an *abſciſs* with reſpect to that ordinate, and is denoted by x. The ordinate and abſciſs together are called *co-ordinates*.

4. If the relation of the variable abſciſs and ordinate AP and PM be expreſſed by an equation, which beſides x and y contains only known quantities, the curve MO deſcribed by the motion of the ordinate, is called the *locus* of that equation.

5. If the equation is finite, the curve is called *algebraical* *.

6. The *dimenſions* of ſuch equations are eſtimated from the higheſt ſum of the exponents of x and y in any term. Thus the terms x^4, x^3y, x^2y^2, xy^3, y^4, are all of the ſame dimenſion.

7. Curve lines are divided into *orders* from the dimenſions of their equations, when freed from fractions and ſurds.

I. *The Determination of the Figure of a Curve from its Equation.*

The general figure of the curve may be found by ſubſtituting ſucceſſively particular values of x the abſciſs, and finding by the reſolution of theſe equations the correſponding values of y the ordinate, and of conſequence ſo many points of the curve.

1. If in any caſe a value of y vaniſhes, then the curve meets the baſe in a point determined by the correſponding value of x. Hence by putting $y = 0$, the roots of the equation, which in that ſituation are values of x, will give the diſtances on the baſe from the point aſſumed as the beginning of x, at which the curve meets it.

2. If at a particular value of x, y becomes infinite, the curve has an infinite arc, and the ordinate at that point becomes an aſymptote.

3. If when x becomes infinite, y vaniſhes, the baſe is an aſymptote.

4. If any values of y become impoſſible, then ſo many interſections of the ordinate and curve vaniſh. If at any value of x, all the values of y become impoſſible, the ordinate does not there meet the curve.

5. If two values of y become equal and have the ſame ſign, the ordinate in that ſituation either touches the curve, or paſſes through an interſection of two of its branches, which is called a *punctum duplex*, or through an oval become infinitely little, called a *punctum conjugatum*.

In like manner is a *punctum triplex*, &c. to be determined.

Let the equation be $ay^2 - xy^2 = x^3 + bx^2$.

Therefore, $y^2 = \frac{x^3 + bx^2}{a - x}$ and $y = \pm\sqrt{\frac{x^3 + bx^2}{a - x}} = \pm\sqrt{\frac{x + b}{a - x}} \times x$.

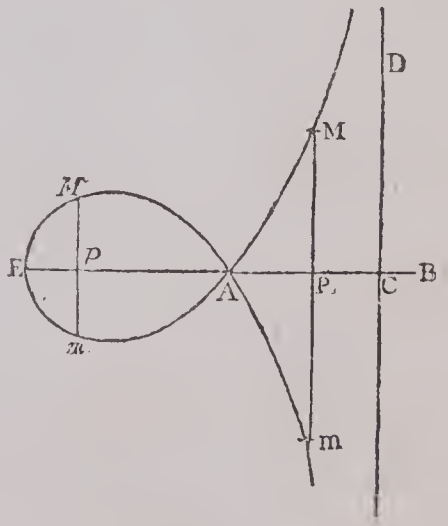
Let AB be aſſumed as a baſe on which the abſciſſas are to be taken from A, and the ordinates perpendicular to it.

Since the two values of y are equal, but have oppoſite ſigns; PM, and Pm which repreſent them, muſt be taken equal to each other on oppoſite ſides of AB; and it is plain that the parts of the curve on the two ſides of AB muſt be every way ſimilar and equal.

If x is made equal to a, $y = x\sqrt{\frac{x + b}{0}}$,

which is an algebraical expreſſion for infinity; therefore if AC is taken equal to a, the perpendicular CD will become an aſymptote to the curve, which will have two infinite arcs. If x is greater than a, the quantity under the radical ſign becomes negative, and the values of y are impoſſible; that is, no part of the curve lies beyond CD.

Both branches of the curve paſs through A, ſince $y = 0$, when $x = 0$. Let x be negative, and $y = \pm x\sqrt{\frac{b - x}{a + x}}$; the values of y will be poſſible, if x is not greater than b; but if $x = b$, then $y = 0$, and if x is greater than b, the values of y become impoſſible; that is, if the abſciſs AP be taken to the left of A, and leſs than b, there will be two real equal values of y, PM, Pm on the oppoſite ſides as before; if AE be taken equal to b, the curve will paſs through E, and no part of it is beyond E.



* The terms *geometrical* and *algebraical*, as applied to curve lines, are uſed in different ſenſes by different writers; there are ſeveral other claſſes of curves beſides what are here called algebraical, which can be treated of mathematically, and even by means of algebra.

The portion between A and E is called a *Nodus*.

If y be put $= 0$, then the values of x are 0, 0, $-b$; that is, the curve paſſes twice through A, or A is a punctum duplex, and it paſſes alſo through E as before.

By the ſame methods the locus of any other equation is to be traced: Thus, by varying the former equation, the figure of its locus will be varied. If $b = 0$, then the points A and E coincide, the nodus vaniſhes, and A is called a *cuſpis*.

If b is negative, then E is to the right of A, which will now be a punctum conjugatum. The reſt of the curve will be between E and C, and CD becomes an aſymptote.

II. *General Properties of Curves from their Equations.*

A ſtraight line may meet a curve in as many points as there are units in the dimenſion of its equation; for ſo many roots may that equation have. An aſymptote may cut a curve line in as many points, excepting two, as it has dimenſions, and no more. The ſame may be obſerved of the tangent.

Impoſſible roots enter an equation by pairs; therefore the interſection of the ordinate and curve muſt vaniſh by pairs.

The curves of which the number expreſſing the order is odd, muſt have at leaſt two infinite arcs; for the abſciſs may be ſo aſſumed, that for every value of it, either poſitive or negative, there muſt be at leaſt one value of y, &c.

Scholium.

If the relation between the ordinate and abſciſs be fixed, but not expreſſible by a finite equation, the curve is called *Mechanical* or *Tranſcendental*. This claſs is alſo ſometimes defined by equations, by ſuppoſing either x or y in a finite equation to be a curve line, of which the relation to a ſtraight line cannot be expreſſed in finite terms.

If the variable quantities x or y enter the exponents of any term of an equation, the locus of that equation is called an *Exponential Curve*.

A L G

ALGEDO, the ſudden ceſſation of the diſcharge in a gonorrhœa, and its apparent conſequences; which are, pain and irritation throughout the parts of generation. Theſe ſymptoms are generally removed and the diſcharge brought back by a purging doſe of calomel.

ALGENEB, a fixed ſtar of the ſecond magnitude, in Perſeus's right ſide; its longitude is 27° 46′ 12″ of Taurus, and its latitude 30° 05′ 28″ north, according to Mr. Flamſtead's catalogue.

ALGEZIRA, a town of Andaluſia in Spain, with a port on the coaſt of the Straits of Gibraltar. It was called *Old Gibraltar*, and is about 4 leagues from the New. W. long. 5. 2. N. lat. 36 0.

ALGHIER, or ALGERI, a town in Sardinia, between Saſſeri and Boſa. W. long. 4. 2. lat. 36. 0.

ALGIABARII, a Mahometan ſect of Predeſtinarians, who attribute all the actions of men, good or evil, to the agency or influence of God. The Algiabarii ſtand oppoſed to the ALKADARII.

ALGIERS, a kingdom of Africa, now one of the ſtates of Barbary. It extends 460 miles in length from eaſt to weſt, and is very unequal in breadth; ſome places being ſcarce 40 miles broad, and others upwards of 100. It lies between Long. 0. 16. and 9. 16. W. and extends from Lat. 36. 55. to 44. 50. N.—It is bounded on the N. by the Mediterranean; on the E. by the river Zaine, the ancient Tuſca, which divides it from Tunis; on the W. by the Mulvya, and the mountains of Trava, which ſeparate it from Morocco; and on the S. by the Sahara, Zaara, or Numidian deſert.

The Algerine kingdom made formerly a conſiderable part of the Mauritania Tingitana, which was reduced to a Roman province by Julius Cæſar, and from him alſo called *Mauritania Cæſarienſis*.

ALGIERS, a city, the capital of the above kingdom, and probably the ancient *Icoſium*: by the Arabians called *Algezair*, or rather *Al-Jezerah*, i. e. *the iſland*, becauſe there was an iſland before the city, to which it hath been ſince joined by a mole. It is built on the declivity of a hill by the ſea-ſide, in the form of an amphitheatre: at ſea, it looks like the top-ſail of a ſhip. The tops of the houſes are quite flat and white; inſomuch, that when it is firſt diſcovered, it appears like a place where they bleach linen. The mole of the harbour is 500 paces in length, extending from the continent to a ſmall iſland where there is a caſtle and large battery. E. long. 3. 30. N. lat. 36. 40.

A L I

ALGOL, a fixed ſtar of the third magnitude, called *Meduſa's Head*, in the conſtellation Perſeus.

ALGONQUINS, a nation in North America, who formerly poſſeſſed great tracts of land along the north ſhore of the river St. Lawrence. Their language is one of the three radical ones in North America, being underſtood from the river St. Lawrence to the Miſſiſſippi.

ALGOR, with phyſicians, an obſolete term uſed to expreſs an unuſual coldneſs in any part of the body.

ALGORITHM, an Arabic word expreſſive of numerical computation.

ALGUAZIL, in the Spaniſh polity, an officer whoſe buſineſs it is to ſee the decrees of a judge executed.

ALHAGI, in botany, the trivial name of a ſpecies of hedyſarum. See HEDYSARUM.

ALHAMA, a very pleaſant town of the kingdom of Granada, in Spain, ſituated in the midſt of ſome craggy mountains, about 25 miles S. W. of Granada, on the banks of the Rio Frio, in W. long. 1. 10. N. lat. 36. 59.

ALHAMBRA, the ancient fortreſs and reſidence of the Mooriſh monarchs of Granada. It derives its name from the red colour of the materials which it was originally built with, Alhambra ſignifying a red houſe. It is deſcribed by travellers as rude and taſteleſs without; but, within, abounding with every poſſible luxury and convenience, ſo as in ſhort to render it the moſt voluptuous of all retirements.

ALI, gives the denomination to a ſect, or diviſion, among the Mahometans, who adhere to the right of ſucceſſion of Ali the fourth khalif or ſucceſſor of Mahomet, and to the reform of Muſſulmaniſm introduced by him. The ſectaries of Ali are more particularly called *Schiites*; and ſtand oppoſed to the *Sunnites*, or ſect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar. The Perſians are the chief adhe-

rents to the ſect of Ali, whom they hold to have been the legitimate ſucceſſor of Mahomet, and Abubeker an uſurper. On the contrary, the Turks are of the ſect of Omar; and hold Ali in execration, having raiſed a furious civil war among the Muſſulmans.

ALJAMEIA is a name which the Moriſcoes in Spain give to the language of the Spaniards. The junto appointed by the emperor Charles V. in 1526, in favour of the Moriſcoes, agreed, That the Moriſcoes ſhould no longer ſpeak Algavareia, i. e. Mooriſh or Arabic; but ſhould all ſpeak *Aljameia*, i. e. Spaniſh, as it was called by the Moors, and all their writings and contracts ſhould be in that language.

ALIAS, in law, a ſecond writ iſſued from the courts of Weſtminſter, after a *capias*, &c. ſued out without effect.

ALIBI, in law, denotes the abſence of the accuſed from the place where he is charged with having committed a crime; or his being *elſewhere* at the time ſpecified.

ALICANT, a large ſea-port town in the province of Valencia and territory of Segura. It is ſeated in the Mediterranean, on a bay of the ſame name, 37 miles N. E. of Murcia, and 75 S. of Valencia. W. long. 0. 36. N. lat. 38. 24.

ALICATA, a mountain of Sicily, near the valleys Mazara and Noto, upon which was the famous Dædalion, where the tyrant Phalaris kept his brazen bull.

ALICATA, a town of Sicily, 22 miles S. E. of Girgenti. E. long. 15. 20. N. lat. 37. 11.

ALICATA *Chlamys*, was a ſort of a veſt with ſleeves, worn by the Roman boys till the age of thirteen, at which time they put on the *prætexta*.

ALIEN, in law, a perſon born out of the king's allegiance; in contradiſtinction to a denizen, or natural ſubject. The word is formed from the Latin *alius*, "another;" *q. d.* one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is entitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unleſs where an alien is party in a cauſe, when the inqueſt is compoſed of an equal number of denizens and aliens. The reaſons for eſtabliſhing theſe laws were, that every man is preſumed to bear faith and love to that prince and country where he received protection during his infancy; and that one prince might not ſettle ſpies in another's country; but chiefly, that the rents and revenues of the country might not be drawn to the ſubjects of another. Some have thought that the laws againſt aliens were introduced in the time of Henry II. Others that it is an original branch of the feudal law: for by that law no man can purchaſe any lands but he muſt be obliged to do fealty to the lords of whom the lands are holden; ſo that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another ſovereign's dominions. Among the Romans, only the *Cives Romani* were eſteemed freemen; but when their territories increaſed, all born within the pale of the empire were conſidered as citizens.

ALIEN-*Duty*, an impoſt laid on all goods imported by aliens, over and above the cuſtoms paid for ſuch goods imported by Britiſh, and on Britiſh bottoms.

ALIENS-*Duty* is otherwiſe called *petty cuſtoms*, and *navigation-duty*.—Fiſh dried or ſalted, and cod-fiſh or herring not caught in Britiſh veſſels and cured by Britiſh ſubjects, pay a double *aliens-duty*.

ALIEN-*Priories*, a kind of inferior monaſteries, formerly very numerous in England, and ſo called from their belonging to foreign abbeys.

ALIENATION, in law, denotes the act of making over a man's property in land, tenements, &c. to another.

ALIENATION, in mortmain, is making over lands, tenements, &c. to a body-politic, or to a religious houſe, for which the king's licence muſt firſt be obtained, otherwiſe the lands, &c. alienated will be forfeited.

ALIENATION *in fee*, is the ſelling the fee-ſimple of any land, or other incorporeal right. All perſons who have a right to lands may generally alien them to others: but ſome alienations are prohibited; ſuch as alienations by tenants for life, &c. whereby they incur a forfeiture of their eſtate. By the ſtatute of Edward I. a bar was put to alienations by what we call *entails*, which is an expedient for procuring perpetuities in families; but counter expedients were deviſed to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reverſions by recoveries. The ſtatute for alienations in Henry VIIth's time had a great effect on the conſtitution of this kingdom; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people. By the ſtat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbids any clerk to alienate his benefice, prebend, or the like. Among the ancient Jews, lands could only be alienated for the ſpace of 50 years. At each return of the jubilee all returned again to the primitive owners, or their deſcendants, to whom the lands were originally allotted at the firſt diſtribution of Canaan.

ALIENATION-*Office*, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries ſuffered, are carried, to have fines for alienation ſet and paid thereon.

ALIMENT, from *alo* to nouriſh, implies food both ſolid and liquid; from which, by the proceſs of digeſtion, *chyle* is prepared and this being abſorbed by the lacteal veſſels, and conveyed into the circulation, is there aſſimilated into the nature of blood, ſo as to afford that ſupply of nutrition which the continual waſte of the body is known to require.

ALIMENTARII *Pueri*, &c. were certain children maintained and educated by the munificence of the emperors, in a ſort of public places, not unlike our hoſpitals.—Trajan was the firſt that brought up any of theſe *alimentary* boys, and after him, Adrian. Antoninus Pius did the ſame for a number of maids, at the deſire of Fauſtina; and hence, in ſome medals of that empreſs, we read PVELLAE FAVSTINIANAE.—Alexander Severus did the like at the requeſt of Mammæa; and the maids thus educated were called Mammæanæ.

ALIMENTARY *Canal*, is that part of the body through which the food paſſes, from its reception into the mouth to its exit at the *anus*; including the *gula*, ſtomach, and inteſtines. See ANATOMY.

This canal has been conſidered the true characteriſtic of an animal, there being no animal without it, and whatever has it being properly ranged under the claſs of animals. Plants receive their nouriſhment by the numerous fibres of their roots, but have no common receptacle for digeſting the food received, or for carrying off the recrements. But in all animals even of the loweſt degree, we find a ſtomach and inteſtines, even where we cannot trace any organ of the ſenſes, but that common one of feeling, as in oyſters.

ALIMENTARY *Law*, *lex alimentaria*, was an old law among the Romans, whereby children were obliged to find ſuſtenance for their parents.

ALIMONY, in law, implies that allowance which a married woman ſues for, and is intitled to, upon any occaſional ſeparation from her huſband. See LAW.

ALIPILARIUS, or ALIPILUS, in Roman antiquity, a ſervant belonging to the baths, whoſe buſineſs it was, by means of waxen plaſters, and an inſtrument called *volſella*, to take off the hairs from the arm-pits, and even arms, legs, &c. this being deemed a point of cleanlineſs.

ALIPTERIUM, αλειπτηριον, in antiquity, a place in the ancient *paleſtræ*, where the *athletæ* were anointed before their exerciſes.

ALIQUANT PART, in arithmetic, is that number which cannot meaſure any other exactly without ſome remainder. Thus 7 is an aliquant part of 16; for twice 7 wants 2 of 16, and 3 times 7 exceeds 16 by 5.

ALIQUOT PART, is that part of a number or quantity which will exactly meaſure it without any remainder. Thus 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c.

ALISANDERS, in botany. See SMYRNIUM.

ALISMA, or WATER-PLANTAIN; a genus of the polygynia order, belonging to the hexandria claſs of plants, and in the natural method ranking under the 5th order, *Tetrapetaloideæ*. The characters are: The *calyx* a 3-leaved perianthium: The *corolla* conſiſts of 3 roundiſh, large, flat, expanding petals: The *ſtamina* conſiſt of 6 ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh: The *piſtillum* conſiſts of more than 5 germina; the ſtyli are ſimple, the ſtigmata obtuſe: The *pericarpium* conſiſts of compreſſed capſulæ: The *ſeeds* are ſmall and ſolitary. Of this genus there are 8 ſpecies, viz. The plantago, or great water-plantain, which grows in all the marſhy parts of this country; the ranunculoides, or leſſer water-plantain; the natans, or creeping water-plantain; the damaſonium, or ſtar-headed water-plantain; all which are natives of Britain. The others, *viz.* the flava, cordifolia, ſubulata, and parnaſſifolia, are natives of America, where they are generally found in ſwampy places.

ALITES, in Roman antiquity, a name given to ſuch birds as afforded matter of auguries by their flight.

ALKADARII, a ſect among the Mahometans who deny any eternal, fixed, divine decrees, and are aſſerters of free-will. The Alkadarii are a branch of Motazalites, and ſtand oppoſed to the Algiabarii.

ALKAHEST, or ALCAHEST, in chemiſtry, a ſuppoſed univerſal menſtruum capable of reſolving all bodies into their firſt principles. Van Helmont pretended he was poſſeſſed of it, but the notion is now generally ridiculed.

ALKALI, in chemiſtry, one of the general diviſions of ſalts, comprehending that claſs of chemical elements which, by their union with acids, form *perfect neutrals*, in oppoſition to the ſalts formed of acids with metals or earths, which are called *imperfect*.

Alkaline ſalts are divided into two kinds, the fixed and volatile; and the former into two ſpecies, vegetable, and mineral or foſſile. All of theſe poſſeſs ſome properties in common, and ſome peculiar to each. Thoſe which they have in common are, 1. An acrid and pungent taſte, which, when the ſalts are very pure and ſtrong, degenerates into abſolute cauſticity, and would entirely deſtroy the organ of ſenſation if long applied to it. 2. A tendency to diſſolve animal ſubſtances, and reduce them to a gelatinous ſubſtance. 3. An attraction for acids, with a power of ſeparating earths and metals from them. 4. They change the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. They unite with oils, and deſtroy or injure almoſt all kinds of colours that can be put upon cloth, whence their uſe in bleaching, &c.

The properties common to both kinds of fixed alkalis are, 1. They reſiſt the action of fire to a great degree, ſo that they can eaſily be reduced to a ſolid form by evaporating any liquid in which they happen to be diſſolved. 2. By an intenſe fire, they flow into a liquid which concretes into a ſolid maſs when cold. 3. If mixed in certain proportions with vitrifiable earths, they melt, in a heat ſtill more intenſe, into glaſs. 5. Mixed with ammoniacal ſalts, with animal ſubſtances, or with ſoot, they extricate a volatile alkali.

The volatile alkali differs from the other two in being unable to reſiſt the fire, and being entirely reſolvable into a permanently elaſtic fluid, called *alkaline air*. Hence it always affects the olfactory nerves very perceptibly. Its attraction for acids, power of changing colours, &c. are alſo conſiderably weaker than thoſe of the fixed alkalis.

Effervescence with acids is not, as was formerly ſuppoſed, a diſtinguiſhing property of alkalis; for this effect is merely owing to the fixed air, to which they are united during the proceſs by which they are originally formed. Yet the quantity of this air is never ſo great as to ſaturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly ſaid to be in a *mild* ſtate. But the truth is, that now they are in a kind of intermediate ſtate between what may be called perfectly mild and perfectly cauſtic.

Vegetable alkali is obtained in its greateſt purity by deflagrating nitre with charcoal, provided we can overcome the difficulty of uſing in the proceſs no more of the latter than is barely ſufficient to deſtroy the nitrous acid. Burnt tartar, puriſied by ſolution and filtration, may perhaps be looked upon as the beſt alkali we have. But the common alkalis are too impure for chemical experiments.

Vegetable alkali, when pure, and containing near $\frac{1}{2}$ its weight of fixed air, is of a white colour when dry, and very cauſtic to the taſte. It runs *per deliquium* when expoſed to the air; and is uſually incapable of being cryſtallized, though it acquires this property after being employed in the rectification of ardent ſpirit. It adheres more cloſely to acids than any ſubſtance hitherto diſcovered; though this has been queſtioned by Bergman. After being once united with marine acid, it appears to have undergone ſome change; for the ſalt ſo produced, when combined with vitriolic acid, reſembles Glauber's ſalt almoſt as much as it does vitriolated tartar.

Foſſil alkali differs from vegetable, in having leſs attraction for acids, in being more eaſily fuſible by itſelf, and forming a more ſoluble compound with the vitriolic acid. It is alſo eaſily cryſtallizable, even without the addition of more fixed air than it naturally contains; and it proves to be more proper for making glaſs or ſoap than the vegetable alkali. This alkali was anciently called *natron*; and indeed this name has been lately reſtored to it by the college of phyſicians.

Foſſil alkali is the natural baſis of ſea-ſalt; and many attempts have been made to procure it by decompoſing the latter. But theſe have hitherto been ineffectual. The demand for foſſil alkali is at preſent ſupplied from the aſhes of kali and other ſea-plants. The pureſt kind of aſhes is called *ſoda* or *barilla*, and is imported chiefly from foreign countries. That which is procured from the ſea weed of our own coaſts, and called *kelp*, is ſo impure, as ſcarcely to admit of being analyſed.

Both theſe alkalis may be deprived of their fixed air, and rendered pure and cauſtic, by the addition of quicklime. In this ſtate they deſtroy the parts of a living animal in a manner ſimilar to fire; whence they are called *potential* cauteries, as the former is called the *actual* cautery. The *kali purum*, formerly *lapis infernalis*, of the ſhops, is of this kind. Both alkalis attract moiſture from the air when in their cauſtic ſtate, though neither the foſſil alkali nor its combinations do ſo in any other caſe. It is only in their cauſtic ſtate alſo that they unite with oils, or diſſolve in ſpirit of wine; which laſt they have been ſuppoſed to purify.

Volatile alkali, when procured immediately by the diſtillation of any ſubſtance capable of yielding it, is obtained in a ſtate ſimilar to that in which the alkalis are uſually met with, viz. half mild and half cauſtic. By expoſing the liquid alkali to a great quantity of fixed air, we may at laſt have it perfectly mild and neutraliſed; in which ſtate it appears as a white ſalt extremely volatile, though leſs ſo than the pure cauſtic alkali. It diſſolves very readily in water; but unleſs ſome cauſtic ſpirit, or

ſome lime or fixed alkali be added, in order to abſtract part of the fixed air, it will ſcarcely exhibit the characteriſtic of volatile alkali, viz. a pungent and urinous ſmell. The addition of fixed air, however. makes very little difference with regard to the chemical combinations of this ſalt; for as fixed air has a very ſlender power of acidity, it is expelled by every other acid with the greateſt eaſe, and the ſame combinations formed as though it had not been preſent. The only difference is, that when a mild alkali is added to an acid, a ſtrong efferveſcence is produced by the eſcape of the fixed air, while, with the cauſtic alkali, the mixture is made without any ebullition.

The various combinations of the alkaline ſalts with the different acids, and the neutral compounds thence reſulting, may be ſeen in the following table.

1. Vegetable fixed alkali combined with

Vitriolic acid	forms	Vitriolated tartar.
Nitrous acid	forms	Nitre.
Marine acid	forms	Sal digeſtivus.
Acetous acid	forms	Terra foliata tartari.
Acid of tartar	forms	Soluble tartar.
Acid of borax, Acid of phoſphorus, Saccharine acid, &c.	forms	Anomalous ſalts, whoſe properties have not been aſcertained.
Aerial acid	forms	Mild or aerated alkali.

2. Foſſil or mineral fixed alkali combined with

Vitriolic acid	forms	Glauber's ſalt.
Nitrous acid	forms	Cubical nitre.
Marine acid	forms	Common ſalt.
Acetous acid	forms	A ſalt reſembling terra foliata tartari, but which does not deliquate.
Acid of tartar	forms	Rochelle ſalt.
Acid of borax	forms	Borax.
Acid of phoſphorus, Saccharine acid, &c.	forms	Unknown ſalts.
Aerial acid	forms	Mild foſſil alkali.

3. Volatile alkali combined with

Vitriolic acid	forms	Vitriolic ammoniac, or Glauber's ſecret ſal ammoniac.
Nitrous acid	forms	Nitrous ammoniac, or volatile nitre.
Marine acid	forms	Common ſal ammoniac.
Acetous acid	forms	Spiritus Mindereri.
Acid of tartar	forms	A ſalt whoſe properties have not been inveſtigated; which ſhoots into fine long cryſtals, and does not deliquate in the air.
Acid of borax	forms	An anomalous ſalt.
Acid of phoſphorus	forms	Microcoſmic ſalt, or eſſential ſalt of urine.
Saccharine acid, &c.	forms	Anomalous ſalts.
Aerial acid	forms	Volatile ſal ammoniac, or ſalt of hartſhorn.

But beſides their attraction for acids, the alkalis have alſo an attraction for oils, ſulphur, and ſpirit of wine, in the moiſt way, when the ſalts are deprived of their fixed air; and in this, as well as the dry way, with ſeveral metals, and vitrifiable earths and ſtones, as has been already ſtated.

The vegetable fixed alkali combined with oil forms a ſoap, though leſs perfect than that made with the cauſtic mineral alkali. When combined with fixed air they ſcarcely unite with oils. Boiled with ſulphur, or melted with it in their dry ſtate, they unite into a very fetid compound called *hepar ſulphuris*, which is ſoluble in water, but totally and very quickly decompoſed by the contact of air. Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fuſion. It does not act upon gold in its metallic ſtate; but if a ſufficient quantity be added to a ſolution of gold in aqua regia, the calx of the metal will be firſt precipitated and afterwards diſſolved.

The vegetable alkali is a principal ingredient in *fluxes* which are uſed for the fuſion of metalline ores. It promotes the fuſion of earths, and forms glaſs with the cryſtalline kind. It is ſoluble in an equal weight of diſtilled water; and, when expoſed to the air, it ſoon attracts moiſture from it and flows into a liquid. In its cauſtic ſtate it diſſolves in ſpirit of wine, and forms a red tincture once in great repute, called *Van Helmont's tincture of ſalt of tartar*.

In its cauſtic ſtate foſſil alkali unites with oil into an harder ſoap than that made with vegetable alkali. With ſulphur it forms a hepar ſulphuris in the ſame manner as the vegetable alkali, and yields a tincture with ſpirit of wine, which diſſolves part of the ſalt whilſt hot, but lets it fall again in a cryſtalline form when cold. Gold, ſilver, or quickſilver, are not affected by a ſolution of this ſalt; but copper and tin are diſſolved by it in the open air. It affects tin, lead, regulus of antimony, and cobalt, ſlightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, biſmuth, zinc, antimony, and regulus of cobalt, fuſed with two parts of foſſil alkali, are almoſt entirely diſſolved in a very ſtrong heat; but tin, lead, and regulus of antimony, treated in the ſame manner, are only partially diſſolved.

The different alkalis are of conſiderable uſe in medicine; in the formation of cauſtics for external uſe; as ſolvents for the ſtone in the bladder; but more eſpecially as the means of decompoſing and counteracting mineral poiſons that have been taken into the ſtomach; an important application of them firſt ſuggeſted by the late Dr. Houlſton of Liverpool, in a treatiſe on that ſubject.

Reſpecting the uſe of ſoap-ley as a ſolvent of the human calculus, though an infinite number of trials of it have been made, the degree of ſucceſs attending them has not been ſufficient to warrant our entering on the ſubject at any length. Inſtead of ſoap-ley, which has been found injurious to the ſtomach, the following ſolution of vegetable alkali, fully ſaturated with fixed air, has been lately recommended. "Take two ounces of ſalt of tartar, and diſſolve it in two quarts of diſtilled water; and then ſaturate it fully with fixed air by means of the apparatus deſcribed in pl. 2. fig. 7. or rather by that which is uſually ſold in the ſhops for the purpoſe of aerating water; and let the patient take eight ounces of it every eight hours." But though many caſes have been related in which this medicine is ſaid to have been ſerviceable, the author ſays he has ſeen only one gentleman who had taken it, and who had found any conſiderable degree of relief from it.

With regard to the origin of alkalis, chemiſts have been divided in their opinions, whether alkaline ſalts be natural bodies, or formed by the force of fire, uniting the principles of which they conſiſt in the burning or diſtilling the ſubſtances from which they are got. It is generally ſuppoſed that they are formed by the force of fire intimately uniting an earth, an acid, and an inflammable matter together, ſo as to form an alkaline ſalt, which is ſuppoſed to be compoſed of theſe principles. In ſupport of this opinion, it has been alleged, 1. That the fixed vegetable alkali is produced by burning vegetables which contain the principles fit for forming theſe ſalts; though no veſtige

of an alkali can be discovered in these vegetables in their natural state. 2. That the essential salts of vegetables, which contain an acid and an earth, on being calcined in a crucible with charcoal, yield an alkaline salt. 3. That by alternately allowing the vegetable alkali to run per deliquium, and drying it again, it precipitates a quantity of earth every time it is dissolved; so that the whole of the salt is at last reduced to this kind of earth, while the acid, phlogiston, &c. have evaporated, or been destroyed by the repeated application of heat for drying the salt. 4. In like manner the volatile alkali is produced by distilling animal substances which contain the principles fit for producing it, though no marks of a volatile alkali could be discovered in these substances originally.

On the other hand, it has been asserted, that the alkaline salts obtained by burning vegetables or distilling animal substances, existed originally in the materials from which they are procured; that they were generated in the plants by the process of vegetation, and freed by the fire from the other principles which disguised them. In support of this opinion the following arguments are made use of by Messrs. Weigleb, Rosenstiel, Morveau, &c. 1. That they had not been able to procure an alkaline salt by mixing earths, oil, and acids together, and subjecting them to the most intense fire. 2. The crystals of tartar, which were formerly believed to be pure acid salts, have been found by late experiments to contain a vegetable alkali. 3. The vegetable alkaline salt, when purified, is always of the same nature, from whatever substance it is procured; and therefore must have an original principle or body existing in the vegetables from which it is procured: for had it been produced by art, it would have varied, and we should have had different species of it, according to the principles which the plants contained. And, 4. The neutral salts which have been found mixed with the ashes of plants, as vitriolated tartar, nitre, and sea-salt, are likewise strong proofs of the original existence of alkali in vegetables.

On this subject the opinions of the greatest chemists of former times have been much at variance. But whatever may have been their conclusions respecting it, the late discoveries of Dr. Priestley and Mr. Cavendish have decisively shown, that the *volatile* alkali is by no means a simple element or natural principle, but a compound, and which may be artificially prepared. Dr. Priestley informs us, that by the union of nitrous air with iron, a volatile alkali is generated; and Mr. Cavendish, that by the action of the electric fluid, or pure elementary fire, upon phlogisticated air, the nitrous acid is produced: the volatile alkali, therefore, must be supposed to consist ultimately of phlogisticated air united to a great quantity of elementary fire. In like manner, if we can suppose this subtile element to enter into the substance of any kind of earth in such a manner as to exert its peculiar action when that substance is applied to any other, we may reasonably conclude that the fixed alkalis also are not simple and permanent principles, but capable of artificial composition and decomposition. It is certain that the action of alkaline salts is extremely similar to that of fire; and as we know that this element is combined in a *latent* state with fluids, there can be no absurdity in supposing it capable of combining also with solid substances.

ALKALI, or *Sal Kali*, in botany. See SALICORNIA.

ALKANET, in botany. See ANCHUSA.

ALKEKENGI, in botany, the trivial name of a species of physalis. See PHYSALIS.

ALKENNA, in botany. See LAWSONIA.

ALKERMES, in pharmacy, a kind of cordial confection, deriving its name from the kermes-berries used in its composition. It is now discarded from practice.

ALKORAN. See ALCORAN.

ALL-HALLOWS. See *All-Saints*.

ALL-*Good*. See CHENOPODIUM.

ALL-*Heal*. See HERACLEUM and STACHYS.

ALL-*Saints*, in the calendar, denotes a festival celebrated on the first of November, in commemoration of all the saints in general; which is otherwise called *All-Hallows*. The number of saints being so excessively multiplied, it was found too burdensome to dedicate a feast-day to each. Hence the expedient of commemorating such in the lump as had not their own days.

ALL-SAINTS *Bay*, a spacious harbour near St. Salvador in Brazil, in S. America. W. long. 40. S. lat. 12.

ALL-*Souls*, in the calendar, denotes a feast-day, held on the 2nd of November, in commemoration of all the faithful deceased.

ALL-SPICE. See MYRTUS and CALYCANTHUS.

ALLA, or ALLAH, the name by which the professors of Mahometanism call the *Supreme Being*. The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the same with the Hebrew *Eloah*, which signifies the *Adorable Being*.

ALLAMANDA, in botany: a genus of the monogynia order, belonging to the pentandria class of plants. The characters are: The *calyx* a 5-leaved perianthium: The *corolla* consists of one funnel-shaped petal; the tube cylindric; the border semiquinquefid and ventricose; the divisions expanding and obtuse: The *stamina* have scarce any filaments; the antheræ are five, arrow-shaped, converging, in the throat of the tube: The *pistillum* has an oval germen, girt at the base with an annular margin; the stylus is filiform, the length of the tube; the stigma is headed, and contracted in the middle: The *pericarpium* is an orbicular, compressed, bristly capsule, containing one cell with two valves: The *seeds* are imbricated, orbicular, flat, with a membranaceous wing on the margin, and are very numerous. There is but one species, the cathartica, a native of Surinam.

ALLANTOIS, or ALLANTOIDES, a gut-shaped vesicle investing the fœtus of cows, goats, sheep, &c. filled with an urinous liquor conveyed to it from the urachus.—(See COMPARATIVE *Anatomy*.) Anatomists are not agreed whether the allantois has any existence in the human species or not.

ALLAY. See ALLOY.

ALLEGATA, a word anciently subscribed at the bottom of rescripts and constitutions of the emperors; as *signata*, or *testata*, was under other instruments.

ALLEGEAS, or ALLEGIAS, a stuff manufactured in the East Indies. There are two sorts; some of cotton and others of several kinds of herbs, which are spun like flax and hemp.

ALLEGIANCE, in law, is the tie which binds the subject to the king, in return for that protection which the king affords the subject. The thing itself, or substantial part of it, is founded in reason and the nature of government; the name and the form are derived to us from our Gothic ancestors. In Britain, on its becoming a settled principle of tenure, that all lands in the kingdom were holden of the king as their sovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was necessarily confined to the person of the king alone. By an easy analogy, the term of *allegiance* was soon brought to signify all other engagements which are due from subjects to their prince, as well as those duties which were simply and merely territorial; and the oath of allegiance, as administered in England for upwards of 600 years, contained a promise "to be true and faithful to the "king and his heirs, and truth and faith to bear of life and limb "and terrene honour, and not to know or hear of any ill or da- "mage intended him, without defending him therefrom." But, at the Revolution, the terms of this oath being thought perhaps to favour too much the notion of non-resistance, the present form was introduced by the convention parliament, which is more general and determinate than the former; the subject only promising "that he will be faithful and bear *true* allegiance "to the king," without mentioning "his heirs," or specifying in the least wherein that allegiance consists. This oath

muſt be taken by all perſons in any office, truſt, or employment; and may be tendered by two juſtices of the peace to any perſon whom they ſhall ſuſpect of diſaffection. And the oath of allegiance may be tendered to all perſons above the age of twelve years, whether natives, denizens, or aliens.

But, beſides theſe *expreſs* engagements, the law alſo holds that there is an *implied*, *original*, and *virtual* allegiance, owing from every ſubject to his ſovereign, antecedently to any expreſs promiſe, and although the ſubject never ſwore any faith or allegiance in form. Allegiance, both expreſs and implied, is alſo diſtinguiſhed by the law into two ſpecies, the one *natural*, the other *local*; the former being perpetual, the latter temporary.

It is to be obſerved, however, in explanation of this allegiance, that it does not preclude reſiſtance to the king, when his miſconduct or weakneſs is ſuch as to make reſiſtance beneficial to the community. It ſeems fairly preſumable, that the convention parliament, which introduced the oath of allegiance in its preſent form, did not intend to exclude all reſiſtance; ſince the very authority by which the members ſat together, was itſelf the effect of a ſucceſsful oppoſition to an acknowledged ſovereign.—Again: The allegiance above deſcribed can only be underſtood to ſignify obedience to lawful commands. If, therefore, the king ſhould iſſue a proclamation, levying money or impoſing any ſervice or reſtraint upon the ſubject, beyond what the law authoriſed, there would exiſt no ſort of obligation to obey ſuch a proclamation, in conſequence of having taken the oath of allegiance.—Neither can allegiance be ſuppoſed to extend to the king after he is actually and abſolutely depoſed, driven into exile, or otherwiſe rendered incapable of exerciſing the regal office. The promiſe of allegiance implies, that the perſon to whom the promiſe is made continues king; that is, continues to exerciſe the power, and afford the protection, which belong to the office of king: for it is the poſſeſſion of theſe which makes ſuch a particular perſon the object of the oath.

ALLEGORY, a figure in rhetoric, which conſiſts in chooſing a ſecondary ſubject, having all its properties and circumſtances reſembling thoſe of the principal ſubject, and deſcribing the former in ſuch a manner as to repreſent the latter. The principal ſubject is thus kept out of view, and we are left to diſcover it by reflection. There cannot be a finer or more correct allegory than that in pſal. lxxx. where a vineyard is made to repreſent God's own people the Jews.

Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. But ſome writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe. Allegories, as well as metaphors and ſimilies, are unnatural in expreſſing any ſevere paſſion which totally occupies the mind. For this reaſon, that ſpeech of Macbeth which begins "Methought I heard a voice cry, Sleep no more!" &c. is juſtly condemned by Lord Kaimes. See METAPHOR.

ALLEGRI (Antonio), called *Corregio* from the place of his birth, an eminent hiſtorical painter, was born in the year 1494, and died in 1534. Being deſcended of poor parents, and educated in an obſcure village, he enjoyed none of thoſe advantages which contributed to form the other great painters of that illuſtrious age. He ſaw none of the ſtatues of ancient Greece or Rome; nor any of the works of the eſtabliſhed ſchools of Rome and Venice. But Nature was his guide; and Corregio was one of her favourite pupils. To expreſs the facility with which he painted, he uſed to ſay that he always had his thoughts ready at the end of his pencil.—The agreeable ſmile, and the profuſion of graces which he gave to his madonas, ſaints, and children, have been taxed with being ſometimes unnatural; but ſtill they are amiable and feducing. An eaſy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and ſhade, give an aſtoniſhing relief to all his pictures, and have been the admiration both of his cotemporaries and his ſucceſſors. Annibal Caracci, who flouriſhed 50 years after him, has been particularly laviſh in his commendation of this great artiſt.

ALLEGRO, in muſic, an Italian word, denoting that the part is to be played in a ſprightly, briſk, lively, and gay manner.—*Piu* ALLEGRO, ſignifies, that the part it is joined to ſhould be ſung or played quicker; as *Poco piu* ALLEGRO intimates, that the part to which it refers ought to be played or ſung only a little more briſkly than allegro alone requires.

ALLELUIAH, or HALLELUIAH, a word ſignifying, *praiſe the Lord*, to be met with either at the beginning or end of ſome pſalms: ſuch is pſalm cxlv. and thoſe that follow, to the end. Alleluiah was ſung upon ſolemn days of rejoicing, Tobit, chap. xiii. v. 12. It was afterwards transferred from the ſynagogue to the church; and ſo much energy has been obſerved in this term, that the antient church thought proper to preſerve it, without tranſlating it either into Greek or Latin, for fear of impairing the genius and ſoftneſs of it. The fourth council of Toledo prohibited the uſe of it in times of Lent, or other days of faſting, and in the ceremonies of mourning; and, according to the preſent practice of the Romiſh church, this word is never repeated in Lent, nor in the obſequies of the dead; notwithſtanding which, it is uſed in the maſs for the dead, according to the moſarabic ritual, at the introit, when they ſing, *Tu es portio mea, Domine, Alleluia, in terra viventium, Alleluia, Alleluiah.* The ſinging alleluiah was oftentimes an invitatory or call to each other to praiſe the Lord.

ALLEMAND, a ſort of grave ſolemn muſic, with good meaſure, and a ſlow movement.—It is alſo a briſk kind of dance, very common in Germany and Switzerland.

ALLEMANNIC, in a general ſenſe, denotes any thing belonging to the ancient Germans. Thus, we meet with Allemannic hiſtory, Allemannic language, &c.

ALLENDORF, a ſmall town in the circle of the Upper Rhine. It is ſeated on the river Weſer, 15 miles eaſt of Caſſel; E. long. 10. 5. N. lat. 51. 26.

ALLER, a river which runs through the duchy of Lunenburg, and falls into the Weſer a little below Verden.

ALLER, *good*, in our ancient writers. The word *aller* expreſſes a ſuperlative ſignification. Thus, *aller-good* is the greateſt good. Sometimes they wrote *alder*.

ALLERION, or ALERION, in heraldry, a ſort of eagle without beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas thoſe of the martlet are cloſe; and denote imperialiſts vanquiſhed and diſarmed.

ALLEVEURE, a ſmall braſs Swediſh coin, worth about ½d. Engliſh money.

ALLEY, in gardening, a ſtraight parallel walk, bounded on both ſides with trees, ſhrubs, &c.

ALLEY, among builders, denotes a narrow paſſage leading from one place to another.

ALLEY, in perſpective, that which, in order to have a greater appearance of length, is made wider at the entrance than at the termination.

ALLEY, in the new huſbandry, implies the vacant ſpace between the outermoſt row of corn on one bed and the neareſt row to it on the next parallel bed. It is uſually about 4 feet in breadth, excluſive of the partitions between the rows of corn in the beds.

ALLEYN (Edward), a celebrated Engliſh actor in the reigns of queen Elizabeth and king James, and founder of the college at Dulwich in Surry, was born at London, in the pariſh

of St. Botolph, Sept. 1, 1566. Haywood, in his prologue to Marloe's Jew of Malta, calls him Proteus for ſhapes, and Roſcius for a tongue. He uſually played the capital parts, and was one of the original actors in Shakeſpear's plays. He died Nov. 25, 1626, in the 61ſt year of his age, and was buried in the chapel of his new college, where there is a tomb-ſtone over his grave, with an inſcription. His original Diary is alſo there preſerved.

ALLIA, a river of Italy, which running down a very ſteep channel from the mountains of Cruſtuminum, mixes with the Tiber at 40 miles diſtance from Rome.

ALLIANCE, in the civil and canon law, the relation contracted between two perſons or two families by marriage.

ALLIANCE is alſo uſed for a treaty entered into by ſovereign princes and ſtates, for their mutual ſafety and defence.—In this ſenſe, alliances may be diſtinguiſhed into ſuch as are offenſive, whereby the contracting parties oblige themſelves jointly to attack ſome other power; and into defenſive ones, whereby they bind themſelves to ſtand by and defend each other in caſe they are attacked by others. By the deſpots of Europe, alliances have been diſgraced, and made only the inſtruments of political convenience.

ALLIANCE, in a figurative ſenſe, is applied to any kind of union or connection; thus we ſay, there is an alliance between the church and ſtate.

ALLIGATI, in Roman antiquity, the baſeſt kind of ſlaves, who were uſually kept fettered. The Romans had 3 orders of ſlaves; the firſt employed in the management of their eſtates; the ſecond in the menial functions of the family; the third, the *alligati*.

ALLIGATION, the name of a method of ſolving all queſtions that relate to the mixture of one ingredient with another.

Alligation is of two kinds, *medial* or *alternate*.

ALLIGATION *Medial*, from the rates and quantities of the ſimples given, diſcovers the rate of the mixture.

Multiply each quantity by its rate, and divide the ſum of the products by the ſum of the quantities, the quotient gives the rate of the compoſition.

Examp. If 30 lb. of currants, at 4d. per lb. are mixed with 10 lb. of other currants, at 6d. per lb: What is the value of 1 lb. of the mixture? *Anſ.* $4\frac{1}{2}$ d.

lb.	*d.*		*d.*		*d.*
30,	at 4	amounts to	120	180	
10,	at 6		60	———	$= 4\frac{1}{2}$
———			———	40	
40			180		

The rates of two ſimples, with the rate and quantity of the mixture, being given, the quantity of each ſimple may be found. Multiply the quantities into the rate of the mixture, and ſubtract the quantities multiplied into the rate of the leaſt quantity, and divide the ſum thus found by the difference of the rates of the two quantities.

A mixture of 400 lb. weight coſts 7l. 10s. conſiſting of raiſins at 4d. per lb. and almonds at 6d. how many pounds of almonds were in the mixture?

		lb.	*Rates*
		400	6d.
L.	*s.* *d.*	4	4d.
7	10 = 1800	———	———
	1600	1600d.	2d.

		L.	*s.*
2) 200 (100 lb. of almonds at 6d. is		2	10
And 300 lb. of raiſins at 4d. is		5	0
Total	400	Proof	7 10

ALLIGATION *Alternate*, from the rates of the ſimples, and rate of the mixture given, finds the quantities of the ſimples.

Rule. 1ſt, Place the given rates of the ſimples in a column, under each other; noting which rates are leſs, and which are greater than the propoſed compound. 2d, Connect or link with a crooked line, each rate which is leſs than the propoſed compound rate, with one or any number of thoſe which are greater than the ſame; and every greater rate with one or any number of the leſs ones. 3d, Take the difference between the given compound rate and that of each ſimple rate, and ſet this difference oppoſite every rate with which that one is linked. 4th, Then if only one difference ſtand oppoſite any rate, it will be the quantity belonging to that rate; but when there are ſeveral differences to any one, take their ſum for its quantity.

For example, Suppoſe it were required to mix together gold of various degrees of fineneſs, viz. of 19, of 21, and of $23\frac{1}{3}$ carats fine, ſo that the mixture ſhall be of 20 carats fine. Hence,

	Rates	*Diffs.*	*Sum of Diffs.*
Comp. rate 20	21	--- 1	1 of 21 carats fine,
	19	--- 1 + 3	4 of 19 carats fine,
	23	--- 1	1 of 23 carats fine.

That is, there muſt be an equal quantity of 21 and 23 carats fine, and four times as much of 19 carats fine.

Various limitations, both of the compound and the ingredients, may be conceived; and in ſuch caſes, the differences are to be altered proportionally.

Queſtions of this ſort are however commonly beſt and eaſieſt reſolved by common Algebra, of which they form a ſpecies of indeterminate problems, as they admit of many, or an indefinite number of anſwers.

ALLIGATOR, in zoology, a ſynonyme of the lacerta crocodilus. See LACERTA.

ALLIGATOR *Pear*. See LAURUS.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The characters are; the common *calyx* oblong, ſimple, three-flowered, five-parted, and perſiſtent; the proper one, obſcure, above: the proper *corolla* is monopetalous and funnel-ſhaped; the mouth quinquefid and erect: the *ſtamina* conſiſt of four briſtly filaments, longer than the corolla, and bending to one ſide; the antheræ are roundiſh: the *piſtillum* has an oblong germen beneath; the *ſtylus* is briſtly, and longer than the ſtamina; the ſtigmata are multifid and linear. There is no *pericarpium*. The *ſeeds* are ſolitary, oblong, and naked. The *receptaculum* is naked. There are two ſpecies, the violeacea and incarnata, both natives of America.

ALLIOTH, a ſtar in the tail of the greater bear, much uſed for finding the latitude at ſea.

ALLITERATION, an ornament of which language appears to be capable. It is chiefly uſed in poetry, and conſiſts in the repetition of the ſame letter at certain intervals. It ſometimes deforms language however inſtead of adorning it, eſpecially in proſe compoſitions; and on this account, as well as the trivial degree of excellence which attaches to it even when judiciouſly applied, critics in general diſregard it. The poets furniſh numerous inſtances of alliteration, moſt of them perhaps accidental. Dr. Johnſon cites the following line from Milton, as an inſtance:

"*B*ehemoth *b*iggeſt *b*orn—"

But Grey's Odes abound with alliterations; almoſt every ſtrophe commencing and concluding with an alliterative line.

" *R*uin ſeize thee, *r*uthleſs king."
" To *h*igh-born *H*oel's *h*arp, or ſoft *L*lewellyn's *l*ay."
" *W*eave the *w*arp, and *w*eave the *w*oof"
" Stamp we our vengeance *d*eep, and ratify his *d*oom."
" Regardleſs of the *ſ*weeping whirlwind's *ſ*way."
" That huſh'd in grim re*p*oſe, expects his ev'ning *p*rey."

From Mr. Pope we may alſo draw an example:

" Eternal beauties grace the ſhining *ſ*cene,
" *F*ields ever *f*reſh, and *g*roves for ever *g*reen."

ALLIUM, Garlic, from 'αλεω to *avoid* or *ſhun*, becauſe many ſhun the ſmell of it; a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking in the 9th order, *Spathaceæ*. The characters are; the *calyx* a common ſpatha, roundiſh, withering, and multiflorous. The *corolla* conſiſts of ſix oblong petals. The *ſtamina* have ſix ſubulated filaments, often the length of the corolla. The antheræ are oblong and erect. The *piſtillum* has a germen above, ſhorter, nearly three cornered, with angles engraved with a line. The ſtyli are ſimple, the ſtigmata acute. The *pericarpium* is a very ſhort, broad, three-lobed capſule, with 3 cells and 3 valves. The *ſeeds* are many and roundiſh. Of this genus no fewer than 40 different ſpecies are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks. We ſhall mention 1. The *ſativum*, or garlic, which has a bulbous root, of an irregularly roundiſh ſhape, with ſeveral fibres at the bottom; each root is compoſed of a number of leſſer bulbs, called *cloves* of garlic, incloſed in one common membranous coat, and eaſily ſeparable from one another. All the parts of this plant, but more eſpecially the roots, have an acrimonious, and almoſt cauſtic taſte, with a ſtrong offenſive ſmell, which laſt has induced thoſe who preſerved ſome of the ſpecies in gardens, on account of their yellow flowers, to eradicate them. Garlic is very hardy, and will thrive in almoſt any ſoil or ſituation. It is eaſily propagated either by the roots or ſeeds.—2. The *aſcalonicum*, or *eſchalot*, was found wild in Paleſtine. The root is conglobate, conſiſting of many oblong roots bound together by thin membranes. Each of theſe ſmall roots ſends forth two or three fiſtulous, long, awl-ſhaped leaves, iſſuing from a ſheath, and are nearly like thoſe of the common onion. The flower-ſtem ſhoots from a membranaceous ſheath; is round, almoſt naked, and terminated by a globular umbel of flowers, which have erect, purpliſh, lance-ſhaped petals, of the length of the ſtamina. The root of this ſpecies is very pungent, has a ſtrong, but not unpleaſant ſmell, and therefore is generally preferred to the onion in cookery.—3. The *ſcorodopraſum*, or *rokambole*, grows naturally in Denmark and Sweden, has a heart-ſhaped ſolid root, which ſtands ſidewiſe of the ſtalk. The leaves are broad, and are a little crenated on their edges. The flowers are of a pale purple colour, and collected into a globular head. The roots are uſed for the ſame purpoſe as the former.—4. The *ſchænopraſum*, or *cives*, is an inhabitant of Siberia, and is a very ſmall plant compared with the former, the leaves and ſtems ſeldom exceeding ſix inches in length, and the roots never producing any bulbs. The leaves are awl-ſhaped, hollow, and the ſtem naked. It was formerly in great requeſt for mixing with ſallads in the ſpring.—5. The *cepa*, or common onion, differs from the garlic only in the ſwelling pipy ſtalk, which is much larger in the middle than at either end. The varieties are, the Straſburgh, the Spaniſh, and the Egyptian onion. They are propagated by ſeeds, which ſhould be ſown the latter end of February, or the beginning of March, on good, light, rich ground, well dug and levelled, and cleared from weeds. They ſhould alſo be ſown at a time when the ſurface of the ground is not moiſt; and where they are intended for a winter crop, they muſt not be ſown too thick. The common allowance is ſix pounds of ſeed to an acre; though ſome allow more, in order to have a crop to draw out, which they call *cullings*. The mode of cultivating this uſeful vegetable is univerſally known.—6. The *porrum*, or leek, whoſe native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in the 11th chap. of Numbers, where it is ſaid the Iſraelites longed for leeks in conjunction with onions. They are in great eſteem with the Welſh, and their general uſe as a pot-herb is well known.

ALLOA, or Alloway, a ſea-port town in Scotland, ſeated on the Forth, and 5 miles eaſt of Stirling.

ALLOCATION denotes the admitting or allowing of an article of an account, eſpecially in the exchequer. Hence, Allocatione *Facienda*, is a writ directed to the lord treaſurer, or barons of the exchequer, commanding them to allow an accountant ſuch ſums as he has lawfully expended in the execution of his office.

ALLOCUTIO, an oration or ſpeech of a general addreſſed to his ſoldiers, to animate them to fight, to appeaſe ſedition, or to keep them to their duty.

ALLODIUM, or Alleud, denotes lands which are the abſolute property of their owner, without being obliged to pay any ſervice or acknowledgment whatever to a ſuperior lord. See Fee and Feodal *Syſtem*.

ALLOPAYLLUS, in botany; a genus of the monogynia order, belonging to the octandria claſs of plants. The characters are; the *calyx* a 4 leaved perianthium, with orbicular leaflets, the oppoſite ones leſs: The *corolla* conſiſts of 4 orbicular equal petals, leſs than the calyx; the claws broader, the length of the ſmaller leaves of the calyx: The *ſtamina* conſiſts of 8 ſlender filaments, the length of the corolla; the antheræ are roundiſh: The *piſtillum* has a round didymous germen above; the ſtylus is filiform, and longer than the ſtamina; and the ſtigma is bifid, with revolute diviſions. There is but one ſpecies, the zelanicus, a native of Ceylon.

ALLOTTING, or Allotment *of Goods*, in matters of commerce, is when a ſhip's cargo is divided into ſeveral parts, bought by divers perſons, whoſe names are written on as many pieces of paper, which are applied by an indifferent perſon to the ſeveral lots or parcels; by which means the goods are divided without partiality.

ALLOY, or Allay, properly ſignifies a proportion of a baſer metal mixed with a finer one. The alloy of gold is eſtimated by carats, that of ſilver by pennyweights. In different nations, different proportions of alloy are uſed; whence their moneys are ſaid to be of different degrees of fineneſs or baſeneſs, and are valued accordingly in foreign exchanges. The chief reaſons alleged for the alloying of coin are: 1. The mixture of the metals, which, when ſmelted from the mine, are not perfectly pure. 2. The ſaving the expence it muſt otherwiſe coſt if they were to be refined. 3. The neceſſity of rendering them harder, by mixing ſome parts of other metals with them, to prevent the diminution of weight by wearing in paſſing from hand to hand. 4. The melting of foreign gold or coin which is alloyed. 5. The charges of coinage, which muſt be made good by the profit ariſing from the money coined. 6. and laſtly, The duty belonging to the ſovereign, on account of the power he has to cauſe money to be coined in his dominions.—In a more general ſenſe, the word is employed in chemiſtry to ſignify the union of different metallic matters; whereby their denſity, ſpecific gravity, and other properties are capable of being changed.

ALLUM. See Alum.

ALLUMINOR, from the French *alumer*, to *lighten*, is uſed for one who colours or paints upon paper or parchment; becauſe he gives light and ornament by his colours to the letters or other figures. Such ornaments are ſtyled *illuminations*.

ALLUSION, in rhetoric, a figure by which ſomething is applied to, or underſtood of, another, on account of ſome ſimilitude between them.

ALLUVION, in law, denotes the gradual increaſe of land along the ſea-ſhore, or on the banks of rivers.

ALLY, in matters of polity, a ſovereign or ſtate that has entered into alliance with others. See ALLIANCE.

ALMACANTARS. See ALMUCANTARS.

ALMACARRON, a ſea-port town in Spain, in the province of Murcia; W. long. 1. 15. N. lat. 37. 40.

ALMADE, a town of Spain, in the province of La Mancha.

ALMADIE, a kind of African canoe, or ſmall veſſel, about four fathoms long, commonly made of bark.

ALMADIE is alſo the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and ſix or ſeven in breadth. They are exceedingly ſwift, and are otherwiſe called *catburi*.

ALMAGEST, in literature, a collection or book compoſed by Ptolemy, containing various problems of the ancients both in geometry and aſtronomy. It is alſo the title of other collections of this kind. Thus, Riccioli's book of aſtronomy is called the *New Almageſt*; and Pluckenet's on botany, *Almageſtrum Botanicum*.

ALMAGRA, a fine deep red ochre, with ſome admixture of purple, very heavy, and of a denſe yet friable ſtructure, and rough duſty ſurface. It adheres very firmly to the tongue, melts freely and eaſily in the mouth, is of an auſtere and ſtrongly aſtringent taſte, and ſtains the ſkin in touching. It is the *Sil Atticum* of the ancients. It ferments very violently with acids; which ſufficiently diſtinguiſhes it from the *Sil Syricum*, to which it has in many reſpects a great affinity. There are immenſe quantities of it in many parts of Spain. It is uſed in painting, and in medicine as an aſtringent.

ALMAGRO, a fortreſs of Spain, the capital of one of the diſtricts of La Mancha.

ALMANACK, a book, or table, containing a calendar of days and months, the riſing and ſetting of the ſun, the age of the moon, the eclipſes of both luminaries, &c. Authors are divided with regard to the etymology of the word; ſome deriving it from the Arabic particle *al*, and *manach*, to count; ſome from *almanah*, new-year's gifts, becauſe the Arabian aſtrologers uſed at the beginning of the year to make preſents of their ephemerides; and others, from the Teutonic *almaenachte*, obſervations on all the months. Some derive it from the Arabic particle *al*, and the Greek μην, a month, or μανακος, the courſe of the months. But the moſt ſimple etymology appears from the common ſpelling; the word being compoſed of two Arabic ones, *Al Manack*, which ſignify *the Diary*. Regiomontanus appears to have been the firſt in Europe, who reduced almanacks into their preſent form and method, gave the characters of each year and month, foretold the eclipſes and other phaſes, calculated the motions of the planets, &c. His almanack was firſt publiſhed in 1474.

The eſſential part of an almanack is the calendar of months and days, with the riſings and ſettings of the ſun, age of the moon, &c. To theſe, however, are added various parerga, aſtronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipſes, ſolar ingreſſes, prognoſtics of the weather, tables of the tides, terms, &c. liſts of poſts, offices, dignities, public inſtitutions, with many other particulars.

In the conſtruction of an almanack, the firſt thing to be done is to compute the ſun's and moon's place for each day of the year, or it may be taken from ſome ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, diſtribute the calendar into weeks; then, having computed the time of Eaſter, by it fix the other moveable feaſts; adding the immoveable ones, with the names of the martyrs, the riſing and ſetting of each luminary, the length of day and night, the aſpects of the planets, the phaſes of the moon, and the ſun's entrance into the cardinal points of the ecliptic, *i. e.* the two equinoxes and ſolſtices. By the help of good aſtronomical tables or ephemerides, the conſtruction of almanacks is extremely eaſy.

ALMANACK, among antiquaries, is alſo the name given to a kind of inſtrument uſually of wood, inſcribed with various figures and Runic characters, and repreſenting the order of the feaſts, dominical letters, days of the week, and golden number, with other matters neceſſary to be known throughout the year; uſed by the ancient northern nations, in their computations of time, both civil and eccleſiaſtical. Almanacks of this kind are known by various names, among the different nations wherein they have been uſed; as rimſtocks, primſtaries, runſtocks, runſtaffs, *Scipiones Runici*, *Bacculi Annales*, clogs, &c. They appear to have been uſed only by the Swedes, Danes, and Norwegians. From the ſecond of theſe people, their uſe was introduced into England, whence divers remains of them in the counties. Dr. Plot has given the deſcription and figure of one of theſe clogs, found in Staffordſhire, under the title of *The perpetual Staffordſhire Almanack*.

ALMANZA, a little town of New-Caſtile, on the frontiers of the kingdom of Valencia in Spain, ſituated in W. long. 1. 19. N. lat. 38. 54. It is remarkable for the defeat of the allies in 1707, under the Marquis de las Minas and the Earl of Galway.

ALME, or ALMA, ſinging and dancing girls in Egypt, who, like the Italian *Improviſatori*, can occaſionally pour forth "unpremeditated verſe." They are called *Almé*, from having received a better education than other women. They form a celebrated ſociety in that country. To be received into it, according to Mr. Savary, it is neceſſary to have a good voice, to underſtand the language well, to know the rules of poetry, and be able to compoſe and ſing couplets on the ſpot, adapted to the circumſtances of the occaſion. The common people have alſo their Almé. They are girls of the ſecond claſs, who try to imitate the former; but they have neither their elegance, their graces, nor their knowledge. The public places and walks about Grand Cairo are full of them; but decency will not permit the relation to what a pitch they carry the licentiouſneſs of their geſtures.

ALMEDIA, a frontier town of Portugal, in the province of Tralos Montes; 17 miles N. W. of Cividad Rodrigo. W. long. 7. 10. N. lat. 40. 41.

ALMEHRAB, in the Mahometan cuſtoms, a niche in their moſques, pointing towards the kebla or temple of Mecca, to which they are obliged to bow in praying. See KEBLA.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of caſting of lots with arrows, ſtrictly forbid by the law of Mahomet, on account of the frequent quarrels occaſioned by it.

ALMENE, in commerce, a weight of 2lb. uſed to weigh ſaffron in ſeveral parts of the continent of the Eaſt Indies.

ALMERIA, a ſea-port town in the kingdom of Granada in Spain, pleaſantly ſituated in a fine bay at the mouth of the river Almeria, on the Mediterranean: W. long. 3. 20. N. lat. 36. 51.

ALMISSA, a ſmall but ſtrong town at the mouth of the Cetina, in Dalmatia, famous for its piracies; ten miles eaſt of Spalatro. E. long. 39. 33. N. lat. 43. 56.

ALMOND, the fruit of the almond-tree. See AMYGDALUS.

ALMOND, in commerce, a meaſure by which the Portugueſe ſell their oil; 26 almonds make a pipe.

ALMONDS, in anatomy, a name ſometimes given to two glands, generally called the *tonſils*.

ALMONDS, among lapidaries, ſignify pieces of rock-cryſtal, uſed in adorning branch-candleſticks, &c. on account of the reſemblance they bear to the fruit of that name.

ALMOND-*Furnace*, among refiners, that in which the ſlags of litharge, left in refining ſilver, are reduced to lead again by the help of charcoal.

ALMONDBURY, a village in England, in the weſt-riding of Yorkſhire, ſix miles from Halifax.

ALMONER, in its primitive ſenſe, denotes an officer in religious houſes, to whom belonged the management and diſtribution of the alms of the houſe. By the ancient canons, all monaſteries were to ſpend at leaſt a tenth part of their income in alms to the poor. The almoner of St. Paul's is to diſpoſe of the monies left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up 8 boys to ſinging, for the uſe of the choir. By an ancient canon, all biſhops are required to keep almoners.

Lord ALMONER, or *Lord High* ALMONER, *of England*, is an eccleſiaſtical officer, generally a biſhop, who has the forfeiture of all deodands, and the goods of *felos de ſe*, which he is to diſtribute among the poor. He has alſo, by virtue of an ancient cuſtom, the power of giving the firſt diſh from the king's table to whatever poor perſon he pleaſes, or, inſtead of it, an alms in money.

Great ALMONER, *Grand* AUMONIER, in France, was reckoned before the revolution the higheſt eccleſiaſtical dignity in that kingdom. To him belonged the ſuperintendency of all hoſpitals and houſes of lepers. The king received the ſacrament from his hands; and he ſaid maſs before the king in all grand ceremonies and ſolemnities.

ALMONER is alſo a more faſhionable title given by ſome writers to chaplains. In this ſenſe we meet with almoner of a ſhip, almoner of a regiment.

ALMONRY, or AUMBRY, the office or lodgings of the almoner; alſo the place where alms are given. See AMBRY.

ALMS, *eleemoſyna*, a general term for what is given out of charity to the poor. Anciently, the eccleſiaſtics ſubſiſted wholly on *alms*, which were thus divided: One part was allotted to the biſhop, another to the prieſts, and a third to the deacons and ſubdeacons, which made their whole ſubſiſtence; the fourth part was employed in relieving the poor, and in repairing the churches.—No religious ſyſtem is more frequent or warm in its exhortations to alms-giving than the Mahometan. The Alcoran repreſents alms as a neceſſary means to make prayer be heard. Hence that ſaying of one of their khalifs: "Prayer carries us half-way to God, faſting brings us to the door of his palace, and alms introduces us into the preſence-chamber."

ALMS alſo denotes lands or other effects left to churches or religious houſes, on condition of praying for the ſoul of the donor. Hence,

Free ALMS was that which is liable to no rent or ſervice.

Reaſonable ALMS was a certain portion of the eſtates of inteſtate perſons, allotted to the poor.

ALMS-*Box*, or *Cheſt*, a ſmall cheſt, or coffer, called by the Greeks Κιβωτον, wherein anciently the alms were collected, both at church and at private houſes.—The alms-cheſt in Engliſh churches is a ſtrong box with a hole in the upper part, having three keys, one to be kept by the parſon or curate, the other two by the church-wardens. The erecting of ſuch alms-cheſt in every church is enjoined by the book of canons, as alſo the manner of diſtributing what is thus collected among the poor of the pariſh.

ALMS-*Houſe*, a petty kind of hoſpital, for the maintenance of a certain number of poor, aged, or diſabled people.

ALMUCANTARS, in aſtronomy, an Arabic word denoting circles of the ſphere paſſing through the centre of the ſun, or a ſtar, parallel to the horizon, being the ſame as PARALLELS *of Altitude*.

ALMUCANTARS-*Staff*, is an inſtrument uſually made of pear-tree or box, having an arch of 15 degrees; uſed to take obſervations of the ſun, about the time of its riſing and ſetting, in order to find the amplitude, and conſequently the variation of the compaſs.

ALMUCIUM, denotes a kind of cover for the head, worn chiefly by monks and eccleſiaſtics: It was of a ſquare form, and ſeems to have given riſe to the bonnets of the ſame ſhape ſtill retained in univerſities and cathedrals.

ALMUGIM, or ALMUG-TREE, a certain kind of wood mentioned in the firſt book of Kings, ch. x. ver. 11. and 2d Chron. ch. ii. ver. 8. It was imported by Solomon from Ophir, and uſed in the making of rails, or pillars of the temple. It is alſo thought to be the ſame with the ſhittim-wood, whereof there is ſuch frequent mention made by Moſes.

ALMUNECAR, a ſea-port town in the kingdom of Granada; W. long. 3. 45. N. lat. 36. 50.

ALNAGE, or AULNAGE, from the French *aune* or *alne* an ell, the meaſuring of woollen manufactures with an ell. As a proof of the goodneſs of that commodity, a ſeal was invented and affixed as a mark that the commodity was made according to the ſtatute; but, it being now poſſible to purchaſe theſe ſeals, they are affixed, whenever the vender pleaſes, to all cloths indiſcriminately, to the great prejudice of our woollen manufactures.

ALNAGER, ALNEGER, or AULNEGER, q. d. *meaſurer by the ell*, ſignified a ſworn public officer, who, by himſelf or deputy, was to look to the aſſize of woollen cloth made throughout the land, i. e. the length, width, and work thereof; and to the ſeals for that purpoſe ordained. The office of king's aulnager ſeems to have been derived from the ſtatute of Richard I. A. D. 1197; but this office was aboliſhed by the ſtatute 11 and 12 W. III. cap. 20.

ALNUS, the ALDER-TREE, a ſpecies of betula. See BETULA.

ALNUS, in the ancient theatres, that part which was moſt diſtant from the ſtage.

ALNWICK, a thoroughfare town in Northumberland, on the road to Scotland; 310 miles N. by W. from London, 33 N. of Newcaſtle, and 29 S. of Berwick. Long. 1. 10. Lat. 55. 24.

ALOA, in Grecian antiquity, a feſtival kept in honour of Ceres by the huſbandmen, and ſuppoſed to reſemble our harveſt-home.

ALOE, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 10th order, *Coronariæ*. The characters are: No *calyx*; the *corolla* monopetalous, creſt, ſix-cleft, and oblong; the tube gibbous; the border ſpreading, and ſmall; with a nectary-bearing bottom. The *ſtamina* conſiſt of ſix ſubulated filaments, rather ſurpaſſing the corolla in length, and inſerted into the receptacle; the antheræ are oblong and incumbent. The *piſtillum* has an ovate germen; the ſtylus is ſimple, the length of the ſtamina; the ſtigma obtuſe and trifid. The *pericarpium* is an oblong capſule, three-furrowed, three-celled, three-valved. The *ſeeds* are many and angular. Of this genus, botanical writers enumerate ten ſpecies; of which the moſt remarkable are,

1. The *diſticha*, by ſome called the *ſoap aloe*, by others *caballine aloe*; which ſeldom riſes above two feet high. 2. The

variegata, or partridge-breaſt aloe, a low plant, ſeldom riſing above 8 inches. 3. The *viſcoſa*, with funnel-ſhaped flowers, which grows near a foot high, with triangular leaves of a dark green. 4. The *ſpiralis*, with oval crenated flowers, growing ſomewhat like the former. 5. The *linguiſformæ*, or tongue-aloe, which has its leaves about ſix inches in length, and ſhaped like a tongue. 6. The *margaritifera*, or pearl aloe, a very beautiful plant, and ſmaller than moſt of the aloe kind. 7. The *perfoliata*, or ſocotorine aloe, with long, narrow, ſucculent leaves, which come out without any order, and form large heads; the ſtalks growing 3 or 4 feet high. 8. The *retuſa*, or cuſhion aloe, which has very ſhort, thick, ſucculent leaves, compreſſed on the upper ſide like a cuſhion. This grows very cloſe to the ground; and the flowers grow on ſlender ſtalks, and are of an herbaceous colour.

For planting theſe vegetables, one half freſh light earth ſhould be had from a common, and the reſt an equal mixture of white ſea ſand and ſifted lime-rubbiſh. This mixture ſhould be always made ſix or eight months before the plants are to be ſet in it. The common aloe will live in a dry green-houſe in winter; and may be placed in the open air in ſummer, in a ſheltered ſituation; but muſt have very little water. Moſt of the other aloes are beſt preſerved in an airy glaſs-caſe, in which there is a ſtove, to make a little fire in very bad weather. But the tendereſt kinds require a greater ſhare of heat to preſerve them in winter, and ſhould be kept in a good ſtove, in a degree of heat ten degrees above temperate. Many other kinds may alſo be kept in this heat; but the greater the heat, the more water they always require. About the beginning of June, it is uſual in England to ſet the pots of aloes out of the houſe; but they ſhould be ſet under the ſhelter of hedges or trees, to keep them from the violence of the ſun; the rains alſo, which uſually fall in this and the following month, are apt to rot them. It is therefore beſt to keep them under cover the greateſt part of the year.

Of the leaves of the Guinea aloe, mentioned by Mr Adanſon, in his voyage to Senegal, the negroes make very good ropes, not apt to rot in the water. Dr. Sloane mentions two ſorts of aloe; one of which is uſed for fiſhing-lines, bow-ſtrings, ſtockings, and hammocks; the other has leaves which, like thoſe of the wild-pine and banana, hold rain-water. In Mexico, the *maguei*, a ſpecies of aloe, yields almoſt every thing neceſſary to the life of the poor. Beſides making excellent hedges for their fields, its trunk ſerves for the roofs of their houſes, and its leaves inſtead of tiles. From thoſe leaves they obtained paper, thread, needles, clothing, ſhoes and ſtockings, and cordage; and from its copious juice they make wine, honey, ſugar, and vinegar, &c.

The drug known by the name of *aloes* is the inſpiſſated juice of ſome of the above-mentioned plants. The ancients diſtinguiſhed two ſorts, the one pure and of a yelloviſh colour, inclining to red, reſembling the colour of a liver, and thence named *hepatic*; the other full of impurities, and hence ſuppoſed to be only the droſs of the better kind. At preſent, various ſorts are met with in the ſhops; and theſe we ſhall range in three claſſes: 1. ALOE *Perfoliata*, ſocotorine aloes, brought from the iſland of Socotora in the Indian ocean, wrapt in ſkins. It is of a gloſſy ſurface, clear, and, in the lump, of a yelloviſh red colour, with a purple caſt; but when reduced to powder, of a bright golden colour. Its taſte is bitter and aromatic, but diſagreeable: the ſmell, which is not very unpleaſant, reſembles that of myrrh.—2. ALOE *Hepatica*, hepatic, Barbadoes, or common aloes (the juice of a variety of the former), is not ſo clear and bright as the foregoing ſort; it is alſo of a darker colour, more compact texture, and for the moſt part drier. Its ſmell is much ſtronger and more diſagreeable; the taſte intenſely bitter and nauſeous, with little or nothing of the fine aromatic flavour of the ſocotorine. The beſt hepatic aloes come from Barbadoes in large gourd ſhells; an inferior ſort is brought over in caſks.—3. ALOE *Caballina*, fetid, caballine, or horſe-aloes, is ſuppoſed to be a coarſer ſort obtained from the ſame ſpecies with the foregoing; according to others, it is the produce of the *diſticha*. It is chiefly diſtinguiſhable by its ſtrong rank ſmell.

All the different kinds are gum-reſins, which contain more gummous than reſinous parts. Water, when of a boiling heat, diſſolves all the ſoluble parts of aloes; but if let ſtand till it grows cold, it lets drop moſt of its reſin; a ſtrong ſpirit however diſſolves and keeps ſuſpended almoſt the whole.

Aloes is a ſtimulating ſtomachic purge, which, given in ſmall quantity, operates mildly by ſtool; but in large doſes acts roughly, and often occaſions an irritation about the anus. It is a good opening medicine to people of a lax habit, or who live a ſedentary life; and to thoſe whoſe ſtomach and bowels are loaded, or who are troubled with worms, or are debilitated. In ſmall doſes, it promotes the menſtrual diſcharge in women; and therefore is frequently employed in chloroſis. It is however looked upon as a heating medicine, and not proper where there is much heat or fever; and its continued uſe is apt to bring on the piles. It is given in ſubſtance from 2 or 3 to 10 grains; and it agrees beſt when joined with ſoap or with a ſmall quantity of fixed alkali.

ALOES-*Wood*. See XYLO-*Aloes*.

American ALOE. See AGAVE.

ALOGIANS, in church-hiſtory, a ſect of ancient hereties, who appeared about the cloſe of the 2d century. They denied that Jeſus Chriſt was the Logos, and conſequently rejected the goſpel of St. John. The word is compounded of the privative α, and λογος, q. d. *without Logos* or *Word*.

ALOGOTROPHIA, among phyſicians, a term ſignifying the unequal growth or nouriſhment of any part of the body, as in the rickets.

ALOOF. See LUFF.

ALOPECIA, a term uſed among phyſicians to denote a total falling off of the hair, either in conſequence of a defect of nutritious juices, or by a diſeaſed ſtate of the ſkin. Many ridiculous remedies for this, ſuch as bears greaſe, &c. have been propoſed. Others adviſe waſhing the head every night with a ley prepared by boiling the aſhes of vine branches in red wine. A powder of hermodactyls is alſo commended for the ſame purpoſe. Some adviſe a decoction of burdock root in white wine; and others the rubbing a freſh cut onion on the part till it becomes red, which is perhaps the moſt rational method of any.

ALOPECURUS, or FOX-TAIL GRASS, in botany, a genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, *Gramina*. The characters are; the *calyx* a ſingle-flowered bivalve glume; the *corolla* one-valved; the *ſtamina* 3 capillary filaments; the antheræ bifurcated at both ends; the *piſtillum* a roundiſh germen. There are two ſtyli; and the ſtigmata are ſimple. The *pericarpium* is a corolla clothing the ſeed; and the *ſeed* is ſingle and roundiſh. There are eight ſpecies viz. the *pratenſis*, or meadow fox-tail graſs; the *bulboſus*, or bulbous fox-tail graſs; the *geniculatus*, or ſlote fox-tail graſs; and the *myoſuroides*, or field fox-tail graſs; theſe four grow wild in Britain: the *agreſtis*, the *monſpelienſis*, the *paniceous*, and the *hordeiformis*, are all natives of France and the ſouthern parts of Europe, except the laſt, which is a native of India.

ALOPEX, in zoology, a ſpecies of the canis, with a ſtrait tail and black tip; commonly called the *field fox*.

ALOSA, the ſhad, or mother of herrings, a ſpecies of the Clupea. See CLUPEA.

ALOST, a town in Flanders, belonging to the Houſe of

Auſtria, ſeated on the river Dender, in the midway between Bruſſels and Ghent. E. long. 4. 10. N. lat. 49. 55.

ALPHA, the name of the firſt letter of the Greek alphabet, anſwering to our A.—As a numeral, it ſtands for one, or the firſt of any thing. It is particularly uſed among ancient writers, to denote the chief or firſt man of his claſs or rank.

ALPHA is alſo uſed to denote the beginning of any thing. In which ſenſe it ſtands oppoſed to *Omega*, which denotes the end. And theſe two letters were made the ſymbol of Chriſtianity; and accordingly were engraven on the tombs of the ancient Chriſtians, to diſtinguiſh them from thoſe of idolaters.

ALPHABET, the natural or cuſtomary ſeries of the ſeveral letters of a language. The word is formed from *alpha* and *beta*, the firſt and ſecond letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The Engliſh alphabet contains 24 letters; to which if we add *j* and *v* conſonant, the ſum will be 26: the French contains 23; the Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perſian 31; the Turkiſh 33; the Georgian 36; the Coptic 32; the Muſcovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spaniſh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Barameſe 19. The Chineſe have, properly ſpeaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of conſiderable diſpute whether the method of expreſſing our ideas by viſible ſymbols called *letters*, be really a human invention; or whether we ought to attribute an art ſo exceedingly uſeful, to an immediate revelation from the Deity. It would lead us however into too wide a field to diſcuſs this ſubject, and to ſtate the arguments that have been uſed on both ſides; neither indeed is it immediately neceſſary to our purpoſe.

With reſpect to the pretenſions of different nations to the invention of letters, a ſubject on which alſo writers are very much divided, Mr. Aſtle makes the following reflections: "The vanity of each nation induces them to pretend to the moſt early civilization; but ſuch is the uncertainty of ancient hiſtory, that it is difficult to determine to whom the honour is due. It ſhould ſeem, however, that the conteſt may be confined to the Egyptians, the Phœnicians, and the Chaldeans. The Greek writers, and moſt of thoſe who have copied them, decide in favour of Egypt, becauſe their information is derived from the Egyptians themſelves. The poſitive claim of the Phœnicians does not depend entirely upon the teſtimony of Sanchoniatho; the credit of his hiſtory is alſo well ſupported by Philo of Byblus, his tranſlator, Porphyry, Pliny, Curtius, Lucan, and other ancient writers, who might have ſeen his works entire, and whoſe relations deſerve at leaſt as much credit as thoſe of the Egyptian and Greek writers. It muſt be allowed, that Sanchoniatho's hiſtory contains many fabulous accounts; but does not the ancient hiſtory of the Egyptians, the Greeks, and moſt other nations, abound with them to a much greater degree? The fragments which we have of this moſt ancient hiſtorian are chiefly furniſhed by Euſebius, who took all poſſible advantages to repreſent the Pagan writers in the worſt light, and to render their theology abſurd and ridiculous.

"The Phœnician and Egyptian languages are very ſimilar; but the latter is ſaid to be more large and full, which is an indication of its being of a later date. The opinion of Mr. Wiſe, however, that the ancient Egyptians had not the knowledge of letters, ſeems to be erroneous; as they had commercial intercourſe with their neighbours the Phœnicians, they probably had the knowledge of letters, if their policy, like that of the Chineſe at this day, did not prohibit the uſe of them.

"The Chaldeans, who cultivated aſtronomy in the moſt remote ages, uſed ſymbols or arbitrary marks in their calculations; and we have ſhown, that theſe were the parents of letters. This circumſtance greatly favours their claim to the invention; becauſe Chaldea, and the countries adjacent, are allowed by all authors, both ſacred and profane, to have been peopled before Egypt; and it is certain that many nations ſaid to be deſcended from Shem and Japhet, had their letters from the Phœnicians, who were deſcended from Ham.

"It is obſervable, that the Chaldeans, the Syrians, Phœnicians, and Egyptians, all bordered upon each other; and as the Phœnicians were the greateſt as well as the moſt ancient commercial nation, it is very probable that they communicated letters to the Egyptians, the ports of Tyre and Sidon being not far diſtant from each other.

"Mr. Jackſon is evidently miſtaken when he ſays, that letters were invented 2619 years before the birth of Chriſt. The deluge recorded by Moſes was 2349 years before that event; and if letters were not invented till 550 years after, as he aſſerts, we muſt date their diſcovery only 1799 years before the Chriſtian æra, which is 410 years after the reign of Menes, the firſt king of Egypt, who, according to Syncellus and others, is ſaid to have been the ſame perſon with the Miſer of Sanchoniatho, the Mizraim of the ſcriptures, and the Oſiris of the Egyptians; but whether this be true or not, Egypt is frequently called in ſcripture *the land of Mizraim*.

"This Mizraim, the ſecond ſon of Amyn or Ham, ſeated himſelf near the entrance of Egypt at Zoan, in the year before Chriſt 2188, and 160 years after the flood. He afterwards built Thebes, and ſome ſay Memphis. Before the time that he went into Egypt, his ſon Taaut had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr. Jackſon ſuppoſes, we may trace letters as far back as the year 2178 before Chriſt, or 150 years after the deluge recorded by Moſes: and beyond this period, the written annals of mankind, which have been hitherto tranſmitted to us, will not enable us to trace the knowledge of them; though this want of materials is no proof that letters were not known until a century and an half after the deluge. As for the pretenſions of the Indian nations, we muſt be better acquainted with their records before we can admit of their claim to the firſt uſe of letters; eſpecially as none of their manuſcripts of any great antiquity have as yet appeared in Europe. That the Arabians were not the inventors of letters, has appeared by their own confeſſion.—Plato ſomewhere mentions Hyperborean letters very different from the Greek; theſe might have been the characters uſed by the Tartars or ancient Scythians.

"It may be expected that ſomething ſhould be ſaid concerning thoſe books mentioned by ſome authors to have been written before the deluge. Amongſt others, Dr. Parſons, in his Remains of Japhet, p. 346. 359. ſuppoſes letters to have been known to Adam; and the Sabeans produce a book which they pretend was written by Adam. But concerning theſe we have no guide to direct us any more than concerning the ſuppoſed books of Enoch; ſome of which, Origen tells us, were found in Arabia Felix, in the dominion of the queen of Saba. Tertullian affirms, that he ſaw and read ſeveral pages of them; and in his treatiſe *De Habitu Mulierum*, he places thoſe books among the canonical: but St. Jerom and St. Auſtin look upon them to be apocryphal. William Poſtellus pretended to compile his book *De Originibus* from the book of Enoch; and Thomas Bangius publiſhed at Copenhagen, in 1657, a work which includes many ſingular relations concerning the manner of writing among the Antediluvians, and which contains ſeveral pleaſant ſtories concerning the books of Enoch.

"With regard to this patriarch, indeed, St. Jude informs us, that he *propheſied*, but he does not ſay that he *wrote*. The

writings, therefore, attributed to the Antediluvians, muſt appear quite uncertain; though it might be improper to aſſert that letters were unknown before the deluge recorded by Moſes."

The ſame writer proceeds to ſhow, that all the alphabets in the world cannot be derived from one original; becauſe there are a variety of alphabets uſed in different parts of Aſia, which vary in name, number, figure, order, and power, from the Phœnician, ancient Hebrew, or Samaritan. In ſeveral of theſe alphabets alſo, there are marks for ſounds peculiar to the language of the eaſt, which are not neceſſary to be employed in the notation of the languages of Europe.

None of the alphabets to the eaſt of Perſia have any connection with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conqueſts of the Mahometans. The foundation of all the Indian characters are thoſe called *Shanſcrit*, or *Sungſkrit*. This ſignifies ſomething brought to perfection, in contradiſtinction to *prakrit*, which ſignifies vulgar or unpoliſhed. Hence the refined and religious language and characters of India are called *Sungſkrit*, and the more vulgar mode of writing and expreſſion *Prakrit*. From this Shanſcrit are derived the ſacred characters of Thibet, the Caſhmirian, Bengaleſe, Malabaric, and Tamoul; the Singaleſe, Siameſe, Maharattan, Concanee, &c. From the ſame ſource we may derive the Tangutic or Tartar characters, which are ſimilar, in their great outlines, to the Shanſcrit; though it is not eaſily determined which is derived from the other. The common Tartar is generally read, like the Chineſe, from top to bottom.

There are, however, ſeveral alphabets uſed in different parts of Aſia, entirely different not only from the Shanſcrit and all thoſe derived from it, but alſo from the Phœnician and thoſe which proceed from it. Some of theſe are the alphabet of Pegu, the *Batta* characters uſed in the iſland of Sumatra, and the *Barman* or *Boman* characters uſed in ſome parts of Pegu. The names and powers of the letters of which theſe alphabets are compoſed, differ entirely from the Phœnician, or thoſe derived from them. It is impoſſible to aſſimilate their forms, and indeed it is by no means eaſy to conceive how the 50 letters of the Shanſcrit language could be derived from the Phœnician alphabet, which conſiſted originally only of 13; though it is certain, that by far the greater number of alphabets now in uſe are derived from the ancient Hebrew, Phœnician, or Samaritan.

The alphabets derived from the Phœnician, are ſuppoſed to have been immediately the aneient Hebrew or Samaritan; the Chaldaic, the Baſtulian or Spaniſh Phœnician; the Punic, Carthaginian, or Sicilian; and the Pelaſgian. From the ancient Hebrew proceeded the Chaldaic or ſquare Hebrew; the round Hebrew; and what is called the *running hand of the Rabbins*. The Pelaſgian gave birth to the Etruſcan, Eugubian, or Umbrian, Oſcan, Samnite, and Ionic Greek, written from the left. From the Chaldaic or ſquare Hebrew are derived the Syriac, and the ancient and modern Arabic. The Syriac is divided into the Eſtraugelo and Mendæan, and the modern Arabic has given riſe to the Perſian and Turkiſh. From the ancient Arabic are derived the Kufic or Oriental, the Mauritanic or Occidental; the African or Saracen, and the Mooriſh. The Ionic Greek gave riſe to the Arcadian, Latin, aneient Gauliſh, ancient Spaniſh, aneient Gothic, Coptic, Ethiopic, Ruſſian, Illynian or Sclavonic, Bulgarian and Arminian. From the Roman are derived the Lombardic, Viſigothic, Saxon, Gallican, Franco-Gallie or Merovingian, German, Caroline, Capetian, and modern Gothic.

The Etruſcan letters are Pelaſgic, and ſeveral of the Etruſcan inſcriptions are written in the Pelaſgic language. The Roman letters are Ionic. The Oſean language was a dialect of the Etruſcan; their characters are nearer the Ionic or Roman than the Etruſcan. There is alſo very little difference between the Pelaſgian, Etruſcan, and moſt ancient Greek letters, which are placed from right to left. The Arcadians were ancient Greeks, and uſed the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uneertain. The Etruſcan, Oſcan, and Samnite alphabets are derived from the Pelaſgic; they differ from each other more in name than in form; but a far greater number are derived from the Ionic Greek, namely, the Arcadian, the Latin or Roman, and the others already enumerated. The Runic is immediately derived from the Gothic. It is not eaſy to diſcover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not univerſally prevail even in Greece till ſeveral ages after it was found out. The Athenians did not comply with it till the year of Rome 350; nor was it practiſed by the Samnites even in the ſixth century of that city, or 230 years before Chriſt. The ancient Gauliſh letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inſcription of Gordian, meſſenger of the Gauls, who ſuffered martyrdom in the third century, with all his family. Theſe aneient Gauliſh characters were generally uſed by that people before the conqueſt of Gaul by Cæſar; but after that time the Roman letters were gradually introduced. The ancient Spaniards uſed letters nearly Greek before their intereourſe with the Romans. The aneient Gothic alphabet was very ſimilar to the Greek, and is attributed to Ulphilas, biſhop of the Goths, who lived in Meſia about 370 years after Chriſt. He tranſlated the Bible into the Gothic tongue. This circumſtance might have occaſioned the tradition of his having invented theſe letters; but it is probable that theſe characters were in uſe long before this time. The Runic alphabet is derived from the ancient Gothic. For ſpecimens of the ancient alphabets, ſee pl. 6.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuſcripts of Italy; the Viſigothic to thoſe of Spain; the Saxon to thoſe England; the Galliean and Franco-Gallic or Merovingian to the manuſcripts of France; the German to thoſe of that country; and the Caroline, Capetian, and modern Gothic, to all the countries of Europe who read Latin. The firſt ſix of theſe alphabets are before the age of Charlemagne, the laſt three poſterior to it. They are more diſtinguiſhed by their names than the forms of their characters; and the former indicate all of them to have been of Roman extraction. Each nation, in adopting the letters of the Romans, added thereto a taſte and manner peculiar to itſelf, which obviouſly diſtinguiſhed it from the writings of all other people; whence aroſe the differences between the writings of the Lombards, Spaniards, French, Saxons, Germans, and Goths, and all the ſtrange terms obſervable in the writings of the Francic Gauls or Merovingians; and thoſe of the Carlovingians, their ſucceſſors, may be traced from the ſame ſource. From theſe diſtinctions the name of *national writing* was derived.

The modern Gothic, which ſpread itſelf all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently uſed by the Goths. It is, however, the worſt and moſt barbarous way of writing, and originated among the ſchoolmen in the decline of the arts; being indeed nothing elſe than Latin writing degenerated. It began in the 12th century, and was in general uſe, eſpecially among monks and ſchoolmen, in all parts of Europe, till the reſtoration of arts in the 15th century, and continued longer in Germany and the northern nations. Our ſtatute books are ſtill printed in Gothic letters. The moſt barbarous writing of the ſeventh, eighth, and ninth centuries, was preferable to the modern Gothic. It is diverſified in ſuch a manner as can ſcarce admit of deſcription; and the abbre-

viations used by the writers were so numerous, that it became very difficult to read it; which was one of the great causes of the ignorance of those times. Along with this, however, the Lombardic, Gothic, Roman, Caroline, and Capetian modes of writing were occasionally used by individuals.

The idea that all the alphabets above mentioned are derived from the Roman, tends to prove the distinction of national writing, and is of great use in discovering the age of manuscripts: for though we may not be able exactly to determine the time when a manuscript was written, we may be able nearly to ascertain its age. For example, if a writing is Merovingian, it may be declared not to be posterior to the 9th, nor prior to the 5th century. If another be Lombardic, it may be affirmed to be posterior to the middle of the 6th, and prior to the 13th. Should it be Saxon, it cannot be of an earlier date than the 7th, nor later than about the middle of the 12th.

Having considered whence most of the alphabets now in use throughout the various nations of the world are derived, it remains to say something concerning them as the elements of words, or how far they are capable of expressing those sounds, which, by proper combination and arrangement, constitute articulate language. The number of simple sounds in any language cannot be very numerous; and it is plainly these simple sounds alone that we have occasion to represent by alphabetical characters. Hence the person who first invented letters must have been capable of analysing language in a manner which seems by no means easy to do, and concerning which even the learned among ourselves are not yet agreed. It is this difficulty which has produced the great diversity in the number of alphabetical characters used by different nations; and where we see a vast number of them used, we may account the writing not the better, but much the worse for it; and whoever the pretended inventor was, it is more reasonable to suppose that he disfigured an alphabet already invented, by unnecessary additions, than that he was the author of one himself.

By the learned author of Hermes we are taught that it is to about 20 plain elementary sounds we owe that variety of articulate voices which have been sufficient to explain the sentiments of such an innumerable multitude as all the past and present generations of men. Mr. Sheridan says, that the number of simple sounds in our tongue is 28; while Dr. Kenrick says, that we have only 11 distinct species of articulate sounds, which even by contraction, prolongation, and composition, are increased only to the number of 16; every syllable or articulate sound in our language being one of the number. Bishop Wilkins and Dr. William Holder speak of 33 distinct sounds.

After the decomposition of language into its elementary sounds, the next step towards the notation of it by alphabetical characters, would be the delineation of a separate mark or letter to represent each sound; which marks, though few in number, would admit of such a variety of arrangements and combinations, as might be capable of producing that infinity of articulate sounds which compose language. The ingenious Wachter endeavours to show, that ten characters are sufficient for this purpose; and if this is the case, then the most simple alphabet, which, according to his scheme, consisted only of 13 letters, must have been abundantly sufficient to answer all the purposes of mankind, and much of our twenty-four letter alphabet may appear superfluous. That able mathematician Tacquet has calculated the various combinations of the 24 letters, even without any repetition, to amount to no fewer than 620,448,401,733,239,439,360,000; while Clavius makes them only 5,852,616,738,497,664,000. Either of these numbers, however, is *infinite* to the human conceptions, and much more than sufficient to express all the sounds that ever were articulated by man. As there are more sounds in some languages than in others, it follows of course, that the number of elementary characters, or letters, must vary in the alphabets of different languages. The Hebrew, Samaritan, and Syriac alphabets have 22 letters; the Arabic 28; the Persian and Egyptian, or Coptic, 32; the present Russian 41; the Shanscrit, 50; while the Cashmirian and Malabaric are still more numerous. The following is the scheme of the English alphabet, as given by Mr. Sheridan in his Rhetorical Grammar.

The number of simple sounds in our tongue is 28.

9 *Vowels*, 3 a 1 a 2 a 3 e 2 o 3 o 1 e 1 i x u
hall hat hate beer note nooſe bet ſit but

w y
ſhort oo ſhort ee

19 *Conſonants*, { eb cd ef eg ek el em en ep er es et ev ez et ℏ eth eſh ezh ing.

2 *Superfluous*, *c*, which has the power of *ck* or *cſ*; *q*, that of *ck* before *u*.

2 *Compound*, *j*, which ſtands for *edzh*; *x*, for *ks*, or *gz*.

1 *No letter*, *h*, merely a mark of aſpiration.

Conſonants divided into Mutes and Semivowels.

6 *Mutes*, eb ed eg ek ep et.
3 *Pure Mutes*, ek ep et
3 *Impure*, eb ed eg.
13 *Semivowels, or liquids*, { ef el em en er eſs ev ez et ℏ eth eſh ezh ing.
9 *Vocal*, el em en er ev ez eth ezh ing.
4 *Aſpirated*, ef eſs et ℏ eſh.

Divided again into

4 *Labial*, eb ep ev ef.
8 *Dental*, cd et eth et ℏ ez eſs ezh eſh.
4 *Palatine*, eg ek el er.
3 *Naſal*, em en ing.

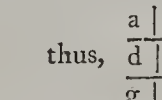
The ſame writer obſerves, that our alphabet is ill calculated for the notation of the Engliſh tongue, as there are many ſounds for which we have no letters or marks: and there ought to be nine more characters or letters to make a complete alphabet, in which every ſimple ſound ought to have a mark peculiar to itſelf. The reaſon of the deficiency is, that the Roman alphabet was formerly adopted for the notation of the Engliſh language, though by no means ſuited to the purpoſe.

Laſtly, we ſhall take ſome notice of the forms of the different letters; ſome knowledge of which is abſolutely neceſſary for aſcertaining the age and authenticity of inſcriptions, manuſcripts, charters, and ancient records. Many authors are of opinion, that letters derive their forms from the poſitions of the organs of ſpeech in their pronunciation. Van Helmont has taken great pains to prove, that the Chaldaic characters are the genuine alphabet of Nature; becauſe, according to him, no letter can be rightly ſounded without diſpoſing the organs of ſpeech into an uniform poſition with the figure of each letter; and in ſupport of this ſyſtem, he has anatomiſed the organs of articulation.

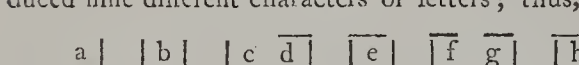
In the opinion of Mr. Nelme, all elementary characters or letters derive their forms from the line and the circle. His alphabet conſiſts of 13 radical letters, four diminiſhed, and four augmented.—The radicals are, L, O, S, A, B, C, D, N, U, I, E, M, R.—H, according to him, is derived from A: P from B; T from D; and F from U: theſe are called diminiſhed letters. The augmented ones are Z from S; G from C; W from U; and Y from I. He proves that his charac-

ters are very similar to those of the ancient Etruscans: but all characters are composed either of lines and circles of the former, and of parts of the latter.——Mr. Gebelin deduces them from hieroglyphic representations, and has given several delineations of human figures, trees, &c. in confirmation of his hypothesis.

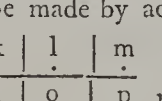
An alphabet of the most simple kind has been formed, by making two perpendicular and two horizontal lines:



thus, from which may be deduced nine different characters or letters; thus,



Nine more may be made by adding a point to each, and as



many more as may be sufficient for the notation of any language, by adding two or more points to each character. Though these square characters are not calculated for dispatch; yet they may be made as expeditiously, or more so, than the Tartar, the Bramin, the Cashmirian, or many others. Writing composed of these characters, is at first sight somewhat like the Hebrew. Mr. Dow, author of the history of Indostan, lately formed a new language and alphabet. This language, and the characters formed for its notation, were so easy, that a female of his acquaintance acquired the knowledge of them in three weeks, and constantly corresponded with him therein.

ALPHÆNIX, white barley sugar, which is made of common sugar, boiled to a proper consistence, and poured upon a marble slab greased with sallad oil; after which it is moulded into various figures with a brass crotchet.

ALPHEUS, or ALPHEIUS; a noted and large river of the Peloponnesus; which, rising in Arcadia, and running in a S. W. course, pours into the Sinus Chelonites, about ten miles to the south of Olympia.

ALPHONSIN, in surgery, an instrument invented by Alphonsus Ferrier, for extracting bullets out of gun-shot wounds.

ALPINI (Prospero), a famous physician and botanist, born in the Venetian territory, in 1553. The republic of Venice appointed him to fill the professorship of botany at Padua; which office he discharged with great reputation; but his health became very precarious, having been much injured by his travels into Egypt. According to the register of the university of Padua, he died the 5th of February 1617, in the 64th year of his age.

ALPINIA, in botany: A genus of the monogynia order, belonging to the monandria class of plants; and in the natural method ranking under the 8th order, *Scitamineæ*. The characters are: The *calyx*, a perianthium above, small, and trifid. The *corolla* is monopetalous, unequal, and as if doubled. The *stamina* consist of one filament, with linear antheræ joining to the margin. The *pistillum* has a roundish germen, beneath; the stylus simple, and the stigma obtusely trigonous. The *pericarpium* is a fleshy ovate trilocular capsule, with three valves. The *seeds* are ovate, and very numerous; the receptaculum, pulpy and very large. Of this genus there is but one species, which is a native of the West Indies, where it grows naturally in moist places.

ALPISTE, or ALPIA, a sort of seed used to feed birds with, especially when they are to be nourished for breeding. The alpiste seed is of an oval figure, of a pale yellow inclining to an isabel colour, bright and glossy.

ALPS, a range of high mountains, separating Italy from Gaul and Germany, in the form of a crescent. They take their rise from the Vada Sabatia, or Savona; and reach to the Sinus Flanaticus (now Golfo di Carnaro of the Adriatic), and the springs of the river Colapis (now the Kulpe); extending, according to Livy, 2000 stadia in length, or 250 miles; they are divided into several parts, and accordingly have different names. From Savona to the springs of the Varus, where the Alps lie against the sea of Genoa, they are called *Maritime*, now *le Montagne di Tenda*. These extend from south to north, between Gaul to the west, and Genoa to the east, beginning at Monaco on the Mediterranean; then running out through the east of the county of Nice, and between that and the marquisate of Saluzzo, terminate at length at mount Viso, between Dauphine and Piedmont.

The ALPS are the highest mountains in Europe; being, according to some geometricians, about two miles in perpendicular height. They begin at the Mediterranean: and stretching northward, separate Piedmont and Savoy from the adjacent countries; whence directing their course to the east, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic Sea, north-east of Venice. It was over the western part of those mountains, towards Piedmont, that Hannibal forced his passage into Italy.

The prospect from many parts of this enormous range of mountains is extremely romantic, especially towards the north-west. The glaciers of Savoy are also justly reckoned among the most stupendous works of nature. These are represented by travellers as immense masses of ice, lodged upon the gentler declivities amidst the Alps, and exhibiting representatious beyond conception fantastic and picturesque. The valley of Montanvert appears also to be peculiarly romantic.

ALPS, besides its proper signification, is frequently used as an appellative to denote any mountains of extraordinary height or extensive range. In this sense, Ausonius and others call the Pyrenean mountains, *Alps*; and Gellius the Spanish Alps, *Alpini Hispani*. Hence also we say the *British Alps*, the *Asiatic Alps*, the *Alps of America*, &c.

ALPUXARRAS, or ALPAXARES, mountains of Spain, in the province of Granada, on the coast of the Mediterranean sea; about 17 leagues in length, and 11 in breadth, reaching from the city of Velez to Almeria.

ALQUIER, a liquid measure, used in Portugal to measure oil, two of which make an almond. See ALMOND.

ALQUIFOU, or ARQUIFOU, is a sort of lead-ore, which, when broken, looks like antimony. It is used by the potters to give a green varnish to their works, and thence is called potter's ore. It is met with in Cornwall, &c. The potters mix a small portion of manganese with the alquifou, and then the varnish or glazing on their ware is of a blackish hue.

ALREDUS, ALURED or ALUREDUS, of Beverley, one of the most ancient and best English historians, who wrote in the reign of Henry I. though the circumstances of his life are not certainly known.

ALRESFORD, a town of Hampshire, on the road from London to Southampton, close by the river Itching.

ALSA, a river of Carniola, now the *Ausa*.

ALSACE, late a province of France, bounded on the east by the Rhine, on the south by Switzerland, on the west by Lorrain, and on the north by the palatinate of the Rhine. It was formerly a part of Germany, but was given to France by the treaty of Munster. Since the French revolution, it has been included in the departments of the Upper and Lower Rhine.

ALSEN, an iſland of Denmark in the Leſſer Belt, remarkable for producing large crops of aniſeed. E. long. 10. 12. N. lat. 55. 12.

ALSFIELD, a town of Germany, in the landgravate of Heſſe Caſſel. E. long. 9. 5. N. lat. 50. 40.

ALSHASH, a very beautiful city in Buckharia, ſuppoſed to be that which is now called *Taſhcant*.

ALSHEDA, a pariſh of Sweden in the province of Smaland, where a gold mine was diſcovered in 1738.

ALSINA, in botany, a ſynonime of the theligonum. See THELIGONUM.

ALSINASTRUM, in botany, the trivial name and alſo a ſynonime of the elatine. See ELATINE.

ALSINE, or CHICKWEED: A genus of the trigynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* quinquephyllous. The *corolla* conſiſts of five equal petals, longer than the calyx. The *ſtamina* conſiſt of five capillary filaments; the antheræ roundiſh. The *piſtillum* has an oval germen, three filiform ſtyli, and obtuſe ſtigmata. The *pericarpium* is an ovate unilocular capſule, with three valves; the *ſeeds* roundiſh and numerous. Of this genus a great number of ſpecies are enumerated by ſome botanical writers; but none of them poſſeſs any remarkable properties, except the media, or common chickweed. This ſpecies, however, affords a notable inſtance of what is called the *ſleep of plants*; for, every night, the leaves approach in pairs, ſo as to include within their upper ſurfaces the tender rudiments of the new ſhoots; and the uppermoſt pair but one at the end of the ſtalk are furniſhed with longer leaf-ſtalks than the others; ſo that they can cloſe upon the terminating pair, and protect the end of the branch.

ALSIRAT, in the Mahometan theology; a bridge laid over the middle of hell, finer than a hair, and ſharper than the edge of a ſword, over which people are to paſs, after their trial, on the day of judgement.

ALSIUM, a city of ancient Etruria, occupying (according to Cluverius) the ſpot on which *Pala* now ſtands.

ALSTON-MORE, a town in Cumberland, ſeated near the river Tyne. W. long. 2. 4. N. lat. 54. 45.

ALSTONIA, in botany; a genus of the monogynia order, belonging to the hexandria claſs of plants. The characters are: The *calyx*, a perianthium beneath, imbricated; the *corolla*, monopetalous, and ſhorter than the calyx; the border expanding, eight or ten parted, with alternate diviſions. The *ſtamina* conſiſt of numerous ſhort filaments, the exterior ones longer; the antheræ are orbicular and furrowed. The *piſtillum* has a ſmall ovate germen above; a ſimple ſtylus the length of the corolla, filiform and erect; the ſtigma inverſe egg-headed. There is but one ſpecies, the theaformis, a native of America.

ALSTROEMERIA, in botany: A genus of the monogynia order belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 11th order, *Sarmentaceæ*. The characters are: There is no *calyx*. The *corolla* is nearly bilabiated; and conſiſts of ſix petals, the two inferior tubular at the baſe. The *ſtamina* conſiſt of ſix ſubulated filaments, declining and unequal; the antheræ oblong. The *piſtillum* has an hexangular germen beneath; the ſtylus declining, filiform, the length of the ſtamina; and three oblong bifid ſtigmata. The *pericarpium* is a roundiſh hexangular capſule, with three cells and three valves: The *ſeeds* are globular and numerous. There are five ſpecies, natives of Italy and Peru.

ALT, in muſic, a term applied to the high notes in the ſcale.

ALTAIC CHAIN, a range of mountains which bounds Aſia on the ſouth.

ALTAMONT, a very handſome town of Italy, in the kingdom of Naples. E. long. 16. 22. N. lat. 39. 40.

ALTAMURA, a town of Naples, in the territory of Bari. E. long. 16. 54. N. lat. 41. 0.

ALTAR, a place upon which ſacrifices were anciently offered to ſome deity. The heathens at firſt made their altars only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as was that of Apollo in Delos. Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſenting either the gods to whom they were erected or their ſymbols.

According to Servius, thoſe altars ſet apart for the honour of the celeſtial gods, and gods of the higher claſs, were placed on ſome pretty tall pile of building; and for that reaſon were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Thoſe appointed for the terreſtrial gods were laid on the ſurface of the earth, and called *aræ*. And, on the contrary, they dug into the earth and opened a pit for thoſe of the infernal gods, which they called βοθροι λακκοι, "ſcrobiculi." But this diſtinction is not every where obſerved: the beſt authors frequently uſe *ara* as a general word, under which are included the altars of the celeſtial and infernal, as well as thoſe of the terreſtrial gods. Witneſs Virgil, Ecl. 5. "——*En quatuor aras!*" where *aræ* plainly includes *altaria*: for whatever we make of Daphnis, Phœbus was certainly a celeſtial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus*. The Greeks alſo diſtinguiſhed two ſorts of altars; that whereon they ſacrificed to the gods was called βωμος, and was a real altar, different from the other whereon they ſacrificed to the heroes, which was ſmaller, and called εσχαρα. Pollux makes this diſtinction of altars in his Onomaſticon; he adds, however, that ſome poets uſed the word εσχαρα for the altar whereon ſacrifice was offered to the gods. The Septuagint verſion does ſometimes alſo uſe the word εσχαρα for a ſort of little low altar, which may be expreſſed in Latin by *craticula*; being a hearth rather than an altar.

Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world; Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whoſe altar is much ſpoken of by Jewiſh, and even Chriſtian writers. Others are contented to make the patriarch Enoch the firſt who conſecrated a public altar. Be this as it will, the earlieſt altars we find any expreſs teſtimony of are thoſe erected by Abraham. The principal altars of the Jews were, The altar of *incenſe*; that of *burnt-offering*; and the *altar*, or *table, for the ſhew-bread*.

ALTAR, is alſo uſed among Chriſtians for the communion-table. In catholic countries, the altar is ſometimes ſuſtained on a ſingle column, as in the ſubterraneous chapels of St. Cecilia, at Rome, &c. and ſometimes by four columns, as the altar of St. Sebaſtian of Crypta Arenaria; but the cuſtomary form is, a maſſive of ſtone-work, ſuſtaining the altar-table. Theſe altars bear a reſemblance to tombs: to this purpoſe, we read in church-hiſtory, that the primitive Chriſtians chiefly held their meeting at the tombs of the martyrs, and celebrated the myſteries of religion upon them; for which reaſon, it is a ſtanding rule to this day in the church of Rome, never to build an altar, without incloſing the relics of ſome ſaint in it.

ALTAR-THANE, or ALTARIST, in old law-books, an appellation given to the prieſt or parſon of a pariſh, to whom the altarage belonged.

ALTARAGE, in law, altars erected in virtue of dona-

tions, before the Reformation, within a parochial church, for the purpose of singing mass for deceased friends.—ALTARAGE likewise signifies the profits arising to the priest on account of the altar.

AL-TAYEFF, a town of Hejaz, a district of Arabia Felix; situated about 60 miles east of Mecca.

ALTDORF, a large handsome town in Switzerland, and the chief of the canton of Uri. E. long. 8. 30. N. lat. 46. 50.

ALTEA, a sea-port town of Valencia, in Spain. W. long. 0. 15. N. lat. 46. 34.

ALTEMBURG, a town of Transylvania, 17 miles S. W. of Wisemburg. E. long. 23. 5. N. lat. 46. 25.

ALTENA, a sea-port town of Germany, in the duchy of Holstein, in Lower Saxony. E. long. 10. 0. N. lat. 53. 51.

ALTENBERG, an ancient town of Germany, situated on the river Pleiss. E. long. 15 8. N. lat. 50. 59.

ALTENBURG, a small fortified town of Hungary, 55 miles from Vienna. E. long. 35. 30. N. lat. 48. 15.

ALTENBURG, or OWAR, a small but strong town of Hungary, 40 miles S. E. of Vienna. E. long. 17. 56. N. lat. 44. 0.

ALTERANTS, or ALTERATIVE *Medicines*, such as are supposed to correct the habit of body, without occasioning any sensible evacuation.

ALTERATION, in physics, the act of changing the circumstances and manner of a thing; its general nature and appearance remaining the same. Or, it is an accidental and partial change in a body; without proceeding so far as to make the subject quite unknown, or to take a new denomination thereupon.—Or, it may be defined, the acquisition or loss of such qualities as are not essential to the form of the body. Thus, a piece of iron, which before was cold, is said to be *altered*, when it is made hot; since it may still be perceived to be iron, is called by that name, and has all the properties thereof. By this, *alteration* is distinguished from *generation* and *corruption*; those terms expressing an acquisition or loss of the essential qualities of a thing.

ALTERN-BASE, in trigonometry, a term used in contradistinction to the true base. Thus in oblique triangles, the true base is either the sum of the sides, and then the *difference* of the sides is called the *altern-base*; or the true base is the difference of the sides, and then the *sum* of the sides is called the *altern-base*.

ALTERNATE, in heraldry, is said in respect of the situation of the quarters. Thus the first and fourth quarters, and the second and third are usually of the same nature, and are called *alternate quarters*.

ALTERNATE, in botany, when the leaves or branches of plants arise higher on opposite sides alternately.

ALTERNATION, in its primary sense, denotes a succession by turns, but is sometimes used to express the different changes or alterations of orders in any number of things proposed. This is also called *permutation*, &c. and is easily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alternations can be rung on 6 bells, multiply the numbers 1, 2, 3, 4, 5, 6, continually into one another; and the last product gives the number of changes.

ALTERNATIVE, is particularly used for the choice of two things proposed. In this sense we say, to take the *alternative* of two propositions.

ALTHÆA, MARSHMALLOW; a genus of the polyandria order, belonging to the monadelphia class of plants; and, in the natural method, ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* a double perianthium, the exterior one nine-cleft. The *corolla* consists of 5 petals, coalesced at the base; the *stamina* of numerous filaments inserted into the corolla. The antheræ are kidney-shaped. The *pistillum* has an orbicular germen, a short cylindrical stylus, and numerous bristly stigmata, the length of the stylus. The *pericarpium* consists of numerous arillæ. The *seeds* are solitary, and kidney-shaped. There are three species. 1. The vulgaris, or common marshmallow, a native of Britain, with a perennial root, an annual stalk, and which perishes every autumn. 2. The hirsuta, or hairy marshmallow, a native of Spain and Portugal. 3. The cannabina, or shrubby marshmallow, a native of Hungary and Istria. The first sort, which has been employed externally in fomentations, and its root internally as yielding a beneficial mucilage in coughs, colds, &c. grows wild in almost every part of England.

ALTHÆA *Frutex*. See HIBISCUS.

ALTIMETRY, the art of measuring altitudes or heights, whether accessible or not. See GEOMETRY.

ALTIN, a money of account in Muscovy, worth three *copecs*; one hundred of which make a ruble, worth about 4s. 6d. sterling.

ALTIN, a lake in Siberia, from whence issues the river Ob, or Oby, in N. lat. 52. 0. E. long. 85. 55.

ALTINCAR, among mineralists, a species of factitious salt used in the fusion and purification of metals. Divers ways of preparing it are given by Libavius.

ALTITUDE, accessible, and inaccessible. See GEOMETRY. The method of taking considerable terrestrial altitudes, of which those of mountains are the greatest, by means of the barometer, is very easy and expeditious. It is done by observing, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain.

ALTITUDE *of the Eye*, in perspective, is a right line let fall from the eye, perpendicular to the geometrical plane.

ALTITUDE, in astronomy, is the distance of a star, or other point from the horizon. This altitude may be either *true* or *apparent*.—If it be taken from the rational or real horizon, the altitude is said to be true or real; if from the apparent or sensible horizon, the altitude is apparent.—Or rather, the apparent altitude is such as it appears to our observation; and the *true* is that from which the refraction has been subtracted.—The true altitudes of the sun, fixed stars, and planets, differ but very little from their apparent altitudes; because of their great distance from the centre of the earth, and the smallness of the earth's semidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52′.

ALTITUDE *Instrument*, or *Equal Altitude Instrument*, is that used to observe a celestial object when it has the same altitude on the east and west sides of the meridian. See ASTRONOMY.

ALTKIRK, a town of Alsace in Germany, situated on the river Ill, in N. lat. 47. 40. and E. long. 7. 15.

ALTMORE, a town of Ireland, in the county of Tyrone; situated in N. lat. 54. 34. W. long. 7. 2.

ALTON, a town in Hampshire, seated on the river Wey. W. long. 0. 46. N. lat. 51. 5.

ALTON, or AVELTON, a village in Staffordshire, 5 miles north of Utoxeter.

ALTO *et* BASSO, or *in* ALTO *&* *in* BASSO, in law, signifies the absolute reference of all differences, small and great, high and low, to some arbitrator or indifferent person.—*Pateat universis per præsentes, quod Willielmus Tylar de Yetton, & Thomas Gower de Almestre, posuerunt se in* Alto *&* *in* Basso, *in arbitrio quatuor hominum*; viz. *de quadam querela pendente inter eos in curia.—Nos et terram nostram* alte *&* basse *ipsius domini Regis supposuimus voluntati.*

ALTO-*Relievo*. See RELIEVO.

ALTO-*Repieno*, in music, the tenor of the great chorus, which sings only now and then in particular places.

ALTORF, a town of the circle of Franconia, in Germany; ſeated on the confines of Bavaria, 15 miles from Nuremberg. E. long. 9. 35. N. lat. 47. 46.

ALT-RANSTADT, a town in Saxony, famous for the treaty between Charles XII. king of Sweden and Auguſtus elector of Saxony, in 1706, wherein the latter reſigned the kingdom of Poland.

ALTRINGHAM, a town of Cheſhire, 7 miles from Manchester. W. long. 1. 30. N. lat. 53. 25.

ALTZEG, a town of Germany in the Lower Palatinate, the capital of a territory of the ſame name, with an old caſtle. W. long. 7. 25. N. lat. 49. 44.

ALVA DE TORMES, a conſiderable town in Spain, in the kingdom of Leon; W. long. 6. 1. N. lat. 41. 0.

ALVAH, the wood wherewith Moſes ſweetened the waters of Marah, Exod. ch. xv. ver. 25.—The name of this wood is not found in ſcripture; but the Mahometans give it that of *alvah*.

ALUDELS, in chemiſtry, are earthen pots without bottoms, inſerted into each other, and uſed in ſublimations.

ALVEARIUM, in anatomy, the bottom of the *concha*, or hollow of the outer ear.

ALVEARIUM alſo ſignifies a bee-hive. The word is formed of *alveus*, a "channel or cavity; in alluſion to the *alveoli*, or cells in bee-hives. Some of the ancients uſe alſo the word *alvearium* for a bee-houſe, more uſually called among us *apiary*.

ALVEARIUM is ſometimes alſo uſed figuratively, to denote a collection; in which ſenſe, *alvearium* amounts to much the ſame with what we otherwiſe call *theſaurus*, *cornucopiæ*, or the like. Vinc. Boreus has publiſhed an Alvearium of Law.

ALVEOLUS, in natural hiſtory, the name of the waxen cells in bee-hives. Alſo the name of a ſea foſſil of a conic figure, compoſed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

ALVEOLUS, in anatomy, is the ſocket wherein a tooth is fixed.—Some writers ſpeak of teeth growing without alveoli. Haller gives an inſtance of a perſon whoſe teeth were of a piece with his jaws, without any inſertion into alveoli.

ALUM, in chemiſtry, a clear and tranſparent ſaline matter, uſually ſold in large maſſes, of a very auſtere and aſtringent taſte, uſeful in medicine, and ſtill more ſo in the arts.—Alum is in general artificially prepared by the methods related under the article CHEMISTRY; though ſometimes it is produced naturally. Native alum is mixed with heterogeneous matters, or efflorefces in various forms upon the ores during calcination. It rarely occurs in a chryſtallized ſtate, though thus it is ſaid to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in the waters, impregnated with fixed air, but very ſeldom in fountains or hot medicated waters.

There are ſeveral kinds of alum to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kind. That called the Roman alum has been conſidered as preferable to any other. This is uſually met with in ſmall cryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation. Mr. Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic ſal ammoniac, renders it unfit for ſome purpoſes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he conſiders as equal, if not ſuperior, to Roman alum. He informs us alſo, that a kind of alum ſome time ago began to be manufactured at Brunſwick, which was equal in quality to the Roman alum. On a chemical analyſis of this alum he found it mixed with cobalt.

This ſalt is extremely uſeful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation of Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not ſaturated by the colouring matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum likewiſe, according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in the making of candles; for being mixed with the tallow, it gives it an hardneſs and conſiſtence which it has not naturally. Wood ſufficiently ſoaked in a ſolution of alum does not eaſily take fire; and the ſame is true of paper impregnated with it; which for that reaſon is very properly employed in preſerving gun-powder, as it alſo excludes the moiſture of the air. Paper impregnated with alum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſion of the ſkins almoſt entirely deſtroyed by the lime. Vintners fine down their wines, &c. with alum; fiſhers uſe it to dry cod-fiſh with; and bakers have mixed it with the flour to make their bread compact and white: to this laſt uſe of it, great objections have been made; but ſome ſay unjuſtly.

In medicine and ſurgery, it is found very uſeful. Phyſicians employ it internally as an aſtringent and tonic, and ſurgeons as a ſtyptic and eſcarotic. Sometimes they alſo prepare lotions with it for the removal of external inflammations. For theſe preparations ſee PHARMACY.

ALUM *mines* are ſaid to have been firſt found in Italy in the year 1460; and in 1506 king Henry VII. made a monopoliſing grant of this commodity to Auguſtine Chigi, a merchant of Sienna. In the year 1608, the manufacture of alum was firſt undertaken in England, and met with great encouragement. King James I. by advice of his miniſtry, aſſumed the monopoly of it, and prohibited the importation of foreign alum; and in 1625 the importation of it was further prohibited by a proclamation of Charles I.

ALUM *works*, places where alum is prepared and manufactured in quantities for ſale. They differ from alum-mines, as in the former an artificial alum, and in the latter natural alum is produced.

ALVUS, in anatomy, a term uſed for the belly in general, but more frequently applied to the bowels.

ALWADII, a ſect of Mahometans who believe all great crimes to be unpardonable.—The Alwadii ſtand in oppoſition to the Morgii. They attribute leſs efficacy to the true belief in the ſalvation of men than the reſt of the Muſſulmans.

ALYSSUM, ALLYSON, or ALLYSOIDES, Madwort; (from *αλυσσω*, *to be mad*; becauſe it was believed to have the property of curing madneſs); a genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, *Siliquoſa*. The characters are; the *calyx* an oblong 4-leaved perianthium. The *corolla* conſiſts of 4 cruciform petals; with claws the length of the calyx, the petals ſhorter. The *ſtamina* conſiſt of 6 filaments, the length of the calyx, two of them rather ſhorter and denticulated; the antheræ erect and expanding. The *piſtillum* has an ovate germen; the ſtylus is ſimple, and the length of the ſtamina; the ſtigma is obtuſe. The *pericarpium* is a ſub-globular emarginated ſilicle, furniſhed with a bilocular ſtylus, having an elliptic partition. The *ſeeds* are few, orbicular, and affixed to ſiliform receptacles.—Of this genus,

Linnæus enumerates 19 ſpecies; but none of them are remarkable, either for beauty, or any other property, except the halimifolium, or madwort with whole ſpear-ſhaped leaves, which ſpreads itſelf upon the ground, and produces, at the extremity of its branches, very pretty tufts of ſmall white flowers; of which it is ſeldom deſtitute for ſix or ſeven months ſucceſſively. Though theſe plants are natives of the ſouthern parts of Europe; yet, if planted on a dry, lean, or rubbiſhy ſoil, they will endure our ſevereſt winters in the open air.

ALYTARCHA, a prieſt of Antioch in Syria, who, in the games inſtituted in honour of the gods, preſided over the officers who carried rods to clear away the crowd and keep order. In the Olympic games, the alytarches had the ſame command, and obliged every perſon to preſerve order.

ALZIRA, a town of Spain in the kingdom of Valencia; E. long. 0. 20. N. lat. 39. 10.

AMA, in eccleſiaſtical writers, a veſſel wherein wine, water, or the like, were held, for the ſervice of the euchariſt. In this ſenſe the word is alſo written amula; ſometimes alſo hama, and hamula.

Ama is ſometimes alſo uſed for a wine-meaſure, as a caſk, pipe, or the like.

AMABYR, a barbarous cuſtom which formerly prevailed in ſeveral parts of England and Wales, being a ſum of money paid to the lord when a maid was married within his lordſhip. The word is ancient Britiſh, and ſignifies "the price of virginity."

AMADABAT, a corruption from Ahmed abad, or *Ahmed's city*, (ſo called from a king of that name); a large and populous city of Indoſtan, and the capital of the province of Guzerat. E. long. 72. 12. N. lat. 23. 0.

AMADAN, or Hamadan, a town of Perſia, between Taurus and Iſpahan; E. long. 47. 4. N. lat. 35. 15.

AMADANAGER, a town in the hither peninſula of India, in the province of Decan; E. long. 74. 15. N. lat. 18. 10.

AMADIA, a trading town of Aſia, in Curdiſtan, belonging to the Turks; E. long. 43. 1. N. lat. 36. 25.

AMADOW, a kind of blackmatch, tinder, or touchwood, which comes from Germany. It is made of a ſort of large muſhrooms, or ſpungy excreſcences, which commonly grow on old trees, eſpecially oaks, aſh, and firs. This ſubſtance being boiled in common water, and afterwards dried and well beaten, is then put into a ſtrong ley prepared with ſaltpetre, after which it is again put to dry in an oven.

AMADOWRY, a kind of cotton which comes from Alexandria, by the way of Marſeilles.

AMAIN, in the ſea-language, a term importing to lower ſomething at once. Thus, to *ſtrike amain*, is to lower, or let fall, the top-ſails; to *wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their top-ſails.

AMAK, a ſmall iſland in the Baltic ſea, near Copenhagen; E. long. 12. 10. N. lat. 55. 20.

AMAL, a town of Sweden, in the province of Daland; E. long. 12. 40. N. lat. 58. 50.

AMALFI, an ancient city of Italy, ſituated in E. long. 15. 20. N. lat. 40. 35.—The merchants of this town formerly engroſſed the trade of the Levant, and tranſacted the commercial buſineſs of the world in a lucrative and excluſive manner. The Piſans, Venetians, and Genoeſe, roſe upon their ruin; and, after monopolizing the emoluments of trade for ſome ages, made way for the more comprehenſive and daring ſpirit of the preſent maritime powers. At preſent Amalfi is ſubject to Naples, and is the ſee of an archbiſhop.

AMALGAM, mercury united with ſome metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal. For the combination of one metal with another, it is generally ſufficient that one of them be in a ſtate of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; nevertheleſs, heat conſiderably facilitates the operation. To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metal to be united with the mercury ſhould be previouſly divided into very thin plates or grains. When heat is uſed, which is with ſome metals indiſpenſably neceſſary, the mercury ſhould be heated till it begins to ſmoke, and the grains of metal made red-hot before they are thrown into it. If it be gold or ſilver, it is ſufficient to ſtir the fluid with an iron rod for a little while, and then throw it into a veſſel filled with water. This amalgam is uſed for gilding or ſilvering on copper, which is afterwards expoſed to a degree of heat ſufficient to evaporate the mercury. Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of theſe metals in a ſtate of fuſion, and ſtirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMANCE, a town in the duchy of Lorrain, upon a rivulet of the ſame name. E long. 6. 10. N. Lat. 48. 45.

AMAND (St.), a town of France in the department of Cher, and late territory of Bourbonois; E. long. 3. 30. N. lat. 46. 32.

Amand (St.), a town of France in the department of the North, and in the late French Flanders; E. long. 2. 35. N. lat. 50. 27.

AMANTEA, a Neapolitan ſea-port town, in the province of Calabria; E. long. 16. 20. N. lat. 39 15.

AMANUS, a mountain of Syria, ſeparating it from Cilicia; now called *Monte Negro*, or rather *Montagna Neres*.

AMAPALLA, a city and port-town of North America, in the province of Guatimala; W. long. 63. 20. N. lat. 12. 30.

AMARANTE, an order of knighthood, inſtituted in Sweden by queen Chriſtina, in 1653, at an annual feaſt, at the cloſe of which ſhe threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the maſques. In memory of this ridiculous ſcramble ſhe founded a military order, called in Swediſh *Ceſchilſchaff*, into which all preſent at the feaſt were admitted, including 16 lords and as many ladies, beſides the queen. Their device was the cypher of *Amarante*, compoſed of two A's, the one erect, the other inverted, and interwoven together; the whole incloſed by a laurel crown, with this motto, *Dolce ne'la memoria*.

AMARANTHOIDES, in botany, the trivial name of a ſpecies of illecebrum. See Illecebrum.

AMARANTHUS, (of α privative, and μαραινω, *to wither*, becauſe the flower of this plant, when cropped, does not ſoon wither), Amaranth, or flower-gentle: A genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 54th order, *Miſcellaneæ*. The characters are; the *male calyx*, a five or three leaved perianthium, erect, coloured, and perſiſtent; no *corolla*; the *ſtamina* five or three erect capillary filaments, the length of the calyx; the antheræ oblong and verſatile; the *female calyx* the ſame as the male and no corolla. The *piſtillum* has an ovate germen. The ſtyli are three, ſhort, and ſubulated; the ſtigmata ſimple and perſiſtent. The *pericarpium* is an ovate capſule, three-beaked, unilocular, and cut round. The *ſeed* is one, globular, compreſſed, and large.

Of this genus Linnæus enumerates 19 ſpecies; the moſt remarkable of which are the following. 1. The tricolor, or three-coloured amaranthus, which has been long cultivated in gardens, on account of its beauty. 2. The melancholicus bicolor, or two-coloured amaranthus. 3. The caudata, with

very long hanging cylindrical ſpikes, a native of America. 4. The maximus, or tree-like amaranthus, which grows with a ſtrong ſtem, to the height of ſeven or eight feet. 5. The ſanguineus, with compound ſpikes, and oblong oval leaves, a native of the Bahama iſlands, and an eſculent plant. 6. The oleraceus, with obtuſe indented leaves. This has no beauty; but it is uſed by the Indians as a ſubſtitute for cabbage.—The two firſt of theſe ſpecies being tender, require ſome art and care to bring them to perfection in Britain, by a ſucceſſion of hot-bed, with proper waterings, airings, and ſhadings.

AMARYLLIS, LILY-ASPHODEL; a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 9th order, *Spathaceæ*. The characters are; the *calyx* an oblong obtuſe ſpatha, emarginated, and withering. The *corolla* conſiſts of ſix petals, lanced; the *ſtamina* of ſix ſubulated filaments; the antheræ oblong, incumbent, and aſcending. The *piſtillum* has a roundiſh ſulcated germen beneath; a ſiliform ſtylus, nearly the length of the ſtamina; the ſtigma triſid and ſlender. The *pericarpium* is an ovate trilocular capſule, with three valves. The *ſeeds* are many. The following are the *principal ſpecies*. 1. The lutea, or autumnal narciſſus, which is uſually ſold by gardeners, along with colchicums, for autumnal ornaments to gardens. 2. The formoſiſſima, or jacobæa lily, which produces flowers of a deep red two or three times in a year, without being regular to any ſeaſon. 3. The farnienſis, or Guernſey lily, ſuppoſed to have come originally from Japan. 4. The regina, or belladonna lily; a native of Portugal, where it was formerly cultivated in great plenty. 5. The zeylanica, or Ceylon lily, which is a native of the Weſt Indies, and uſually flowers in June. 6. The orientalis, or lily daffodil, with leaves ſhaped like a tongue; a native of the Cape of Good Hope. The bulbs of the root of this ſpecies are large and almoſt round; the leaves long, broad, and rounded at their extremities. The firſt ſort is very hardy, and will thrive in almoſt any ſoil or ſituation; but will ſucceed beſt in a freſh light dry ſoil. The jacobæa ought to be kept in a moderate ſtove all winter; in which caſe it will ſend forth plenty of offſets, that will produce vigorous plants. The roots of the Guernſey lily are generally brought over in June and July; but the ſooner they are taken out of the ground after the leaves decay, the better: for although the roots which are taken up when their flower-ſtems begin to appear, will flower; yet their flowers will not be ſo large, nor will their roots be near ſo good after, as thoſe which were removed before they ſent forth freſh fibres.

AMASIA, an ancient town of Turkey, in Natolia, remarkable for the birth of Strabo the geographer. It is ſeated near the river Iris or Caſalmack; and was anciently the reſidence of the kings of Cappadocia. E. long. 36. 10. N. lat. 39. 33.

AMASIA, the name of the northern diviſion of Leſſer Aſia, lying on the ſouth ſhore of the Euxine ſea in Natolia.

AMASONIA, in botany; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; the characters of which are: The *calyx* a tripartite monophyllous perianthium, bell-ſhaped and perſiſtent; the *corolla* monopetalous and tubular; the border quinquefid, expanding, and ſmall. The *ſtamina* conſiſt of four filaments longer than the corolla; the antheræ oval and incumbent. The *piſtillum* has an ovate germen; the ſtylus the length of the ſtamina; the ſtigmata two, acute. There is no *pericarpium*. The *ſeed* is an ovate unilocular nut, the length of the calyx.

AMATHUS, a very ancient town of the ſouth of Cyprus, now called *Limiſſo*.

AMATORII MUSCULI, in anatomy, a term ſometimes uſed for the obliquus ſuperior and obliquus inferior muſcles of the eye, as theſe muſcles aſſiſt in ogling or drawing the eye ſideways.

AMATRICE, a city of the kingdom of Naples, in the Farther Abruzzo, upon the confines of the Pope's territories, and the marquiſate of Ancona.

AMAUROSIS, in ſurgery, a deprivation of ſight, the eye remaining fair and ſeemingly unaffected. A perfect amauroſis is when the blindneſs is total; when there is ſtill a power of diſtinguiſhing light from darkneſs, the diſeaſe is called by M. de St. Ives an *imperfect amauroſis*.

AMAZONIA, or the country of the American AMAZONS; ſituated between 50 and 70 degrees of weſt longitude; and between the equator and 15 degrees of ſouth latitude; being bounded on the ſouth by La Plata, on the weſt by Peru, on the north by the province of Terra Firma, and on the eaſt by Brazil.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Aſia Minor, upon the river Thermodoon, along the coaſts of the Black Sea. They are ſaid to have formed a ſtate out of which men were excluded. What commerce they had with that ſex, was only with ſtrangers; they killed all their male children; and they cut off the right breaſts of their females, to make them more fit for the combat. From which laſt circumſtance it is, that they are ſuppoſed to take their name, viz. from the privative α, and μαζος, *mamma*, "breaſt." But Dr. Bryant, in his analyſis of Ancient Mythology, explodes this account as fabulous; and obſerves, that they were in general Cuthite colonies from Egypt and Syria, who formed ſettlements in different countries, and that they derived their name from *zon*, the "ſun," which was the national object of worſhip. Vol. iii. p. 463.—It has indeed been controverted even among ancient writers, whether ever there really were ſuch a nation as that of the Amazons. Strabo, Palephatus, and others, deny it. On the contrary, Herodotus, Pauſanias, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

M. Petit, a French phyſician, publiſhed a Latin diſſertation in 1685, to prove that there was really a nation of Amazons; it contains abundance of curious inquiries, relating to their habit, their arms, the cities built by them, &c. Others of the moderns alſo maintain, that their exiſtence is ſufficiently proved by the teſtimony of ſuch of the hiſtorians of antiquity as are moſt worthy of credit; by the monuments which many of them have mentioned; and by medals, ſome of which are ſtill remaining; and that there is not the leaſt room to believe that what is ſaid of them is fabulous. The Amazons are mentioned by the moſt ancient of the Greek writers. In the third book of the Iliad, Homer repreſents Priam ſpeaking of himſelf as having been preſent, in the earlier part of his life, in a battle with the Amazons: and ſome of them afterwards came to the aſſiſtance of that prince during the ſiege of Troy.

AMAZONS (the river of), in America. See AMAZONIA.

AMAZONIAN *Habit*, in antiquity, denotes a dreſs formed in imitation of the Amazons. Marcia, the famous concubine of the emperor Commodus, had the appellation of *Amazonian*, becauſe ſhe charmed him moſt in a habit of this kind. Some alſo apply the term *Amazonian* to the hunting-dreſs worn by many ladies among us.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a *rock*. The Abyſſinians gave names to each of their rocks, as *Amba-Dorho*, the rock of a hen, &c. Some of theſe rocks are ſaid to have the name of *Aorni*; and are of ſuch a ſtupendous height, that the Alps and Pyrenées are but low hills in

compariſon of them. The moſt remarkable of theſe rocks is called *Amba-Geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of free ſtone, and almoſt impregnable.

AMBACHT, in topography, denotes a kind of juriſdiction or territory, the poſſeſſor whereof has the adminiſtration of juſtice, both in *alto* and *baſſo*. In ſome ancient writers, ambacht is particularly uſed for the juriſdiction, government, or chief magiſtracy of a city.

AMBAGES. See CIRCUMLOCUTION.

AMBARVALIA, in antiquity, a ceremony among the Romans, when, in order to procure from the gods an happy harveſt, they conducted the victims thrice round the cornfields in proceſſion, before ſacrificing them.—*Ambarvalia* were either of a private or public nature: the private were performed by the maſter of a family, and the public by the prieſts who officiated at the ſolemnity, called *fratres ovales*.

AMBASSADOR, or EMBASSADOR, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon, to another.—Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary*, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Ambaſſadors *extraordinary*, are ſuch as are ſent on ſome particular occaſion only, and who retire as ſoon as that is accompliſhed.—By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to the fathers.—Ambaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, &c. unleſs their maſters have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſon of their prince. By the civil law, the moveable goods of an ambaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgment, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if, therefore, he hath contracted any debt, he is to be called upon kindly; and if he refuſes, then letters of requeſt are to go to his maſter. Nor can any of the ambaſſador's domeſtic ſervants that are regiſtered in the ſecretaries of ſtate's office be arreſted in perſon or goods; if they are, the proceſs ſhall be void, and the parties ſuing out and executing it ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor or either of the chief juſtices ſhall think fit to inflict. Yet ambaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBE, in *ſurgery*, the name of an old inſtrument for reducing diſlocated bones, but chiefly that of the ſhoulder. In *anatomy*, a term once in uſe for the ſuperficial jutting out of a bone.

AMBER, (*Succinum*), in natural hiſtory, a ſolid, hard, ſemipellucid, bituminous ſubſtance of a particular nature, of uſe in medicine and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. Among the Romans, it was eſteemed alſo as a gem; and in the luxurious reign of Nero, immenſe quantities were brought to Rome, and uſed for ornamenting works of various kinds.

The moſt remarkable property of amber is that of attracting light bodies. This was very anciently obſerved, and Thales of Miletus, 600 years before Chriſt, concluded from thence, that it was animated. The attractive property of amber is likewiſe occaſionally taken notice of by Pliny, and other later naturaliſts. From ηλεκτρον, the Greek name for amber, is derived the term *Electricity*, a ſcience which furniſhes the true explanation for the attractive properties of amber, and the like properties in ſealing wax and various other ſubſtances.

Amber aſſumes all figures; that of a pear, an almond, a pea, &c. In amber there have been ſaid to be letters found very well formed; and even Hebrew and Arabic characters. —Within ſome pieces, leaves, inſects, &c. have likewiſe been found included; which ſeems to indicate, either that the amber was originally in a fluid ſtate, or that having been expoſed to the ſun, it was once ſoftened, and rendered ſuſceptible of the leaves, inſects, &c. which came in its way. The latter of theſe ſuppoſitions ſeems the more agreeable to the phenomenon; becauſe thoſe inſects, &c. are never found in the centre of the pieces of amber, but always near the ſurface. It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, aerial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, are viewed with admiration by all the world; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit, the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners into ſeemingly whole pieces of amber, that it is not eaſy to detect the fraud. Drops of clear water are ſometimes alſo preſerved in amber. Theſe have doubtleſs been received into it while ſoft, and preſerved by its hardening round them. Beautiful leaves of a pinnated ſtructure, reſembling ſome of the ferns, or maidenhairs, have been found in ſome pieces; but theſe are rare, and the ſpecimens of great value. Metals and mineral ſubſtances are alſo ſaid to have been found at times lodged in maſſes of amber.

Naturaliſts have been greatly divided as to the origin of this ſubſtance, and what claſs of bodies it belongs to; ſome however ſuppoſe amber a compound ſubſtance. Mr. Brydone, in his tour to Sicily and Malta, ſays, that the river Gearetta throws up near its mouth great quantities of amber. He mentions alſo a kind of artificial amber, made there, as he was told, from copal, but very different from the natural. In the *Journal de Phyſique*, Dr. Girtanner deſcribes amber as an animal product, a ſort of honey or wax formed by a ſpecies of large ant called by Linnæus *formica rufa*. Theſe ants, he informs us, inhabit the old pine foreſts, where they ſometimes form hills about ſix feet in diameter; and it is generally in theſe ancient foreſts, or in places where they have been, that foſſile amber is found. This ſubſtance is not hard like that which is taken up in the ſea at Pruſſia, and which is well known to naturaliſts. It has the conſiſtence of honey or of half melted wax, but it is of a yellow colour like common amber; it gives the ſame product by chemical analyſis, and it hardens like the other when it is ſuffered to remain ſome time in a ſolution of common ſalt. This accounts for the inſects that are ſo often found incloſed in it. Among theſe inſects ants are always the moſt prevailing; which tends farther, Mr. Girtanner thinks, to the confirmation of this hypotheſis. Amber then, in his opinion, is nothing but a vegetable oil rendered concrete by the acid of ants, juſt as wax is nothing but an oil

hardened by the acid of bees; a fact incontestably proved, we are told, since Mr. Metherie has been able to make artificial wax by mixing oil of olives with the nitrous acid, and which wax is not to be distinguished from the natural.

Amber of the finest kind has been found in England. It is frequently thrown on the shores of Yorkshire, and many other places, and is found even in our clay-pits; the pits dug for tile-clay, between Tyburn and Kensington gravel-pits, and that behind St. George's Hospital at Hyde-park corner, having afforded fine specimens. Poland, Silesia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of it, as well dug up from the bowels of the earth, as tossed about on the shores of the sea and rivers there. Saxony, Misnia, and Sweden, and many other places in this tract of Europe, abound with it. Denmark has afforded, at different times, several quantities of fossile amber; and the shores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greatest abundance of all; and of these the most plentiful country is Prussia.

Amber has a subacrid resinous taste, and fragrant aromatic smell, especially when dissolved. It differs from the other bituminous substances in this, that it yields by distillation a volatile acid salt, which none of the others do; otherwise it affords the same sort of principles as they do, viz. an acid phlegm, an oil which gradually becomes thicker as the distillation is continued; and when the operation is finished, there remains a black caput mortuum in the retort.—When boiled in water, it neither softens, nor undergoes any sensible alteration. Exposed to the fire in an open vessel, it melts into a black mass very like a bitumen: it is partly soluble in spirit of wine, and likewise in some essential oils; but it is with difficulty that the expressed oils are brought to act upon it. The stronger sorts of fixed alkaline lixivia almost totally dissolve it.

This substance is principally of two colours, white and yellow. The white is the most esteemed for medicinal purposes, as containing the greatest quantity of volatile salt; though the yellow is most valued by manufacturers because most transparent.

Amber is the basis of almost all the varnishes, by solution as described under the article VARNISH. When it has once been melted, it irrecoverably loses its beauty and hardness. There have been some, however, who pretended they had an art of melting some small pieces of amber into a mass, and constituting large ones of them; but the contrary has been sufficiently proved in the Phil. Trans. No. 248, p. 25.

Amber in substance has been much recommended as a nervous and cordial medicine; and alleged to be very efficacious in female diseases; but as in its crude state it is quite insoluble by our juices, it certainly can have very little effect on the system, and therefore it is now seldom given in substance. The forms in which amber has been used are, as a tincture, a salt, and an oil. With the latter a liniment is prepared said to relieve the paroxysms of the hooping cough; in which case it is rubbed on the pit of the stomach. In the *Pharmacopœia Chirurgica*, a formula is given for a liniment in which oil of amber is an ingredient, and which has been found of great benefit in the cramp. As an internal medicine it is however now very seldom administered.

AMBER-*Tree*, the English name of a species of ANTHOSPERMUM.

AMBERG, a city of Germany, the capital of the palatinate of Bavaria. It is seated near the confines of Franconia, on the river Wils. E. long. 12. 4. N. lat. 20. 46.

AMBERGREASE, AMBERGRISE, or GREY AMBER, in natural history, is a solid, opake, ash-coloured, fatty, inflammable substance, variegated like marble, remarkably light, rugged and uneven in its surface, and has a fragrant odour when heated. It does not effervesce with acids; it melts freely over the fire, into a kind of yellow rosin; and is hardly soluble in spirit of wine. It is found swimming upon the sea, or cast on the sea-coast, or in the sand near the sea-coast; especially in the Atlantic ocean, on the sea-coast of Brasil, and that of Madagascar; on the coast of Africa, of the East-Indies, China, Japan, and the Molucca islands; but most of the ambergrise which is brought to England comes from the Bahama islands, from Providence, &c. where it is found on the coast. It is also sometimes found in the abdomen of whales by the whale-fishermen, always in lumps of various shapes and sizes, weighing from half an ounce to upwards of 100 pounds.

There have been many different opinions concerning the origin of this substance; but the most satisfactory account is that given in the 73d volume of the Philosophical Transactions, by Dr. Swediar. According to the best information that he could obtain from several of the most intelligent persons employed in the spermaceti whale-fishery, and in procuring and selling ambergrise, it appears that this substance is sometimes found in the belly of the whale, but in that particular species only which is called the *spermaceti whale*, and which from its description and delineation appears to be the PHYSETER *Macrocephalus* Linnæi.

It is known, that the Sepia octopodia, or cuttle-fish, is the constant and natural food of this species of whale. This the fishers know so well, that whenever they discover any recent relics of it swimming on the sea, they conclude that a whale of this kind is, or has been, in that part. Another circumstance which corroborates the fact is, that the spermaceti whale on being hooked generally vomits up some remains of the Sepia: Hence it is easy to account for the many beaks, or pieces of beaks, of the Sepia found in all ambergrise. The beak of the Sepia is a black horny substance, and therefore passes undigested through the stomach into the intestinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if these latter be preternaturally retained, forms concretions with them, which render the animal sick and torpid, and produce an obstipation, which ends either in an abscess of the abdomen, as has been frequently observed, or becomes fatal to the animal; whence in both the cases, on the bursting of its belly, that hardened substance, known under the name of *ambergrise*, is found swimming on the sea, or thrown upon the coast. On an ample review of the subject, Dr. Swediar concludes with great probability, that all ambergrise is generated in the bowels of the spermaceti whale; and there mixed with the beaks of the Sepia octopodia, which is the principal food of that whale. He therefore defines ambergrise to be the preternaturally hardened dung or fæces of the Physeter macrocephalus, mixed with some indigestible relics of its food.

The use of ambergrise in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by several eminent physicians. A sailor, who had the curiosity to try the effect of recent ambergrise, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert substance.

Ambergrise may be known to be genuine by its fragrant scent when a hot needle or pin is thrust into it. One thing, however, is very remarkable, that this drug, which is the most sweet of all the perfumes, should be capable of being resembled in smell by a preparation of one of the most odious of all stinks. Mr. Homberg found, that a vessel in which he had made a long digestion of the human fæces, acquired a very strong and perfect smell of ambergrise, insomuch that any one would have thought a great quantity of essence of ambergrise

had been made in it. The perfume was ſo ſtrong and offenſive, that the veſſel was forced to be removed out of the laboratory.

AMBERT, a ſmall town of France, in the late province of Auvergne. E. long. 3. 35. N. lat. 45. 28.

AMBETTUWAY, in botany, a barbarous name of a tree growing in Africa, the leaves of which, when boiled in wine, are ſaid to create an appetite.

AMBIANI, or AMBIANENSIS CIVITAS, now *Amiens*, a city in the department of Somme, and late province of Picardy.

AMBIDEXTER, a perſon who can uſe both hands with the ſame facility, and for the ſame purpoſes, that the generality of people do their right hands. Were it not for education and habit, all mankind would probably be ambidexters; and we ſee nurſes take a good deal of pains to bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, when it would be better to have the equal uſe of both hands. Surgeons and oculiſts are of neceſſity obliged to be ambidexters. By the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic.

AMBIDEXTER, among Engliſh lawyers, a juror or embracer, who accepts money of both parties, for giving his verdict; an offence for which he is liable to be impriſoned, for ever excluded from a jury, and to pay ten times the ſum he accepted of.

AMBIENT, a term uſed for ſuch bodies, eſpecially fluids, as encompaſs others on all ſides: thus, the air is frequently called an ambient fluid, becauſe it is diffuſed round the earth.

AMBIGENÆ OVES, in the heathen ſacrifices, an appellation given to ſuch ewes as, having brought forth twins, were ſacrificed, together with their two lambs one on each ſide.

AMBIGENAL HYPERBOLA, a name given by Sir Iſaac Newton to one of the triple hyperbolas of the ſecond order, having one of its infinite legs falling within an angle formed by the aſymptotes, and the other without.

AMBIGUOUS, a term applied to a word or expreſſion which may be taken in different ſenſes. Ambiguous words are enumerated in the *Lexicon Philoſophicum de Ambiguitate Vocabulorum*, Francof. 1597, 4to.—The reſponſes of the ancient oracles were always ambiguous.

AMBIT, in geometry, is the ſame with what is otherwiſe called the perimeter of a figure. See PERIMETER.

AMBIT was particularly uſed, in antiquity, to denote a ſpace of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houſes were not to be built contiguous, but an ambit or ſpace of $2\frac{1}{2}$ feet was to be left about each for fear of fire. The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the ſame, within which the ſanctity aſſigned to it was limited. The whole ground wherein a tomb was erected was not to be ſecreted from the common uſes; for this reaſon, it was frequent to inſcribe the ambit on it, that it might be known how far its ſanctity extended: thus, *in fronte pedes tot, in agrum pedes tot.*

AMBITUS, in Roman antiquity, the ſetting up for ſome magiſtracy or office, and formally going round the city to ſolicit the intereſt and votes of the people. *Ambitus* differed from *ambition*, as the former lies in the act, the latter in the mind. Ambitus was of two kinds; one lawful, the other infamous. The firſt, called alſo *ambitus popularis*, was when a perſon offered his ſervice to the republic frankly, leaving it to every body to judge of his pretenſions as they found reaſonable. The ſecond kind was that wherein force, cajoling, money, or other extraordinary influence was made uſe of. This was held infamous, and ſeverely puniſhed. The ambitus ceaſed from the time of the emperors, becauſe poſts were not then to be had by courting the people, but by favour from the prince. Perſons who had cauſes depending practiſed the ſame, going about among the judges to implore their favour and mercy. They who practiſed this were called *Ambitioſi*. Hence we alſo meet with *ambitioſa decreta*, and *ambitioſa juſta*, uſed for ſuch ſentences and decrees as were thus procured from the judges, contrary to reaſon and equity, either gratuitouſly or for money.

AMBLE, in horſemanſhip, a peculiar pace by which a horſe's two legs of the ſame ſide move at the ſame time.

AMBLESIDE, a town in Weſtmoreland, ſeated at one end of Winandermeer. W. long. 0. 49. N. lat. 54. 30.

AMBLETEUSE, a ſea-port town of France, in the department of the ſtraits of Calais. E. long. 1. 30. N. lat. 49. 40.

AMBLYGON, in geometry, denotes an obtuſe-angled triangle, or a triangle one of whoſe angles conſiſts of more than 90 degrees.

AMBLYOPY, among phyſicians, ſignifies that ſtate of viſion in which objects at a diſtance cannot be clearly diſtinguiſhed.

AMBO, or AMBON, a kind of pulpit or deſk, in the ancient churches, where the prieſts and deacons ſtood to read or ſing part of the ſervice, and preach to the people; called alſo *Analogium*. The term is derived from αναβαινειν, "to mount." The ambo was mounted upon two ſides; whence ſome alſo derive the appellation from the Latin *ambo*, "both." Beſides the goſpel, which was read at the top of the ambo, and the epiſtle, which was read a ſtep lower, they likewiſe publiſhed from this place the acts of the martyrs, the commemoration of departed ſaints, and the letters of peace and communion ſent by one church to another. Here, too, converts made a public profeſſion of their faith; and biſhops, their defence, when accuſed. Treaties alſo were ſometimes concluded, and the coronations of emperors and kings performed, in the ſame place. The modern reading-deſks and pulpits have been generally ſubſtituted to the ancient ambos; though, in ſome churches, remains of the ambos are ſtill ſeen. In that of St. John de Lateran at Rome, there are two moveable ambos.

AMBOHITSMENE, or VOHITSANGHOMBE, a province of the iſland of Madagaſcar.

AMBOISE, a town of France, in the department of Indre and Loire, and late province of Touraine, ſeated at the confluence of the rivers Loire and Maſſee. E. long. 1. 30. N. lat. 47. 25.

AMBOULE, a province of Madagaſcar, ſomewhat to the northward of S. lat. 23°. It is a fertile and agreeable country, watered by the river Manampani, whoſe mouth lies in S. lat. 23. 30.

AMBOYNA, one of the Molucca iſlands, in the Eaſt Indies. It lies in S. lat. 3. 36. and E. long. 126. 20. and is remarkable for being the centre of the commerce for nutmegs and cloves, which is entirely monopolized by the Dutch Eaſt-India company. It is about 24 leagues in circumference. Beſides cloves, it likewiſe abounds in moſt of the tropical fruits and fiſh; nor is there here any deficiency of good water; but fleſh is very ſcarce. This ſcarcity, however, proceeds more from the policy of the Dutch than either the intemperature of the climate, or the barrenneſs of the ſoil: for, excepting cloves, they have in Amboyna, as well as the Moluccas, induſtriouſly diſcouraged the cultivation of every eſculent commodity, with the view of withholding ſubſiſtence from thoſe who might be tempted to invade them. Amboyna will be remembered by every Engliſhman, on account of the unexampled cruelties practiſed here by the Dutch on the Engliſh factors.

AMBRACIA, one of the moſt conſiderable cities of ancient Epirus, ſituated on the river Arachthus, at a ſmall diſtance from the ſea. At firſt it was a free city; but was afterwards reduced by the Æacidæ kings of Epirus, who choſe it for the place of their reſidence.

AMBREADA, the falſe or factitious amber, which the Europeans uſe in their trade with the negroes on the coaſt of Africa, and particularly on the river Senegal.

AMBRESBERRY, a market-town in Wiltſhire, about 6 miles north of Saliſbury. W. long. 1. 40. and N. lat. 51. 20.

AMBRONES, a Gauliſh people who lived near the foot of the Alps, between Switzerland and Provence.

AMBROSE-ISLAND, a ſmall iſland laid down in ſome charts, and ſtated to lie in S. lat. 25. 30. W. long. 82. 20. It was in vain ſearched for, however, in 1767, by Captain Carteret.

AMBROSE, or *St.* AMBROSE *in the Wood*, an order of religious, who uſe the Ambroſian office, and wear an image of that ſaint engraven on a little plate: in other reſpects, they conform to the rule of the Auguſtins.

AMBROSIA, from α and βροτος, *immortal*, in heathen antiquity, denotes the ſolid food of the gods, in contradiſtinction from their drink, which was called *nectar*.

AMBROSIA is alſo a pompous kind of title, given by the old phyſicians to certain alexipharmic compoſitions. A famous antidote of Philip of Macedon, againſt all poiſons, bites, and ſtings of venomous creatures, was alſo called by this name.

AMBROSIA, a genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 49th order, *Compoſitæ-nucamentaceæ*. The characters are: The MALE flowers compound; the common *calyx* a ſingle-leaved perianthium, the length of the florets; the compound *corolla* uniform, tubular, flat, and hemiſpherical; the proper is monopetalous, funnel-ſhaped, and quinquefid. The *ſtamina* conſiſt of five very ſmall filaments. The antheræ are erect, parallel, and pointed. The *piſtillum* has a filiform ſtylus, the length of the ſtamina; the ſtigma orbicular and membranous. The *receptaculum* is naked. FEMALE flowers below the male ones, on the ſame plant, doubled. The *calyx* is a ſingle-leaved perianthium, entire (with the belly quinquedentated), one-flowered, and perſiſtent. There is no *corolla*. The *piſtillum* has an ovate germen in the bottom of the calyx; a filiform ſtylus, the length of the calyx; and two long briſtly ſtigmata. The *pericarpium* is an ovate unilocular nut; the *ſeed* ſingle and roundiſh. Of this genus five ſpecies are enumerated; but they have no properties worthy of notice.

AMBROSIAN OFFICE, or RITE, in church-hiſtory, a particular formula of worſhip in the church of Milan, which takes its name from St. Ambroſe, who inſtituted that office in the fourth century.

AMBROSIN, in middle-age writers, denotes a coin ſtruck by the lords or dukes of Milan, whereon was repreſented St. Ambroſe on horſeback, with a whip in his right hand.

AMBROSINIA, in botany; a genus of the polyandria order belonging to the gynandria claſs of plants; the characters of which are: The *calyx* a ſingle-leaved ſpatha, divided by a partition into two cells. There is no *corolla*. The *ſtamina* conſiſt of a ſingle filament in the interior cell; the antheræ are numerous, with two roundiſh concave nectaries at their baſe. The *piſtillum* is in the interior cell; the germen roundiſh, the ſtylus cylindrical, and ſhorter than the ſpatha; the ſtigma obtuſe. The *pericarpium* roundiſh and unilocular. There is but one ſpecies, a native of Turkey.

AMBROSIUS AURELIANUS, or AURELIUS AMBROSIUS, a famous general of the ancient Britons, of Roman extraction. The Monmouth hiſtorian gives him a very high character, and tells us he was poiſoned at Wincheſter by one Eopa a Saxon, diſguiſed as a phyſician. But the general opinion is, that he was killed in a battle which he loſt in the year 508, againſt Cerdrick one of the Saxon generals.

AMBRY, a place in which are depoſited all utenſils neceſſary for houſe-keeping. In the ancient abbeys and priories, there was an office under this denomination, wherein were laid up all charities for the poor.

AMBUBAJÆ, in Roman antiquity, were immodeſt women, who came from Syria to Rome, where they lived by proſtitution, and by playing on the flute. According to Cruquius, theſe women uſed likewiſe to ſell paint for ornamenting the face, &c.

AMBULANT, or AMBULATORY. They formerly gave in France the name of *ambulant commiſſioners* to thoſe commiſſioners, or clerks of the king's farms, who had no ſettled office; but viſited all the offices within a certain diſtrict, to ſee that nothing were done in them againſt the king's right and the intereſt of the farm.

AMBULANT, is alſo uſed to denote thoſe brokers at Amſterdam, or exchange agents, who have not been ſworn before the magiſtrates. They tranſact brokerage buſineſs, but their teſtimony is not received in the courts of juſtice.

AMBULATORY, a term anciently applied to ſuch courts, &c. as were not fixed to any certain place; but held ſometimes in one place, and ſometimes in another. In oppoſition to ſtationary courts. The court of parliament was anciently ambulatory; ſo alſo were the courts of king's bench, &c.

AMBURBIUM, in Roman antiquity, a proceſſion made by the Romans round the city and pomœrium, in which they led a victim, and afterwards ſacrificed it, in order to avert ſome calamity that threatened the city.

AMBURY, or ANBURY, among farriers, a tumor, wart, or ſwelling, ſoft to the touch, and full of blood. This is cured by tying a horſe-hair very hard about its root; and, when it has fallen off, ſtrewing ſome verdigris upon the part, ſo as to prevent a return of the complaint. If the tumor be ſo low that nothing can be tied about it, they cut it out with a knife, deſtroy it with a hot iron, or eat it away with cauſtics.

AMBUSCADE, or AMBUSH, in the military art, the place where ſoldiers conceal themſelves till an opportunity offers to ſurpriſe the enemy. This term alſo applies to the perſons ſo hidden.

AMBY, a town of the Auſtrian Netherlands, in the province of Limberg, ſituated oppoſite to Maeſtricht, on the E. ſide of the Maeſe, in E. long. 5. 45. N. lat. 50. 57.

AMEDIANS, in church-hiſtory, a congregation of religious in Italy, ſo called from their profeſſing themſelves *amantes Deum*, "lovers of God;" or rather *amati Deo*, "beloved of God." They wore a gray habit and wooden ſhoes, had no breeches, and girt themſelves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Ciſtercian order, and partly with that of the Soccolanti, or wooden-ſhoe wearers.

AMELIA, an epiſcopal city of Italy, in the ſtate of the church, ſeated on a mountain, in the duchy of Spoletto. E. long. 13. 20. N. lat. 42. 33.

AMELLUS, STARWORT; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-oppoſitifoliæ*. The characters are theſe: The common *calyx* imbricated and roundiſh; the *compound corolla* radiated; the hermaphrodite corollets numerous in the diſk; female numerous in the ray. *Proper* corolla of the hermaphrodites are tubular and quinquefid; of the females, tongued, looſe, and two or three toothed. The *ſtamina* in the hermaphrodites conſiſt of 5 ſhort capillary filaments; the antheræ cylindric and tubular. The *piſtillum* has an ovate germen; a

filiform ſtylus the length of the ſtamina; and two filiform ſtigmata. There is no *pericarpium*, but the calyx unchanged. The *ſeeds* are ovate and ſolitary; the *pappus* hairy; the *receptaculum* chaffy.—Of this there are two ſpecies.

1. The lynchitis, with one flower on each footſtalk, is a native of the Cape of Good Hope. 2. The umbellatus, with flowers growing in umbels, a native of Jamaica. The firſt of theſe is eaſily propagated, either by cuttings planted in the ſummer-months, or by ſeeds ſown on a moderate hot-bed in the ſpring, but the plants require a ſlight ſhelter in winter. The ſecond is much more tender, and therefore requires to be preſerved in a ſtove during the winter ſeaſon.

AMEN, אמן, ſignifies *true, faithful, certain*. It is made uſe of likewiſe to affirm any thing, and was a ſort of affirmation uſed often by our Saviour: Αμην, Αμην, λεγω ὑμιν, i. e. *Verily, verily, I ſay unto you*. Laſtly, it is underſtood as expreſſing a wiſh; as *Amen, So be it!* Numb. v. 22, or an affirmation, *Amen, yes, I believe it*, 1 Cor. xiv. 16. The Hebrews, and the five books of Pſalms, according to their way of diſtributing them, with the words *Amen, amen;* which the Septuagint have tranſlated, γενοιτο, γενοιτο; and the Latins, *Fiat, fiat*. The Greek and Latin churches have preſerved this word in their prayers, as well as *allelujah* and *hoſannah;* becauſe they obſerved more energy in them than in any terms which they could uſe in their own languages. The Jews aſſert, that the gates of heaven are opened to him who anſwers *Amen* with all his might.

AMEND, or Amende, in the French cuſtoms, a pecuniary puniſhment impoſed by a judge for any crime, falſe proſecution, or groundleſs appeal.

Amende *Honorable*, a kind of puniſhment heretofore inflicted in France upon traitors, parricides, or ſacrilegious perſons, in the following manner. The offender being delivered into the hands of the hangman, his ſhirt is ſtripped off, a rope put about his neck, and a paper in his hand; then he is led into court, where he muſt beg pardon of God, the king, the court, and his country. Sometimes the puniſhment ends here; but ſometimes it is only a prelude to death, or the galleys.

Amende *Honorable* is a term uſed for making recantation in open court, or in preſence of the perſon injured.

AMENDMENT, in law, the correction of an error committed in a proceſs, which may be amended after judgement, unleſs the error lies in giving judgement; for in that caſe it is not amendable, but the party muſt bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without motion and leave of the court.

Amendment *of a Bill*, in parliament, is ſome alteration made in the firſt draught of it.

AMENTUM, in botany, the name of a ſpecies of calyx, conſiſting of valves, and hanging down in different directions from the caulis. The common oat affords a good example of the amentum.

Amentum, in Roman antiquity, a thong tied about the middle of a javelin or dart, and faſtened to the fore-finger, in order to recover the weapon as ſoon as it was diſcharged. The ancients made great uſe of the amentum, thinking it helped to enforce the blow. It alſo denotes a latchet that bound their ſandals.

AMERADE, a kind of officers among the Saracens, anſwering to the governors of provinces among the Europeans.—The name is originally the ſame with that of emir.

AMERCEMENT, or Amerciament, in law, a pecuniary puniſhment impoſed on offenders at the mercy of the court. It differs from a fine in being impoſed arbitrarily, in proportion to the fault; whereas a fine is a certain puniſhment ſettled expreſsly by ſome ſtatute.

AMERICA (from *Americus Veſpucius*, falſely ſaid to be the firſt diſcoverer of the continent); one of the four parts of the world, and by much the largeſt. It is bounded on all ſides by the ocean, as appears from the lateſt diſcoveries; it being formerly ſuppoſed to join to the north-eaſt part of Aſia. It took its name from Americus Veſpucius, a Florentine, who having accompanied Ojeda, an enterpriſing Spaniſh adventurer, to America, and drawn up an amuſing hiſtory of his voyage, publiſhed it, and it was read with admiration. In his narrative, he had inſinuated, that the glory of having firſt diſcovered the continent of the new world belonged to him. This was in part believed; the country began to be called after the name of its ſuppoſed firſt diſcoverer; and the unaccountable caprice of mankind has perpetuated the error. But America was firſt diſcovered by Chriſtopher Columbus, a Genoeſe, in 1401. Some call it the New World, and with great propriety; for not only the men, but the birds and beaſts differ in ſome reſpects from thoſe known before. It has likewiſe a great number of trees, ſhrubs, and plants, that grew no where elſe, before they were tranſplanted to other places. All the men, except the Eſkimaux, near Greenland, ſeem to have the ſame original; for they agree in every particular, from the ſtraits of Magellan in the S. to Hudſon's Bay in the N. Their ſkins, unleſs daubed with greaſe or oil, are of a red copper colour, and they have no beards or hair on any other part of their bodies, except the head, where it is black, ſtraight, and coarſe. Many are the conjectures about the peopling of this vaſt continent, and almoſt as various as their authors. America is ſo long, that it takes in not only all the Torrid, but alſo the Temperate and part of the Frigid Zones. It is hard to ſay how many different languages there are in America, a vaſt number being ſpoken by the different people in different parts; and as to religion, there is no giving any tolerable account of it in general, though ſome of the moſt civilized of the Aborigines ſeem to have worſhipped the ſun. The principal motive of the Spaniards in ſending ſo many colonies here was the thirſt of gold; and indeed they and the Portugueſe are poſſeſſed of all thoſe parts where it is found in the greateſt plenty. This vaſt continent is divided into N. and S. America, which are joined by the Iſthmus of Darien. It has the loftieſt mountains in the world, ſuch as thoſe that form the immenſe chain called the Andes; and the moſt ſtupendous river, ſuch as the river Amazon ("the mighty Orellana") the "ſea-like Plata," the Oronoko, the Miſſiſſippi, the Illinois, the Miſaures, the Ohio, the St. Lawrence, the Hudſon, the Delaware, the Suſquehannah, the Potomac, &c. Beſides the Aborigines, who inhabit the interior parts, and the United States of America, who poſſeſs ſome of the fineſt provinces that formerly belonged to Great Britain, the different European powers have rich and flouriſhing colonies here. The American States are fifteen in number, each having a ſeparate local government; but they are formed into one federal republic. Theſe ſtates long flouriſhed as provinces of Great Britain; but parliament attempting to tax them by its ſole authority, without the intervention of their aſſemblies, a civil war enſued; a congreſs was formed, which, in 1776, diſclaimed all dependence on the mother country; the French king entered into an alliance with them in 1778; the colonies powerfully aſſiſted by France, were ſucceſsful; and Great Britain, in 1782, acknowledged their independence in preliminary articles of peace, finally ratified by the definitive treaty in 1783. The Americans have ſince formed a new federal conſtitution, which ſeems to be admirably calculated for the country; and the union is now governed by a congreſs, conſiſting of a preſident, vice-preſident, ſenate, and houſe of repreſentatives. The repreſentatives are elected every ſecond year; the ſenators are choſen for ſix years, and the preſident

and vice-president for four. The illustrious George Washington, their general throughout the whole war, was elected the first president, and since re-elected. The 15 states are, New Hampshire, (including the province of Main) Massachusetts, Rhode Island, Vermont, and Connecticut, in New England; New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North and South Carolina, and Kentucky; and all the country to the N. of the Ohio, extending from Pennsylvania on the E. the Lakes on the N. and the Mississippi on the W. is intended, by Congress, to be divided into 10 new states, to be called Washington, Metropotamia, Pesilippi, Michigania, Illinoia, Chersonesus, Saratoga, Sylvania, Assenipi, and Polypotamia. The American states extend 1250 miles in length, from East Florida to the N. W. angle of Nova Scotia; being situated between 31° and 46° N. lat. The countries still possessed by Great Britain on this continent are, Labrador or New Britain, Upper and Lower Canada, Nova Scotia, and New Brunswick.—In North America, Spain possesses East and West Florida, Louisiana, New Mexico, California, and Old Mexico or New Spain; in South America, they have Terra Firma or Castile del Oro, Peru, Chili, and Paragua or La Plata. In South America, the Portuguese have Brasil; the French, Cayenne; and the Dutch, Surinam, both in Guiana. The original natives of these two vast continents are the Indians of the North and South; of whom it is observable, that there is a natural distinction between the inhabitants of the temperate zones and those of the torrid; and that accordingly, they may be divided into two great classes. The one comprehends all the North Americans, from the river St. Lawrence to the gulf of Mexico, together with the people of Chili, and a few small tribes towards the extremity of the southern continent. To the other belong all the inhabitants of the islands, and those settled in the various provinces which extend from the isthmus of Darien almost to the southern confines of Brasil, along the east side of the Andes. In the former, which comprehends all the regions of the temperate zone in America, that are inhabited, the human species appears manifestly to be more perfect. The natives are more robust, active, intelligent, and courageous. They possess, in the most eminent degree, that force of mind, and love of independence, which are the chief virtues of man in his savage state. They have defended their liberty with persevering fortitude against the Europeans, who subdued the other rude nations of America with the greatest ease. The natives of the temperate zone are the only people in the new world who are indebted for their freedom to their own valour. The North Americans, though long encompassed by three formidable European powers, still retain part of their original possessions. The people of Chili, though early invaded, still maintain a gallant contest with the Spaniards, and have set bounds to their encroachments; whereas, in the warmer regions, men are more feeble in their frame, less vigorous in the efforts of their mind, of a gentle but dastardly spirit, more enslaved by pleasure, and more sunk in indolence. Accordingly, it is in the torrid zone that the Europeans have most effectually established their dominion over America; the most fertile provinces in it are subject to their yoke; and, if several tribes there still enjoy independence, it is either because they have never been attacked by an enemy already satiated with conquest, and possessed of larger territories than he was able to occupy, or because they have been saved from oppression by their remote and inaccessible situation. This distinction, however, although so conspicuous, is not universal. But our limits will not allow us to enter into the particular exceptions. Of the manners of the North American Indians, the reader may have a general idea, by an account of those who inhabit the countries to the E. of the river Mississippi. These consist of 28 different nations; the principal of which are the Cherokees, the Chickasaws, the Choctaws, the Creeks, the Delawares, the six Nations, the Shawanese, the Hurons, the Illinois, &c. Allowing about 700 to a nation or tribe, they will contain, in all, 20,000 souls, and, consequently, may furnish between 4 and 5000 warriors. These Indians are not born white; and take a great deal of pains to darken their complexion, by anointing themselves with grease, and lying in the sun. They also paint their face, breast, and shoulders, of various colours, but generally red; and their features are well formed, especially those of the women. They are of a middle stature, their limbs clean and straight, and scarcely any crooked or deformed person is to be found among them. In many parts of their bodies they prick in gun-powder in very pretty figures. They shave, or pluck the hair off their heads, except a patch about the crown, which is ornamented with beautiful feathers, beads, wampum, and such like baubles. Their ears pared, and stretched in a thong down to their shoulders. They are wound round with wire to expand them, and adorned with silver pendants, rings, and bells, which they likewise wear in their noses. Some of them will have a large feather through the cartilage of the nose; and those who can afford it, wear a collar of wampum, a silver breastplate, and bracelets on the arms and wrists. A bit of cloth about the middle, a shirt of the English make, on which they bestow innumerable stitches to adorn it, a sort of cloth boots and mockasons, which are shoes of a make peculiar to the Indians, ornamented with porcupine quills, with a blanket thrown over all, complete their dress at home; but when they go to war, they leave their trinkets behind, and mere necessaries serve them. There is little difference between the dress of the men and women, excepting that a short petticoat, and the hair, which is exceedingly black and long, and clubbed behind, distinguish some of the latter. Except the head and eyebrows, they pluck the hair, with great diligence, from all parts of the body, especially the looser part of the sex. Their warlike arms are guns, bows and arrows, darts, scalping knives, and tomahawks: this is one of their most useful pieces of field-furniture, serving all the offices of the hatchet, pipe, and sword. They are exceedingly expert in throwing it, and will kill at a considerable distance. The world has no better marksmen with any weapon. They will kill birds flying, fishes swimming, and wild beasts running. They are not so ignorant as some suppose them, but are a very intelligent people, quick of apprehension, sudden in execution, subtle in business, exquisite in invention, and industrious in action. They are of a very gentle and amiable disposition to those they think their friends, but as implacable in their enmity; their revenge being completed only in the entire destruction of their enemies. They are very hardy, bearing heat, cold, hunger, and thirst, in a surprising manner; and yet no people are more addicted to excess in eating and drinking, when it is conveniently in their power. The follies, nay mischief, they commit, when inebriated, are entirely laid to the liquor; and no one will revenge any injury (murder excepted) received from one who is no more himself. Among the Indians all men are equal, personal qualities being most esteemed. No distinction of birth, or rank, renders any man capable of doing prejudice to the rights of private persons; and there is no preeminence from merit, which begets pride, and which makes others too sensible of their own inferiority. Though there is, perhaps, less delicacy of sentiment in the Indians than among us, there is, however, abundantly more probity, with infinitely less ceremony, or equivocal compliments. Their public conferences shew them to be men of genius; and they have, in a high degree, the talent of natural eloquence. They live dispersed in small villages, either in the woods, or on the

banks of rivers, where they have little plantations of Indian corn, and roots, not enough to ſupply their families half the year; and they ſubſiſt, the remainder of it, by hunting, fiſhing, and fowling, and the fruits of the earth, which grow ſpontaneouſly in great plenty. Their huts are generally built of ſmall logs, and covered with bark, each having a chimney, and a door, on which they place a padlock. One of their towns, called Old Chelicothe, is built in the form of a Kentucky ſtation, that is, a parallelogram, or long ſquare; and ſome of their houſes are ſhingled. A long council-houſe extends the whole length of the town, where the king and chiefs of the nation frequently meet, and conſult on all matters of importance, whether of a civil or military nature. Some huts are built by ſetting up a frame on forks, and placing bark againſt it; others of reeds, and ſurrounded with clay. The fire is in the middle of the wigwam, and the ſmoke paſſes through a little hole. They join reeds together, by cords run through them, which ſerve them for tables and beds. They moſtly lie upon ſkins of wild beaſts, and ſit on the ground. They have braſs kettles and pots to boil their food. Gourds or calabaſhes, cut aſunder, ſerve them for pails, cups, and diſhes. The accounts of travellers, concerning their religion, are various; and although it cannot be abſolutely affirmed that they have none, yet it muſt be confeſſed very difficult to define what it is. All agree that they acknowledge one Supreme God, but do not adore him. They have not ſeen him, they do not know him, believing him to be too far exalted above them, and too happy in himſelf to be concerned about the trifling affairs of poor mortals. They ſeem alſo to believe in a future ſtate, and that after death they ſhall be removed to their friends, who have gone before them, to an elyſium, or paradiſe. The Wyandotts near Detroit, and ſome others, have the Roman Catholic Religion introduced among them by miſſionaries. Theſe have a church, a miniſter, and a regular burying-ground. Many of them appear zealous, and ſay prayers in their families. Theſe, by their acquaintance with white people, are a little civilized, which muſt of neceſſity precede Chriſtianity. The Shawaneſe, Cherokees, Chickaſaws, and ſome others, are little concerned about religion. Others continue their former ſuperſtitious worſhip of the objects of their love and fear, and eſpecially thoſe beings whom they moſt dread, and whom therefore we generally denominate devils; though at the ſame time, it is allowed they pray to the ſun, and other inferior benevolent deities, for ſucceſs in their undertakings, for plenty of food, and other neceſſaries of life. They have their feſtivals, and other rejoicing-days, on which they ſing and dance in a ring, taking hands, having ſo painted and diſguiſed themſelves, that it is difficult to know any of them; and after enjoying this diverſion for a while, they retire to the place where they have prepared a feaſt of fiſh, fleſh, fowls, and fruits; to which all are invited, and entertained with their country ſongs. They believe that there is great virtue in feaſts for the ſick. For this purpoſe, a young buck muſt be killed and boiled, the friends and near neighbours of the patient invited, and having firſt thrown tobacco on the fire, and covered it up cloſe, they all ſit down in a ring, and raiſe a lamentable cry. They then uncover the fire and kindle it; and the head of the buck is firſt ſent about, every one taking a bit, and giving a loud croak, in imitation of crows. They afterwards proceed to eat all the buck, making a moſt harmonious, melancholy ſong; in which ſtrain their muſic is particularly excellent. As they approach their towns, when ſome of their people are loſt in war, they make great lamentations for their dead, and bear them long after in remembrance. Some nations abhor adultery, do not approve of a plurality of wives, and are not guilty of theft; but there are other tribes that are not ſo ſcrupulous. Among the Chickaſaws, a huſband may cut off the noſe of his wife, if guilty of adultery; but men are allowed greater liberty. This nation deſpiſes a thief. Among the Cherokees they cut off the noſe and ears of an adultreſs; afterward her huſband gives her a diſcharge; and from this time ſhe is not permitted to refuſe any one who preſents himſelf. Fornication is unnoticed; for they allow perſons in a ſingle ſtate unbounded freedom. Their form of marriage is ſhort; the man, before witneſſes, gives the bride a deer's foot, and ſhe, in return, preſents him with an ear of corn, as emblems of their ſeveral duties. The women are very ſlaves to the men; which is a common caſe in rude and unpoliſhed nations, throughout the world. They are charged with being revengeful; but this revenge is only doing themſelves juſtice on thoſe who injure them, and is ſeldom executed, but in caſes of murder and adultery. Their king has no power to put any one to death by his own authority; but the murderer is generally delivered up to the friends of the deceaſed, to do as they pleaſe. When one kills another, his friend kills him, and ſo they continue until much blood is ſhed; and at laſt the quarrel is ended by mutual preſents. Their kings are hereditary, but their authority extremely limited. No people are a more ſtriking evidence of the miſeries of mankind in the want of government than they. Every chief, when offended, breaks off with a party, ſettles at ſome diſtance, and then commences hoſtilities againſt his own people. They are generally at war with each other. When they take captives in war, they are exceedingly cruel, treating the unhappy priſoners in ſuch a manner, that death would be preferable to life. They afterward give them plenty of food, load them with burdens, and when they arrive at their towns they muſt run the gauntlet. In this, the ſavages exerciſe ſo much cruelty, that one would think it impoſſible they ſhould ſurvive their ſufferings. Many are killed; but if one outlives this trial, he is adopted into a family as a ſon, and treated with paternal kindneſs; and if he avoids their ſuſpicions of going away, he is allowed the ſame privileges as their own people. But ſometimes their priſoners are deſtined to be tortured to death, in order to ſatiate the revenge of their conquerors. While their lot is in ſuſpenſe, the priſoners themſelves appear altogether unconcerned about what may befal them. They talk, they eat, they ſleep, as if there were no danger impending: when the fatal ſentence is intimated to them, they receive it with an unaltered countenance, raiſe their death-ſong, and prepare to ſuffer like men. The victors aſſemble as to a ſolemn feſtival, reſolved to put the fortitude of the captives to the utmoſt proof. A ſcene enſues, the bare deſcription of which is enough to chill the heart with horror, wherever men have been accuſtomed, by mild inſtitutions, to reſpect their ſpecies, and to melt into tenderneſs at the ſight of human ſufferings. The priſoners are tied naked to a ſtake, but ſo as to be at liberty to move round it. All preſent, men, women, and children, ruſh upon them like furies. Every ſpecies of torture is applied. Some burn their limbs with red-hot irons, ſome mangle their bodies with knives, others tear their fleſh from their bones, pluck out their nails by the roots, and rend and twiſt their ſinews; and ſuch is their cruel ingenuity in torturing, that, by avoiding to touch the vital parts, they often prolong this ſcene of anguiſh for ſeveral days. In ſpite of all their ſufferings, the victims continue to chant their death-ſong with a firm voice, they boaſt of their own exploits, they inſult their tormentors for their want of ſkill to avenge the death of their friends and relations, they warn them of the vengeance that awaits them on account of what they are now doing, and excite their ferocity by the moſt provoking reproaches and threats. To diſplay undaunted fortitude in ſuch dreadful ſituations, is the nobleſt triumph of a warrior: to avoid the trial by a voluntary death, or to ſhrink under it, is deemed cowardly and infamous. If

any one betray ſymptoms of timidity, his tormentors often diſpatch him at once with contempt, as unworthy of being treated like a man. Animated by theſe ideas, they endure, without a groan, what it ſeems almoſt impoſſible that human nature ſhould ſuſtain. Weary, at length, of contending with men, whoſe conſtancy they cannot vanquiſh, ſome chief, in a rage, puts a period to their ſufferings, by diſpatching them with his dagger or his club. The people of S. America gratify their revenge in a manner ſomewhat different, but with the ſame unrelenting rancour. Their priſoners, after meeting, at their firſt entrance, with the ſame rough reception as among the N. Americans, are not only exempt from injury, but treated with the greateſt kindneſs. They are feaſted and careſſed, and ſome beautiful young women are appointed to attend and ſolace them. But, by a refinement of cruelty, while they ſeem ſtudious to attach their captives to life, their doom is irrevocably fixed. On an appointed day, the victorious tribe aſſembles, the priſoner is brought forth with great ſolemnity, he meets his fate with undaunted firmneſs, and is diſpatched by a ſingle blow. The moment he falls, the women ſeize the body, and dreſs it for the feaſt. They beſmear their children with the blood, in order to kindle in their boſoms a hatred of their enemies, and all join in feeding upon the fleſh with amazing greedineſs and exultation. Wherever this practice prevails, captives never eſcape death; but they are not tortured with the ſame cruelty as among tribes which are leſs accuſtomed to ſuch horrid feaſts. The Indians of S. America immediately under the Spaniſh government, although the moſt depreſſed order of men in the country which belonged to their anceſtors, are now far from being treated with that rigour and cruelty which was laid to the charge of the firſt conquerors of that continent. They are no longer conſidered as ſlaves; on the contrary, they are reputed as freemen, and entitled to the privileges of ſubjects. A certain tax, or tribute, is indeed impoſed upon them, and certain ſervices required; but theſe are all under the due regulations of policy and humanity. The Indians who live in the principal towns, are entirely ſubject to the Spaniſh laws and magiſtrates; but, in their own villages, they are governed by caziques, ſome of whom are the deſcendants of their ancient lords; others are named by the Spaniſh viceroys. Theſe regulate the petty affairs of the people under them, according to maxims of juſtice, tranſmitted to them by tradition from their anceſtors. To the Indians, this juriſdiction, lodged in ſuch friendly hands, affords ſome conſolation; and ſo little formidable is this dignity to their new maſters, that they often allow it to deſcend by hereditary right. For the farther relief of men ſo much expoſed to oppreſſion, the Spaniſh court has appointed an officer in every diſtrict, with the title of Protector of the Indians. It is his duty, as the name implies, to aſſert the rights of the Indians; to appear as their defender in the courts of juſtice; and to ſet bounds to the encroachments and exactions of his countrymen. A portion of the annual tribute is deſtined for the ſalaries of the caziques and protectors; another part is appropriated to the payment of their tribute in years of famine, or when a particular diſtrict is afflicted by any extraordinary local calamity. Proviſion too is made, by various laws, that hoſpitals ſhould be founded in every new ſettlement, for the reception of Indians. Such hoſpitals have accordingly been erected, both for the indigent and infirm, in Lima, Cuſco, and Mexico, where the Indians are treated with tenderneſs and humanity.

AMERICAN NIGHT-SHADE. See PHYTOLACCA.

AMERICAN GROUND-NUT. See ARRACHIS.

AMERICUS VESPUCIUS, a Florentine gentleman, from whom *America* derived its name. The merchants of Seville having obtained permiſſion to attempt diſcoveries as private adventurers, ſent out four ſhips in 1499, under the command of Alonzo de Ojeda (who had accompanied Columbus in his ſecond voyage), aſſiſted by Americus Veſpucius, who was known to be deeply ſkilled in the ſcience of navigation. This fleet touched on that part of the weſtern continent already diſcovered by Columbus, whoſe track Ojeda followed; and Americus, who was a man of much addreſs, as well as poſſeſſed of conſiderable literary talents, by publiſhing the firſt voyages on the ſubject, and other artful means, gave his name to the New World, in prejudice to the illuſtrious Genoeſe. The impoſture, though long detected, has been ſanctified by time; and the fourth diviſion of the globe, ſo long unknown to the inhabitants of Europe, Aſia, and Africa, ſtill continues to be diſtinguiſhed by the name of AMERICA.

AMERSFORT, a city in the Netherlands, in the province of Utrecht, ſeated on the river Ems, E. long. 5. 20. N. lat. 52. 14.

AMERSHAM, or AGMONDESHAM, a market-town in Buckinghamſhire; W. long. 0. 15. N. lat. 51. 47.

AMESTRATA, a town of Sicily, now *Miſtretta*, in the Val di Demona, on the river Haleſus.

AMETHYST, a tranſparent gem of a purple colour, which ſeems compoſed of a ſtrong blue and a deep red; and, according as either of thoſe prevails, affording different tinges of purple, ſometimes approaching to violet, and ſometimes even fading to a pale roſe colour. It is nevertheleſs ſometimes found naturally colourleſs, and may at any time be made ſo by putting it into the fire; in which pellucid or colourleſs ſtate, it ſo reſembles the diamond, that its want of hardneſs ſeems the only way of diſtinguiſhing it. Some derive the name *amethyſt* from its colour, which reſembles wine mixed with water; whilſt others, with more probability, think it got its name from its ſuppoſed virtue of preventing drunkenneſs; an opinion which, however imaginary, prevailed to that degree among the ancients, that it was uſual for great drinkers to wear it about their necks. The amethyſt is found in the Eaſt and Weſt Indies, and in ſeveral parts of Europe; the oriental ones, at leaſt ſome of the finer ſpecimens, being ſo hard and bright as to equal any of the coloured gems in value. However, by far the greater number of amethyſts fall infinitely ſhort of theſe; as all the European ones, and not a few of thoſe brought from the Eaſt and Weſt Indies, are very little harder than common cryſtal.

Counterfeit or Factitious AMETHYST. Spars and cryſtals tinged red and yellow, &c. are ſold for amethyſts. The falſe ones come from Germany, are tinged by vapours in the mines, and contain ſome lead. Amethyſts may alſo be counterfeited by the following means: Take cryſtal-frit, made with the moſt perfect and fine tarſo. Then prepare a mixture of manganeſe in powder, one pound; and zaffer prepared, one ounce and a half. Mix theſe powders well together; and add to every pound of the frit an ounce of this powder. Let it be put into the pots with the frit; not into the already made metal. When the whole has ſtood long enough in fuſion to be perfectly pure, work it into veſſels, and they will reſemble the colour of the amethyſt.

AMETHYST, in heraldry, a term for the purple colour in the coat of a nobleman, in uſe with thoſe who blazon with precious ſtones, inſtead of metals and colours. This, in a gentleman's eſcutcheon, is called *Purpure*: and in theſe of ſovereign princes, *Mercury*.

AMETHYSTEA, AMETHYST: A genus of the monogynia order, belonging to the diandria claſs of plants; and, in the natural method, ranking under the 42d order, *Verticillatæ*. The characters are; the *calyx*, a ſingle-leaved perianthium, bell-ſhaped, angular, ſemiquinquefid, and permanent; the *corolla*, monopetalous; the border quinquepartite, the loweſt diviſion more expanding. The *ſtamina* conſiſt of two ſlender

filaments approximated; the antheræ are ſimple and roundiſh. The *piſtillum* has a four-cleft germen; ſtylus, the ſize of the ſtamina; ſtigmata two, acute. No *corolla*. The *ſeeds* four, gibbous, and ſhorter than the calyx:—There is only one known ſpecies, a native of Siberia. It is an annual plant, with an upright ſtalk, which riſes about a foot high. Towards the top it puts forth two or three ſmall lateral branches, garniſhed with ſmall trifid leaves, ſawed on their edges, of a very dark green colour. The flowers appear in June or July, and are produced in ſmall umbels at the extremities of the branches. They are of a fine blue colour, as are alſo the upper part of the branches, and the leaves immediately under the umbel, ſo that they make a fine appearance. The ſeeds of the amethyſtea ſhould be ſown in autumn, as they are apt to remain a whole year in the ground if kept till the ſpring.

AMETHYSTINE is applied, in antiquity, to a kind of purple garment dyed of the hue of amethyſt. In this ſenſe amethyſtine differed from *Tyrian* as well as from *hyacinthine* purple, being a kind of medium between both.

AMHAR, or AMHARA, a province of Abyſſinia, ſaid to extend 40 leagues from eaſt to weſt. It is conſidered as the moſt noble in the whole empire, both on account of its being the uſual reſidence of the Abyſſinian monarchs, and having a particular dialect different from all the reſt.

AMIANTHUS, or EARTH-FLAX, in natural hiſtory, a fibrous, flexile, elaſtic, mineral ſubſtance, conſiſting of ſhort, abrupt, and interwoven filaments. It is found in Germany, in the ſtrata of iron ore, ſometimes forming veins of an inch in diameter. Its fibres are ſo flexible that cloth has been made of them, and the ſhorter filaments that ſeparate in the waſhing of the ſtone may be made into paper in the common manner.

Amianthus is claſſed by Mr. Kirwan in the muriatic genus of earths, becauſe it contains about a fifth part of magneſia. Its other conſtituents are, flint, mild calcareous earth, barytes, clay, and a very ſmall proportion of iron. It is fuſible *per ſe* in a ſtrong heat, and alſo with the common fluxes. It differs from aſbeſtos in containing ſome ponderous earth.

AMICABLE *Benches*, in Roman antiquity, were, according to Pitiſcus, lower and leſs honourable ſeats allotted for the *judices pedanei*, or inferior judges, who, upon being admitted of the emperor's council, were dignified by him with the title *amici*.

AMICABLE *Numbers*, ſuch as are mutually equal to the ſum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers; for the aliquot parts 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICTUS, in Roman antiquity, was any upper garment worn over the tunica.

AMICTUS, among eccleſiaſtical writers, the uppermoſt garment anciently worn by the clergy; the other five being the alba, ſingulum, ſtola, manipulus, and planeta. The amictus was a linen garment, of a ſquare figure, covering the head, neck, and ſhoulders, and buckled or claſped before the breaſt. It is ſtill worn by the religious abroad.

AMICULUM, in Roman antiquity, a woman's upper garment, which differed from the pala. It was worn both by matrons and courtezans.

AMICUS CURIÆ, a law term, to denote a by-ſtander who informs the court of a matter in law that is doubtful or miſtaken.

AMIDA, a god worſhipped by the Japaneſe, who has many temples erected to him in the iſland of Japan, of which the principal is at Jedo.

AMIDA, in ancient geography, a principal city of Meſopotamia; E. long. 39. 0. N. lat. 36. 58.

AMIENS, a large handſome city of France, in the department of Somme, and late province of Picardy. It is agreeably ſituated on the river Somme, and ſaid to have received its Latin name *Ambianum* from being every where encompaſſed with water. It is a place of great antiquity; being mentioned by Cæſar as a town that had made a vigorous reſiſtance againſt the Romans, and where he convened a general aſſembly of the Gauls after having made himſelf maſter of it. It is ſituated in the road from Calais to Paris, 20 miles S. E. of Abbeville, and 75 N. of Paris. Long. 2. 28. E. lat. 49. 54. N.

AMILCAR, the name of ſeveral Carthaginian captains. The moſt celebrated of them is Amilcar Barcas, the father of Hannibal, who during five years infeſted the coaſt of Italy; when the Romans, ſending out their whole naval ſtrength, defeated him near Trapani, 242 years before Chriſt; and this put an end to the firſt Punic war. Amilcar began the ſecond, and landed in Spain, where he ſubdued the moſt warlike nations; but as he was preparing for an expedition againſt Italy, he was killed in battle, 228 years before the Chriſtian æra. He left three ſons, whom he had educated, as he ſaid, like three lions, to tear Rome in pieces; and made Hannibal, his eldeſt ſon, ſwear an eternal enmity againſt the Romans.

AMILICTI, in the Chaldaic theology, denote a kind of intellectual powers, or perſons in the divine hierarchy. The amilicti are repreſented as three in number; and conſtitute one of the tryads, in the third order of the hierarchy.

AMIRANTE, in the Spaniſh polity, a great officer of ſtate, anſwering to our lord high-admiral.

AMISUS, the chief city of the ancient kingdom of Pontus. It was built by the Mileſians, and peopled partly by them, and partly by a colony from Athens.

AMITERNUM, a town of the Sabines, in Italy, now extinct: The ruins are to be ſeen on the level ridge of a mountain, near S. Vittorino.

AMITTERE LEGEM TERRÆ, among lawyers, a phraſe importing the loſs of liberty of ſwearing in any court: The puniſhment of a champion overcome or yielding in battle, of jurors found guilty in a writ of attaint, and of a perſon outlawed.

AM-KAS, in hiſtory, a name given to a ſpacious ſaloon in the palace of the Great Mogul, where he gives audience to his ſubjects, and where he appears on ſolemn feſtivals with extraordinary magnificence. His throne is ſupported by ſix large ſteps of maſſy gold, ſet with rubies, emeralds, and diamonds, eſtimated at 60,000,000l.

AMMA, among eccleſiaſtical writers, a term uſed to denote an abbeſs or ſpiritual mother.

AMMAN, or AMMANT, in the German and Belgic polity, a judge who has the cognizance of civil cauſes. It is alſo uſed among the French for a public notary, or officer, who draws up inſtruments and deeds.

AMMANIA; a genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The characters are theſe: The *calyx* is an oblong, erect, bell-ſhaped perianthium, with eight ſtriæ, quadrangulated, octodentated, and perſiſtent. The *corolla* is either wanting, or it conſiſts of four ovate expanding petals inſerted into the calyx. The *ſtamina* conſiſt of four briſtly filaments the length of the calyx; the antheræ are didymous. The *piſtillum* has a large ovate germen, above; the ſtylus ſimple and very ſhort, the ſtigma headed. The *pericarpium* is a roundiſh four-celled capſule, covered by the calyx. The *ſeeds* are numerous and ſmall.—Of this genus there are three ſpecies, all of them natives of warm climates.

They have neither beauty nor any other remarkable property.

AMMI, BISHOP'S WEED; a genus of the digynia order, belonging to the pentandria claſs of plants; and ranking, in the natural method, under the 45th order, *Umbellatæ*. The characters are theſe: Of the *calyx* the univerſal umbel is manifold; the partial one ſhort and crowded; the involucra are pinnatifid, with numerous leaflets. The *corolla* are radiated, and all hermaphrodite. The *ſtamina* conſiſt of five capillary filaments: the antheræ roundiſh. The *piſtillum* has a germen beneath. The ſtyli are two, and reflected; and the ſtigmata are obtuſe. There is no *pericarpium*; the fruit is roundiſh, poliſhed, ſtriated, ſmall, and partible. The *ſeeds* are two, plano-convex, and ſtriated. Of this there are three ſpecies. 1. The majus, or common biſhop's-weed. 2. The glaucifolium, with all its leaves ſhaped like a ſpear. 3. The copticum, or Egyptian biſhop's weed. The firſt is an annual plant, and therefore to be propagated by ſeeds ſown in the autumn. They will grow in any open ſituation. The ſecond ſort is perennial and very hardy. It thrives beſt in a moiſt ſoil, and may be propagated in the ſame manner as the former. The third ſpecies is now no otherwiſe known than by the figure of its ſeeds, which were formerly uſed in medicine.

AMMOCHRYSOS, from αμμος *ſand*, and χρυσος gold, a name given by authors to a ſtone very common in Germany, and ſeeming to be compoſed of a golden ſand. It is of a yellow gold-like colour, and its particles are very gloſſy, being all fragments of a coloured talc. It is uſually ſo ſoft as to be eaſily rubbed to a powder in the hand; ſometimes it requires grinding to powder in a mortar, or otherwiſe. It is uſed as ſand to ſtrew over writing.

AMMODYTES, or SAND-EEL, in ichthyology, a genus of fiſhes belonging to the order of apodes. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head is compreſſed, and narrower than the body; the upper jaw larger than the under; the body cylindrical, with ſcales hardly perceptible. There is but one ſpecies, viz. the tobianus, or launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre. It is found in moſt of our ſandy ſhores during the ſummer-months; where it conceals itſelf, in places where the water is left, about a foot deep. They are uſed as baits for other fiſh, but are alſo very delicate eating. Theſe fiſh are found in the ſtomach of the *Porpeſs*; an argument that the laſt roots up the ſand with its noſe, as hogs do the ground.

AMMON, anciently a city of Marmarica, Arrian calls it a *place*, not a city, in which ſtood the temple of Jupiter Ammon, round which there was nothing but ſandy waſtes. Here a kind of foſſil ſalt was ſaid to be dug out of the earth in large oblong pieces, and tranſparent as cryſtal. It was thought to be a preſent worthy of kings, and was uſed by the Egyptians in their ſacrifices: from this our ſal-ammoniac has taken its name.

AMMON, or HAMMON, in heathen mythology, the name of the Egyptian Jupiter, worſhipped under the figure of a ram. Hammon, the god of the Egyptians, was the ſame with the Jupiter of the Greeks.

AMMONIAC, a concrete gummy reſinous juice, brought from the Eaſt Indies, uſually in large maſſes, compoſed of little lumps or tears, of a milky colour, but ſoon changing, upon being expoſed to the air, to a yellowiſh hue. We have no certain account of the plant which affords this juice; the ſeeds uſually found among the tears reſemble thoſe of the umbelliferous claſs. It has been, however, alledged, and not without ſome degree of probability, that it is an exudation from a ſpecies of the FERULA, another ſpecies of which produces the aſafœtida. The plant producing it is ſaid to grow in Nubia, Abyſſinia, and the interior parts of Egypt. It is brought to the weſtern part of Europe from Egypt, and to England from the Red Sea, by ſome of the ſhips belonging to the Eaſt India Company trading to thoſe parts. Ammoniac has a nauſeous ſweet taſte, followed by a bitter one; and a peculiar ſmell, ſomewhat like that of galbanum, but more grateful. It is extremely uſeful in medicine, particularly in complaints of the lungs. In the aſthma phyſicians uſually join it with ſquills, and find its operation very ſalutary. In the ſhops is prepared a ſolution of it in pennyroyal water, called from its milky colour, *lac ammoniaci*. It is an ingredient alſo in many different plaſters.

Sal AMMONIAC: of this two kinds have been heretofore deſcribed; the *crude*, or that lately denominated by the College of Phyſicians *ammonia muriata*; and the *volatile*, or *ammonia præparata*. The latter is the kind of ſalt of which ſmelling bottles are prepared. The former is an article of manufacture, and of great uſe both in medicine and in the arts. See CHEMISTRY.

AMMONIAN PHILOSOPHY; that of which Ammonius, ſurnamed Saccas, was the teacher, about the beginning of the third century. It was calculated to produce a general coalition of all ſects, whether philoſophical or religious.

AMMONITÆ, in natural hiſtory. See CORNU *Ammonis*.

AMMONITES, a people deſcended from Ammon, the ſon of Lot; and whoſe hiſtory we read in the holy ſcriptures.

AMMONIUS, ſurnamed LITHOTOME, a celebrated ſurgeon of Alexandria; ſo called from his inventing the operation of extracting the ſtone from the bladder.

AMMUNITION, a general name for all warlike proviſions; but more particularly powder, ball, &c.—Ammunition, arms, utenſils of war, gunpowder, imported without licence from his Majeſty, are, by the laws of England, forfeited, and triple the value. And again, ſuch licence obtained, except for furniſhing his Majeſty's public ſtores, is to be void, and the offender to incur a premunire, and to be diſabled to hold any office from the crown.

AMMUNITION, *Bread*, *Shoes*, &c. ſuch as are ſerved out to the ſoldiers of an army or garriſon.

AMNESTY, in matters of policy, denotes a pardon granted by a prince to his rebellious ſubjects, uſually with ſome exceptions: ſuch was that granted by Charles II. at his reſtoration. The word is from the Greek αμνηστια, the name of an edict of this kind publiſhed by Thraſibulus, on his expulſion of the tyrants out of Athens.

AMNIOS, in anatomy, a thin pellucid membrane which ſurrounds the fœtus in the womb. See FOETUS.

AMOEBÆUM, in ancient poetry, a kind of poem repreſenting a diſpute between two perſons, who are made to anſwer each other alternately: ſuch are the third and ſeventh of Virgil's eclogues.

AMOL, a town of Aſia, in the country of the Uſbecks, ſeated on the river Gihon; E. long. 64. 30. N. Lat. 39. 20.

AMOMUM, GINGER; a genus of the monogynia order, belonging to the monandria claſs of plants. The characters are theſe: The *calyx* is an obſcure three-toothed perianthium, above. The *corolla* is monopetalous, the tubus ſhort, the limbus tripartite. The *ſtamina* is an oblong filament, with the anthera adjoining. The *piſtillum* has a roundiſh germen, beneath; the ſtylus is filiform, the ſtigma obtuſe. The *pericarpium* is leathery, ſubovate, trigonous, trilocular, and three-valved. The *ſeeds* are numerous.—Of this genus there are four ſpecies. 1. The zingiber, or common ginger, a native of the Eaſt and Weſt Indies; where it grows naturally without culture. The roots are jointed, and put out many green reed like ſtalks, which riſe to the height of two feet and an half with narrow leaves. 2. The zerumbet, or wild ginger, a native of India. The roots larger than thoſe of the firſt, but

jointed in the ſame manner. 3. The cardamomum, or cardamom, likewiſe a native of India, and little known in this country except by its ſeeds, which are uſed in medicine. Of this there is a variety, with ſmaller fruit, which makes the diſtinction into cardamomum majus and minus. 4. The grana paradiſi, alſo a native of the Eaſt Indies. The fruit is about the ſize of a fig, divided into three cells, in each of which are contained two rows of ſmall ſeeds like cardamoms. They are ſomewhat more grateful, and conſiderably more pungent, than cardamoms.

The two firſt ſpecies are tender, and require a warm ſtove to preſerve them in this country. They are eaſily propagated by parting the roots in the ſpring. Theſe ſhould be planted in pots filled with light rich earth, and plunged into a hot-bed of tanners'-bark, where they muſt conſtantly remain. Cardamoms and grains of paradiſe are not cultivated in this country. If we may believe the Abbé Raynal, the former propagate themſelves, in thoſe countries of which they are natives.

The dried roots of the firſt ſpecies are found to be of great uſe in the kitchen, as well as in medicine. They furniſh a conſiderable export from ſome of the American iſlands. The green roots, preſerved as a ſweet-meat, are preferable to every other kind. The Indians mix them with rice, which is their moſt common food, to correct its natural inſipidity. This ſpice, mixed with others, gives the diſhes ſeaſoned with it a ſtrong taſte, which is extremely diſagreeable to ſtrangers. Ginger is a very uſeful ſpice, and does not heat ſo much as thoſe of the pepper kind. The cardamoms and grains of paradiſe have the ſame medicinal qualities with ginger, and are uſed occaſionally in the compoſition of warm purging tinctures.

Amomum *Verum*, or *True Amomum*, is a round fruit, about the ſize of a middling grape; containing, under a membranous cover, a number of ſmall rough angular ſeeds, of a blackiſh brown colour on the outſide, and whitiſh within. The ſeeds are lodged in three diſtinct cells: thoſe in each cell are joined cloſely together, ſo as that the fruit, upon being opened, appears to contain only three ſeeds. Ten or twelve of theſe fruits grow together in a cluſter; and adhere without any pedicle, to a woody ſtalk about an inch long. Each ſingle fruit is ſurrounded by ſix leaves, in form of a cup; and the part of the ſtalk void of fruit is clothed with leafy ſcales. The huſks, leaves, and ſtems, have a light grateful ſmell, and a moderately warm aromatic taſte; the ſeeds, freed from the huſks, are in both reſpects much ſtronger; their ſmell is quick and penetrating, their taſte pungent, approaching to that of camphor. Notwithſtanding amomum is an elegant aromatic, it has long been diſuſed in medicine.

Amomum *Vulgare*. See Sison.

AMORÆANS, a ſect or order of gemaric doctors, or commentators on the Jeruſalem Talmud. The Amoræans ſucceeded the Miſchnic doctors. They ſubſiſted 250 years; and were ſucceeded by the Seburæans.

AMORITES, a people deſcended from Amorrhæus, according to the Septuagint and Vulgate; Emoræus, according to other expoſitors; Hæmori, according to the Hebrew; or Emorite according to our verſion of the bible; who was the fourth ſon of Canaan, Gen. x. 16. The name Amorite is often taken in Scripture for all Canaanites in general.

AMORIUM, a town of Phrygia Major, near the river Sangarius, on the borders of Galatia.

AMORPHA, False Indigo; a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The characters are theſe: The *calyx* is a ſingle-leaved perianthium, tubular and perſiſtent. The *corolla* conſiſts of an ovate, concave, erect petal, ſcarcely larger than, and placed on the upper ſide of, the calyx. The *ſtamina* conſiſt of ten erect unequal filaments, longer than the corolla; the anthcræ are ſimple. The *piſtillum* has a roundiſh germen; the ſtylus ſubulated, and the length of the ſtamina; the ſtigma ſimple. The *pericarpium* is a lunated unilocular legumen, reflected, larger than the calyx, and tuberculated. The *ſeeds* are two, and kidney-ſhaped. By the corolla alone this genus may be diſtinguiſhed from all the known plants in the univerſe. The petals are the banner, the wings and keel are wanting; which is very ſingular in a papilionaceous corolla. Of this there is only one known ſpecies, a native of Carolina, where the inhabitants formerly made from it a coarſe kind of indigo, whence the plant took its name. It riſes, with many irregular ſtems, to the height of 12 or 14 feet. The leaves are late in the ſpring before their foliage is fully diſplayed. The ends of their branches are generally deſtroyed by the froſt; or, if they recover it, they have the appearance of being dead; whilſt other plants teſtify the effects of the reviving months. But, notwithſtanding theſe defects, this tree has many good properties; and on account of its beauty is well worth cultivating. The ſeeds of the amorphia were firſt ſent to England in 1724, and many plants raiſed in the gardens near London. Theſe were of quick growth, and ſeveral produced flowers in three years. The amorpha is moſt readily propagated by ſeeds, which ought to be procured annually from America. It may alſo be propagated by laying down the young branches, which in one year will make good roots; and may then be taken off, and planted either in the nurſery, or in the places where they are deſigned to remain.

AMORTIZATION, in law, the alienation of lands or tenements to a corporation or fraternity and their ſucceſſors. See Mortmain.

AMOY, an iſland in the province of Fokien, in China, where the Engliſh once had a factory. Long. 136. 0. Lat. 24. 30.

AMPELIS, the vine, in botany. See Vitis.

Ampelis, the *Chatterer*, in zoology, a genus of birds belonging to the order of paſſeres; the diſtinguiſhing characters of which are, that the tongue is furniſhed with a rim or margin all round, and the bill is conical and ſtrait. There are 7 ſpecies, all natives of foreign countries, except the garrulus, which is a native both of Europe and the Weſt Indies. They are gregarious; feed on grapes, where vineyards are cultivated; are eaſily tamed; and are eſteemed delicious food. This ſpecies is about the ſize of the blackbird: the bill is ſhort, thick, and black; on the head is a ſharp pointed creſt reclining backwards; the lower part of the tail is black; the end of a rich yellow; the quill-feathers are black, the three firſt tipt with white; the ſix next have half an inch of their exterior margin edged with fine yellow, the interior with white. But what diſtinguiſhes this from all other birds, is the horny appendages from the tips of ſeven of the ſecondary feathers, and which are of the colour and gloſs of the beſt red wax.

AMPELITES, cannel-coal, or candle-coal, a hard, opaque, foſſile, inflammable ſubſtance, of a black colour. It does not effervesce with acids. Though much inferior to jet in many reſpects, it is yet a very beautiful foſſile; and, for ſo compact a body, remarkably light. Examined by the microſcope, it appears compoſed of innumerable very ſmall and thin plates, laid cloſely and firmly on one another; and full of very ſmall ſpecks of a blacker and more ſhining matter than the reſt, which is evidently a purer bitumen than the general maſs. It is dug in many parts of England, but the fineſt is in Lancaſhire and Cheſhire; but it lies uſually at a conſiderable depth. It makes a very briſk fire, flaming violently for a time, and then becoming red and glowing hot a long while; and finally is reduced into a ſmall proportion of grey aſhes, the

greater part of its ſubſtance having flown off in the burning.—It is capable of a very high and elegant poliſh; and in the countries where it is produced, is formed into a vaſt number of toys, as ſnuff-boxes and the like, which bear all the nicety of turning.

AMPHERES, in antiquity, a kind of veſſels, wherein the rowers plied two oars at the ſame time, one with the right hand and another with the left.

AMPHIATHROSIS, in anatomy, a term for ſuch junctures of bones as have an evident motion, but different from the diarthroſis, &c. See DIARTHROSIS.

AMPHIARAUS, in pagan mythology, a celebrated prophet, who poſſeſſed part of the kingdom of Argos. He was believed to excel in divining by dreams, and is ſaid to be the firſt who divined by fire.

AMPHIBIA, in zoology, the third claſs of animals, whoſe eſſential characters are, according to Linnæus, that they have either a naked, or elſe a ſcaly body, with no grinders, or *dentes molares*, their teeth all ſharp and pointed, and without radiated fins; or, their heart has but one ventricle, and they reſpire through their lungs. This claſs is divided into three others, viz. *reptiles*, *ſerpents*, and the ſwimming *amphibia*, comprehending 24 genera, and 289 ſpecies.

The word comes from αμφι *utrumque*, *both ways*, and βιος *vita*, *life*; as living in either place, which ſeems to imply, that animals termed *amphibious* ſhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conſtantly at will: but it will be difficult to find any animal that can fulfil this definition. Dr. Parſons therefore, from conſidering their œconomy reſpectively, divides them into two orders, viz. 1. Such as enjoy their chief functions by land, but occaſionally go into the water. 2. Such as chiefly inhabit the water, but occaſionally go aſhore.

Moſt of the *amphibious* kind, the *caſtor* and *otter* excepted, have peculiar proviſions in their ſtructure, to fit them for ſo various a way of living; particularly in the heart, and lungs. In ſome of theſe animals, as the *frog*, *tortoiſe*, &c. the heart has but one cavity, with an artery to receive the blood coming out of it, and a vein to convey it thither. In others, the *foramen ovale* appears to be ſtill open for the paſſage of the blood from the *vena cava* to the *arteria venoſa*, without the help of breathing. In the *caſtor*, diſſected by the academiſts of Paris, though the *foramen* was not found actually open, yet the marks of it appeared; and the cauſe of its cloſure might well enough be accounted for, from the animal's having been detained a good while from the water, by which the part having been in diſuſe, cloſed up. In the *otter* the caſe is different; there is no appearance of any thing like a *foramen*, and hence the neceſſity the creature is under of riſing from time to time above water, to take in air. (Phil. Tranſ. N° 124.) The ſtructure of the feet of the *caſtor* pronounces it *amphibious* at firſt ſight, the fore-feet being formed like thoſe of terreſtrial animals, who hold their food in their feet, e. g. ſquirrels, while the hind feet are faſhioned after the manner of river-fowl, with webs or membranes between the toes, as the gooſe, duck, &c.

A great part of the fly-kind may be ſaid, in one ſenſe, to be *amphibious*. Gnats drop their eggs in water, where hatching, the young live and breathe after the manner of fiſhes, till at length undergoing a metamorphoſis, they take wing, quit their native element, and become inhabitants of the air. May not ſwallows alſo be ranged under this claſs, which have been ſometimes found to paſs their winter aſleep under water, from which the warmth of the ſpring awakes, and calls them forth?

Elias Geiſsler has written expreſsly concerning *amphibious* animals. M. Ottwald of Dantzick has left behind him anatomical obſervations on *amphibious* animals. Dr. Hunter obſerves that properly ſpeaking, there are no *amphibious* animals; for that fiſh cannot live long without air, though much longer than men. See two ingenious diſſertations on this ſubject by Dr. Parſons, Phil. Tranſ. vol. lvi.

It has been advanced, that *man* may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts *in ſtatu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alleged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a-day, that the blood might be forced to reſume its priſtine paſſage, and prevent its cloſing up as it uſually does. This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers, who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open.—A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain, to continue twice twenty-four hours under water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the *fiſh Colas*, who, by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than a man.

AMPHIBOLOGY, in grammar and rhetoric, a term uſed to denote a phraſe ſuſceptible of two different interpretations. Amphibology ariſes from the order of the phraſe, rather than from the ambiguous meaning of a word. Of this kind was that anſwer which Pyrrhus received from the oracle: *Aio te, Æacida, Romanos vincere poſſe;* where the amphibology conſiſts in this, that the words *te* and *Romanos*, may either of them precede, or either of them follow, the words *poſſe vincere*, indifferently. The Engliſh language uſually ſpeaks in a more natural manner, and is not capable of any amphibologies of this kind: nor is it ſo liable to amphibologies in the articles, as the French and moſt other modern tongues.

AMPHIBRACHYS, in ancient poetry, the name of a foot conſiſting of three ſyllables, whereof that in the middle is long, and the other two ſhort; ſuch is the word "ābīrĕ."

AMPHICOME, in natural hiſtory, a kind of figured ſtone, of a round ſhape, but rugged, and beſet with eminences, celebrated on account of its uſe in divination. The word is originally Greek, αμφικομη, *q. d. utrinque comata*, or "hairy on all ſides." This ſtone is alſo called *Erotylos*, Ερωτυλος, *Amatoria*, probably on account of its ſuppoſed power of creating love. The amphicome is mentioned by Democritus and Pliny, though little known among the moderns.

AMPHICTYONS, in Grecian antiquity, an aſſembly compoſed of deputies from the different ſtates of Greece; and reſembling, in ſome meaſure, the diet of the German empire. Authors give different accounts of the number of the Amphyctyons, as well as of the ſtates that were entitled to have their repreſentatives in this council. They decided all public differences and diſputes between any of the cities of Greece; but before they entered on buſineſs, they jointly ſacrificed an ox cut into ſmall pieces, as a ſymbol of their union. Their determinations were received with the greateſt veneration, and even held ſacred and inviolable. The ſtated terms of their meeting was in ſpring and autumn; the ſpring was called Εαρινη Πυλαια, that in autumn Μετοπωρινη. On extraordinary occaſions, however, they met at any time of the year, or even continued ſitting all the year round. Philip of Macedon uſurped the right of preſiding in the aſſembly of the Amphictyons, and of firſt conſulting the oracle which was called Προμαντεια.

AMPHIDROMIA, a feaſt celebrated by the ancients on the fifth day after the birth of a child.

AMPHIDRYON, in eccleſiaſtical writers, denotes the veil

or curtain which was drawn before the door of the bema in ancient churches.

AMPHIMACER, in ancient poetry, a foot conſiſting of three ſyllables, whereof the firſt and laſt are long, and that in the middle ſhort; ſuch is the word "Cāſtĭtās."

AMPHION, ſon of Jupiter and Antiope; who, according to the poets, made the rocks follow his muſic; and at his harp the ſtones of Thebes danced into walls and a regular city.

AMPHIPOLES, in antiquity, the principal magiſtrates of Syracuſe. They were eſtabliſhed by Timoleon in the 109th Olympiad, after the expulſion of the tyrant Dionyſius. They governed Syracuſe for the ſpace of 300 years: and Diodorus Siculus aſſures us, that they ſubſiſted in his time.

AMPHIPOLIS, a city of Macedonia, an Athenian colony, on the Strymon, but on which ſide is not known.

AMPHIPOLIS, a town of Syria, on the Euphrates, built by Seleucus, called by the Syrians *Turmeda*.

AMPHIPPII, in Grecian antiquity, ſoldiers who, in war, uſed two horſes without ſaddles, and were dexterous enough to leap from one to the other.

AMPHIPRORÆ, in the naval affairs of the ancients, veſſels with a prow at each end. They were uſed chiefly in rapid rivers and narrow channels, where it was not eaſy to tack about.

AMPHIPROSTYLE, in the architecture of the ancients, a temple which had four columns in the front, and as many in the aſpect behind.

AMPHISBÆNA, in zoology, a genus of ſerpents belonging to the order of amphibia ſerpentes, ſo called from the falſe notion of its having two heads, becauſe it moves with either end foremoſt. The head of the amphiſbæna is ſmall, ſmooth, and blunt; the noſtrils are very ſmall; the eyes minute and blackiſh; and the mouth furniſhed with a great number of ſmall teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex ſegments like thoſe of a worm; and it has about 40 longitudinal ſtreaks, of which 12 on each ſide are in the form of ſmall croſſes like the Roman X; the anus is a tranſverſe ſlit; and the laſt ring or ſegment of the belly has eight ſmall papillæ, forming a tranſverſe line before the anus; the tail, *i. e.* all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white. It has a great reſemblance to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies, viz. 1. The fulginoſa, which anſwers exactly to the above deſcription, and is found in Libya and in different parts of America. 2. The alba, which is totally white, is a native of both the Indies, and is generally found in ant-hillocks. The bite of the amphiſbæna is reckoned to be mortal by many authors; but as it is not furniſhed with dog fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earthworms, but particularly the latter. See pl. 5.

AMPHISBÆNA *Aquatica*, a name given by authors to that long and ſlender inſect commonly called the *ſeta aquatica*, and *vermis ſetarius*. It has the name *amphiſbæna*, from its going backwards or forwards with equal eaſe and celerity. The uſual ſize is four or five inches long, and the thickneſs of a large hair. Two or three of theſe worms are generally to be found in the body of the common black beetle. When put into water they will live a conſiderable time, and ſwim nimbly about; but often put up their heads as if endeavouring to eſcape; and ſometimes faſtening themſelves by the mouth to the ſides of the veſſel, and drawing their whole bodies after them. Theſe creatures are not only found in water, but buried in earth, and ſometimes on the leaves of trees, in our gardens and hedges.

AMPHISCII, among geographers, a name applied to the people who inhabit the torrid zone. The Amphiſcii, as the word imports, have their ſhadows one part of the year towards the north, and the other towards the ſouth, according to the ſun's place in the ecliptic. They are alſo called Asci, which ſee.

AMPHITANE, among ancient naturaliſts, a ſtone ſaid to attract gold as the loadſtone does iron. Pliny ſays it was found in that part of the Indies where the native gold lay ſo near the ſurface of the earth as to be turned up in ſmall maſſes among the earth of ant-hills; and deſcribes it to have been of a ſquare figure, and of the colour and brightneſs of gold. The deſcription plainly points out a well-known foſſil, called, by Dr. Hill, *pyricubium*: this is common in the mines of moſt parts of the world; but its power of attracting gold is fabulous.

AMPHITHEATRE, in antiquity, a ſpacious edifice, built either round or oval, with a number of riſing ſeats, from whence the people uſed to behold the combats of gladiators, of wild beaſts, and other ſports. Amphitheatres were at firſt only of wood; and it was not till the reign of Auguſtus, that Statilius Taurus built one for the firſt time of ſtone. The loweſt part was of an oval figure, and called *arena*, becauſe, for the conveniency of the combatants, it was uſually ſtrewed with ſand; and round the arena were vaults ſtyled *caveæ*, in which were confined the wild beaſts appointed for the ſhews. Above the caveæ was erected a large circular periſtyle, or podium, adorned with columns. This was the place of the emperors, ſenators, and other perſons of diſtinction. The rows of benches were above the podium. Their figure was circular; and they were entered by avenues, at the end of which were gates called *vomitoriæ*. Their theatre was built in form of a ſemicircle, only exceeding a juſt ſemicircle by one fourth part of the diameter; and the amphitheatre was nothing elſe but a double theatre, or two theatres joined together: ſo that the longeſt diameter of the amphitheatre was to the ſhorteſt as $1\frac{1}{2}$ to 1.

There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *Coliſeum*, and that at Verona in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre at Pola, an ancient republic of Iſtria, is very entire: it conſiſts of two orders of Tuſcan pillars, one over the other. The lower have pedeſtals, which is extraordinary; this order having ſcarce ever more than baſes to ſupport them. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators. That of Verona is the beſt preſerved: for though moſt of the great and beſt ſtones of the outſide are picked out, yet the great vault, on which the rows of the ſeats are laid, is entire; the rows alſo (which are 44 in number) are entire. Every row is a foot and a half high, and as much in breadth; ſo that a man ſits conveniently in them; and allowing for a ſeat a foot and a half, the whole will hold 23,000 perſons. Pliny mentions an amphitheatre built by Curio, which turned on large iron pivots; ſo that of the ſame amphitheatre two ſeveral theatres were occaſionally made, whereon different entertainments were ſometimes preſented at the ſame time. Mr. Brydone (vol. i. p. 295.) mentions an amphitheatre at Syracuſe, the theatre of which is ſo entire, that the *gradini* for ſeats ſtill remain; but it is a ſmall theatre, he ſays, in compariſon of the others. See Pl. 1. *Veſpaſian's* amphitheatre.

AMPHITHEATRE, in gardening, certain diſpoſitions of trees and ſhrubs on the ſides of hilly places, which, if the hill or riſing be naturally of a circular figure, always have a good effect. They are uſually formed of evergreens, ſuch as hollies, phillereys, lauruſtines, bays, &c. obſerving to plant the ſhorteſt growing trees in the front, and thoſe which will be the talleſt behind. Amphitheatres are alſo ſometimes formed of ſlopes

on the ſides of hills, covered only with turf; and, when well kept, they are a great ornament to large gardens.

AMPHITRITE, αμφιτριτη, from αμφι, and τριζω *ſono*, in the heathen mythology, the wife of Neptune, and goddeſs of the ſea, ſometimes taken for the ſea.

AMPHITRYON, ſon of Alcæus, leſs known by his own exploits than from thoſe of his wife Alcmena.

AMPHORA, in antiquity, a liquid meaſure among the Greeks and Romans. The Roman amphora contained 48 ſextaries, equal to about 7 gallons 1 pint Engliſh wine-meaſure; and the Grecian or Attic amphora contained $\frac{1}{3}$ more. AMPHORA was alſo a dry meaſure uſed by the Romans, and contained about 3 buſhels. AMPHORA, among the Venetians, is the largeſt meaſure uſed for liquids, containing about 16 quarts.

AMPHORARIUM VINUM, in antiquity, denotes that which is drawn or poured into *amphoræ* or pitchers; by way of diſtinction from *vinum doliare*, or caſk wine. The Romans had a method of keeping wine in *amphoræ* for many years to ripen, by faſtening the lids tight down with pitch or gypſum, and placing them either in a ſituation where the ſmoke came, or under ground.

AMPHOTIDES, in antiquity, a kind of armour or covering for the ears, worn by the ancient pugiles, to prevent their adverſaries from laying hold of that part.

AMPLIATION, in Roman antiquity, the deferring to paſs ſentence in certain cauſes. This the judge did, by pronouncing the word *amplius*; or by writing the letters N. L. for *non liquet*; thereby ſignifying, that, as the cauſe was not clear, it would be neceſſary to bring further evidence.

AMPLIFICATION, in rhetoric, that part of a diſcourſe or ſpeech, wherein a crime is aggravated, a praiſe or commendation heightened, or a narration enlarged, by an enumeration of circumſtances; ſo as to excite the proper emotions in the ſouls of the auditors. Such is the paſſage in Virgil, where, inſtead of ſaying merely that Turnus died, he amplifies the circumſtances of his death.

— Aſt illi ſolvuntur frigore membra,
Vitaque cum gemitu fugit indignata ſub umbras.

Amplification is reckoned by critics the very foul of diſcourſe.

AMPLITUDE, in aſtronomy, an arch of the horizon intercepted between the eaſt or weſt point and the centre of the ſun, or a planet, at its riſing or ſetting; and ſo is either north and ſouth, or orative and occaſive.

Magnetical AMPLITUDE, the different riſing or ſetting of the ſun from the eaſt or weſt points of the compaſs. It is found by obſerving the ſun, at his riſing and ſetting, by an amplitude-compaſs.

AMPSAGA, a river of ancient Numidia.

AMPSANCTI VALLIS, or AMPSANCTI LACUS, a cave or lake in the heart of the Hirpini, or Principato Ultra, near the city Tricento. It is now called *Moffetta*, from Mephitis, the goddeſs of ſtench, who had a temple there.

AMPTHILL, a town in Bedfordſhire, ſeated between two hills. W. long. 0. 29. N. lat. 52. 2.

AMPULLA, in antiquity, a round big-bellied veſſel which the ancients uſed in their baths, to contain oil for anointing their bodies. Alſo the name of a cup for drinking out of at table.

AMPULLA, among eccleſiaſtical writers, denotes one of the ſacred veſſels uſed at the altar. Ampullæ were alſo uſed for holding the oil uſed in chriſmation, conſecration, coronation, &c. Among the ornaments of churches we find frequent mention made of ampuls or vials. In the inventory of the cathedral of Lincoln we meet with ampuls of cryſtal, variouſly enriched with ſilver feet and covers; one containing a tooth of St. Chriſtopher, another a tooth of St. Cecily, another a bone of the head of St. John the Baptiſt.

Knights of St. AMPULLA, belong to an order inſtituted by Clovis I. king of France: at the coronation they bear up the canopy, under which the ampulla is carried in proceſſion.

AMPURA, a province of the kingdom of Peru, before its conqueſt by the Spaniards. Here the inhabitants worſhipped two lofty mountains from a principle of gratitude, becauſe of the deſcent of the water from them by which their lands were fertilized. It is ſaid to have been conquered by Virachoca the eighth inca.

AMPURIAS, the capital of the territory of Ampurdan, in Catalonia, ſeated at the mouth of the river Fluvia, in E. long. 2. 56. N. lat. 42. 5.

AMPUTATION, in ſurgery, the cutting off a limb, or any part, from the body. See SURGERY.

AMRAS, a ſtrong caſtle of Germany, ſeated in Tirol; by ſome German writers called *Arx Ambroſiana*. E. long. 11. 40. N. lat. 47. 0.

AMSANCTI. See AMPSANCTI.

AMSBURY, or AMBERSBURY, a town in Wiltſhire, lying in W. long. 1. 20. N. lat. 51. 29. It is the *Pagus Ambri*, famous for a monaſtery built by one Ambrus, and afterwards for a nunnery of noble women. It is 80 miles W. of London, and 6 N. of Saliſbury.

AMSDORFIANS, in church-hiſtory, a ſect of Proteſtants in the 16th century, who took their name from Amſdorf their leader. They maintained, that good works were not only unprofitable, but were obſtacles to ſalvation.

AMSTERDAM, the capital city of the province of Holland and of the United Netherlands, is ſeated on the river Amſtel and an arm of the ſea called the *Wye*. The air is but indifferent, on account of the marſhes that ſurround it, and render the city almoſt inacceſſible: but this inconvenience is abundantly recompenſed by the utility of its commerce, which the port ſerves greatly to promote; for it will contain above a thouſand large ſhips. Its walls are high, and well fortified; and the bridge which joins the rampart is built over the river Amſtel, and is one of the fineſt pieces of architecture in theſe parts. Few cities have their public buildings ſo fine, numerous, and well-kept. Here are many handſome churches, and hoſpitals for perſons of all ages, religions, and countries. One great cauſe of the populouſneſs of Amſterdam is their tolerating all religions, who have the uſe of churches and bells; though the eſtabliſhed religion is Calviniſm. The exchange is one of the principal ornaments of the city, and the harbour is one of the largeſt and fineſt in Europe, where a vaſt number of merchant ſhips may always be ſeen; though there is a bar at its entrance, which is, doubtleſs, a great ſecurity againſt foreign enemies. The foundation of this town is laid upon piles, driven into a moraſs, and under the ſtadthouſe alone are 13,000. The houſes are brick and ſtone, the ſtreets ſpacious and well-paved, and moſt of them have canals, with rows of trees on each ſide. It is computed to be about half as big as London, and none of the inhabitants are idle. It is governed by a college of 30 ſenators, who hold their places for life, and 12 burgomaſters, 4 of whom are always ſitting. It ſurrendered to the king of Pruſſia, on the 10th of Oct. 1787, when that prince invaded Holland, in favour of the ſtadtholder, but was evacuated on the reſtoration of the latter to his rights and honours. It is ſeated at the confluence of the rivers Amſtel and Wye 65, miles N. of Antwerp, 175 E. by N. of London, 240 N. by E. of Paris, and about 400 W. of Vienna. The longitude of Amſterdam is 4. 30. E. the latitude, 52. 25. N.

AMSTERDAM is also the name of an island in the south-sea, said to have been discovered by Tasman a Dutch navigator. It was visited by Captain Cook in his late voyages. Its greatest extent from east to west is about 21 miles, and from north to south about 13. It is broad at the east end, and runs taper towards the west, where it turns, and runs to a point due north. It is about 6 leagues to the west of Middleburgh. The shore is surrounded by a coral rock, and its most elevated parts are not above 6 or 8 yards above the level of the sea. S. lat. 21. 11. W. long. 175. It is wholly laid out in plantations, in which are cultivated some of the richest productions of nature.

AMULET, a charm, or preservative against mischief, witchcraft, or diseases. Amulets were made of stone, metal, simples, animals, and in a word of every thing that imagination suggested. See ABRACADABRA.

AMYCLÆ, a city of Laconia, distant about 18 miles from the metropolis, founded by Amyclas the son of Lacedæmon, and famed afterwards for the birth of Castor and Pollux the sons of Tyndareus, eighth king of Sparta.

AMYGDALUS, the ALMOND and PEACH; a genus of the monogynia order, belonging to the icosandria class of plants; and, in the natural method, ranking under the 36th order, *Pomaceæ*. The characters are: The *calyx* a single-leaved perianthium beneath, tubular, and quinquefid. The *corolla* consists of five oblong petals, which are inserted into the calyx. The *stamina* consist of 30 slender erect filaments half the length of the corolla, and inserted into the calyx; the antheræ are simple. The *pistillum* has a round villous germen above; a simple stylus, the length of the stamina; and the stigma headed. The *pericarpium* is a large roundish villous drupa, with a longitudinal furrow. The *seed* is an ovate compressed nut perforated in the pores. The species are, 1. The Communis, or Common Almond, a native of Africa, which grows to near 20 feet high; and whether planted singly, or mixed with other trees in clumps, shrubbery-quarters, &c. proves one of the finest flowering trees in nature. The white-flowering almond, well known in our nurseries, is a variety of this species, and is cultivated for the sake of the flowers and the fruit, though the flowers are inferior; and unless it be set against a south wall, in a well sheltered place, there will be little chance of fruit. 2. The Nana, Dwarf Almond, a native of Asia Minor. Of this shrub there are two sorts, the single and the double. Both grow to about 4 or 5 feet high, and both have their flowers arranged the whole length of the last year's shoots. Their colour is a delicate red; and they show themselves early in the spring, which still enhances their value. 3. The Persica, or Peach, is said to be a native of Europe; but of what place is not known. Cultivation has produced many varieties of this fruit; of which the most esteemed are, The White Nutmeg—Red Nutmeg—Early Purple—Small Mignon—White Magdalen—Yellow Alberge—Large French Mignon—Beautiful Chevreuse—Red Magdalen—Chancellor—Smith's Newington—The Montauban—Malta—Vineuse—Bellegarde—Bourdine—Rossanna—Admirable—Old Newington—Royal—Rambouillet—Portugal—Late Admirable—Nivette—Venus's Nipple—The Late Purple—Persique—Catharine—Monstrous Pavy, and lastly, The Bloody Peach. To go into a particular description of each of these, most of them being known in our gardens, would be superfluous.

The NECTARINE, according to Linnæus, is only a variety of the peach; its having a smooth coat being only an accident originally. Of this also many varieties are now cultivated; and the following are some of the most esteemed, viz. The Elruge—The Newington—The Scarlet—The Roman—The Murrey—The Italian—The Golden, and The Temple's. All the foregoing species are propagated by inoculating them into plum-stocks in August. The stocks should be first planted in the nursery when of the size of a straw; and the first or second summer after they will be ready to receive the bud. The usual method of inoculation must be observed, and there is no danger of success; though it may be proper to observe, that the double blossomed peach should always be worked into the stocks of the mussel-plum. The two sorts of dwarf almond may also be propagated by layers, or from the suckers, which they sometimes send forth in great plenty.

The varieties of the peach are produced like those of the finer flowers, by sowing the seeds; and though many raised this way will be of little value, as is also the case of flowers, yet probably among a parcel of stones, saved from the finer kinds of peaches, there would be some new kinds produced; which, as they were raised here, would be easily kept up in their perfection, which is not to be expected of those brought from other countries. The best method of saving the stones is, to let some of the finest peaches of the best kinds hang till they drop of themselves from the tree, and then the stones should be immediately planted on a bed of light dry earth, planting them about three inches deep in the earth, and at about 4 inches asunder. The beds should be covered to preserve them in the winter; and in spring, when the plants come up, they must be cleared of weeds, and well watered. The next spring they should be carefully taken up, and planted in the nursery, in rows 3 feet asunder, and one foot distant from each other; laying a little mulch upon the surface of the ground about their roots, and in a dry spring watering them once in a week; and after one or two years standing here, they may be removed to the places where they are to remain; or they may at that time, when the condition of their fruit is known, be grafted on other stocks.

There are two general rules given for the pruning of peach and nectarine trees; viz. 1. Always to have enough of bearing wood; And, 2. Not to lay in the branches too close to one another. All peach trees produce their fruit from the young wood either of the same, or at the most of the former year's shoot; for which reason the branches are to be so pruned, as to encourage them to throw out new shoots in every part of the tree: and this is to be done in May; when by pinching, or stopping the strong shoots, there may be new wood forced out in any part of the tree. This is the method of the summer pruning: the winter pruning is usually done in February or March; but is much better done at Michaelmas, as soon as their leaves begin to fall; and the wounds will then have time to heal before the severe frosts come on.

In pruning of these trees it must always be observed also, that it is best done under a wood bud, not a blossom bud; which may be distinguished by the wood bud's being less turgid, and longer and narrower than the blossom bud; for if the shoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the shoots to the wall, they should be placed at as equal distances as possible; and so far apart that the leaves may have room; and they must always be trained as horizontally as possible, that the lower part of the tree may be well wooded, which it will not be if the branches are suffered to run upright. When the fruit is set and grown to the size of a small nut, it should be thinned, and left 5 or 6 inches asunder: by this management the fruit will be larger and better tasted, and the trees in a condition to bear well the succeeding year. The quantity of fruit to be left on large full grown trees should never be greater than 5 dozen upon each; but on middling trees, 3 or 4 dozen will be enough. If the season should prove hot and dry, it will be proper to draw up the earth round the stem of each tree, to form a hollow bason of about 6 feet in diameter, and cover the surface of the ground in this bason with mulch; and once in a week or

fortnight, according to the drought of the ſeaſon, to pour down 8 or 10 gallons of water to the root of each tree; or the water may be ſprinkled by an engine over the branches of the trees, which, ſhaking down to the roots, will promote the growth of the fruit and prevent its falling off the trees. This, however, ſhould be continued only while the fruit is growing.

Sweet almonds afford little nouriſhment. In medicine they are moſtly uſed for making emulſions; as they abound not only with oil, but likewiſe with a mucilage fit for incorporating oil and water together. It has been common alſo to diſſolve in them a quantity of gum arabic, and to make patients drink freely of them, during the action of bliſters, in order to prevent ſtrangury. They are alſo uſed in caſes of gravel, and of inflammation of the bladder or urethra. Bitter almonds are not ſo much uſed as they were formerly; it having been diſcovered that a water drawn from them had deleterious effects, and that it bore ſome reſemblance to the diſtilled water from the lauro-ceraſus leaves, which contain a bitter reſembling that of bitter almonds, known to be poiſonous. Bitter almonds are, however, ſtill employed for making orgeate and other liquors, and without producing any bad effects.

AMYLACEOUS, from *amylum* ſtarch; a term applied to the fine flour of farinaceous ſeeds, in which conſiſts their nutritive part.

AMYNTA, in literary hiſtory, a beautiful paſtoral comedy, compoſed by Taſſo; the model of all dramatic pieces wherein ſhepherds are actors. The *Paſtor Fido*, and *Filli di Sciro*, are only copies of this excellent piece.

AMYNTOR, *αμυντωρ*, formed of the verb *αμυνω I defend*, or *avenge*, properly denotes a perſon who defends or vindicates a cauſe. In this ſenſe, Mr. Toland intitles his defence of Milton's life, *Amyntor*, as being a vindication of that work againſt Mr. Blackhall and others.

AMYRALDISM, a name given by ſome writers to the doctrine of univerſal grace, as explained and aſſerted by Amyraldus, or Moſes Amyrault, and others his followers, among the reformed in France, towards the middle of the 17th century.

AMYRIS; a genus of the monogynia order, belonging to the decandria claſs of plants. The characters are: The *calyx* a ſmall ſingle-leaved perianthium, four toothed and perſiſtent. The *corolla* conſiſts of four oblong petals, concave and expanding. The *ſtamina* conſiſt of 8 erect ſubulated filaments; the antheræ are oblong, erect, and the length of the corolla. The *piſtillum* has an ovate germen, above; a thickiſh ſtylus, the length of the ſtamina; and a four-cornered ſtigma. The *pericarpium* is a round drupaceous berry. The *ſeed* is a globular gloſſy nut. The moſt remarkable ſpecies are: 1. The elemifera, or ſhrub which bears the gum elemi, a native of South America, (ſee Pl. 5.) It grows to the height of about 6 feet, producing trifoliated ſtiff ſhining leaves, growing oppoſite to one another on footſtalks two inches long. At the ends of the branches grow 4 or 5 ſlender ſtalks ſet with many very ſmall white flowers. 2. The gileadenſis, or opobalſamum, an evergreen ſhrub, growing ſpontaneouſly in Arabia Felix, from whence the opobalſam, or balm of gilead, is procured. 3. Toxifera, or poiſon wood, a ſmall tree, with a ſmooth light-coloured bark; which grows uſually on rocks, in the Bahama iſlands. 4. The balſamifera, or roſe-wood, found on gravelly hills in Jamaica and the other Weſt India iſlands. It riſes to a conſiderable height, and the trunks are remarkable for having large protuberances on them. The leaves are laurel-ſhaped; the ſmall blue flowers are on a branched ſpike; and the berries are ſmall and black.

From the firſt ſpecies, which is called by the natives of the Braſils *icicariba*, is obtained the reſin improperly called *gum elemi*, or gum lemon. This drug is brought to us from the Spaniſh Weſt Indies, and ſometimes from the Eaſt Indies, in long roundiſh cakes, generally wrapped up in flag leaves. It gives name to one of the officinal unguents, but is not otherwiſe made uſe of in medicine. The ſecond ſpecies yields the balſam of Mecca, of Syria, or of Gilead, which is the moſt fragrant and pleaſant of any of the balſams. The true balſam tree is found near to Mecca, which is ſituated about a day's journey from the Red Sea, on the Aſiatic ſide. It has a yelloviſh or greeniſh yellow colour, a warm bitteriſh aromatic taſte, and an acidulous fragrant ſmell. It has long been held in great eſteem, and recommended in a great variety of complaints; but now it is generally believed that the Canada and copaiva balſams are medicines of equal efficacy. The balſamifera, or roſe-wood, affords an excellent timber of great uſe to cabinet makers. It is alſo replete with a fragrant balſam or oil, which it retains though expoſed to the weather many years. By ſubjecting this wood to diſtillation, a perfume nearly equal to the oleum rhodii may be obtained.

ANA, among phyſicians, denotes a quantity equal to that of the preceding ingredient. It is abbreviated thus, āā, or ā.

Ana, in matters of literature, a Latin termination, adopted into the titles of ſeveral books in other languages. *Anas*, or *books in ana*, are collections of the memorable ſayings of perſons of learning and wit; much the ſame with what we otherwiſe call *table-talk*. Wolfius has given the hiſtory of books in ana, in the preface to the Caſauboniana. He there obſerves, that though ſuch titles be new, the thing itſelf is very old; that Xenophon's books of the deeds and ſayings of Socrates, as well as the dialogues of Plato, are *Socratiana*. To this head of ana may likewiſe be referred the Orphica, the Pythagoræa, Æſopica, Pyrrhonea, &c.

ANABAPTISTON, the ſame with Abaptiston.

ANABAPTISTS, a name which has been indiſcriminately applied to Chriſtians of very different principles and practices; though many of them object to the denomination, and hold nothing in common, beſides the opinion that baptiſm ought always to be performed by immerſion, and not adminiſtered before the age of diſcretion.

The word Anabaptiſt is compounded of *ανα* new, and *βαπτιστης* a baptiſt; and in this ſenſe the Novatians, the Cataphrygians, and the Donatiſts, may be conſidered as a kind of Anabaptiſts in the earlier ages, though not then denoted by this name; for they contended, that thoſe Chriſtians of the catholic church who joined themſelves to their reſpective parties ſhould be rebaptized. But we muſt not claſs under the ſame denomination thoſe biſhops of Aſia and Africa, who, in the third century, maintained, that baptiſm adminiſtered by thoſe whom they called hereties was not valid, and therefore that ſuch of them as returned into their churches ought to be rebaptized. Nor do the Engliſh and Dutch Baptiſts conſider the denomination as at all applicable to their ſect: by whom the baptiſm appointed by Chriſt is held to be "nothing ſhort of *immerſion, upon a perſonal profeſſion of faith*;" of which profeſſion infants being incapable, and ſprinkling being no adequate ſymbol of the thing intended, the baptizing of proſelytes to their communion, who in their infancy had undergone the ceremony of ſprinkling, cannot, it is urged, be interpreted a repetition of the baptiſmal ordinance.

Anabaptiſts, in a ſtrict and proper ſenſe, appear to be thoſe who not only rebaptize, when they arrive at an adult age, perſons that were baptized in their infancy, but alſo, as often as any perſon comes from one of their ſects to another, or as often as any one is excluded from their communion and again received into the boſom of their church, they baptize him. And ſuch were many of the German Baptiſts. But the ſingle opinion common to all the ſects to which the name of *Anabaptiſts* has been indiſcriminately applied, is that of the invalidity of

infant baptiſm, in whatever way adminiſtered. And hence the general denomination of *Antipædobaptiſts*; which includes Anabaptiſts, Baptiſts, Mennonites, Waterlandians, &c. as diſtinguiſhed by their reſpective peculiarities; though *Anabaptiſts* ſeem to have been adopted by moſt writers as the general term.

ANABASII, in antiquity, were couriers who were ſent on horſeback, or in chariots, with diſpatches of importance.

ANABATHRA, in ancient writers, denote a kind of ſteps or ladder whereby to aſcend to ſome eminence. In this ſenſe we read of the anabathra of theatres, pulpits, &c. Anabathra appears to have been ſometimes alſo applied to ranges of ſeats riſing gradually over each other.

ANABATHRA is more particularly applied to a kind of ſtone blocks raiſed by the highway ſides, to aſſiſt travellers in mounting or alighting, before the uſe of ſtirrups was invented. The firſt author of this contrivance among the Romans was C. Gracchus brother of Tiberius.

ANABLEPS, in ichthyology, the trivial name of a ſpecies of cobitis. See COBITIS.

ANABOA, a ſmall iſland ſituated near the coaſt of Loango in Africa, in E. long. 9°. N. lat. 1°.

ANABOLÆUM, or ANABOLE, in antiquity, a kind of great or upper coat, worn over the tunica.

ANABOLEUS, in antiquity, an appellation given to grooms of the ſtable, or equerries, who aſſiſted their maſters in mounting their horſes. As the ancients had no ſtirrups, or inſtruments that are now in uſe for mounting a horſe, they either jumped upon his back, or were aided in mounting by anabolei.

ANACALYPTERIA, according to Suidas, were preſents made to the bride by her huſband's relations and friends when ſhe firſt uncovered her face and ſhowed herſelf to men. Theſe preſents were alſo called επαυλεια: for, among the Greeks, virgins before marriage were under ſtrict confinement, being rarely permitted to appear in public, or converſe with the other ſex; and when allowed that liberty, wore a veil over their faces, termed Καλυπτρον, or Καλυπτρα, which was not left off in the preſence of men till the third day after marriage; whence, according to Heſychius, this day was alſo called *anacalypterion*.

ANACAMPSEROS, in botany, a ſynonime of the portulaca and ſeveral other plants.

ANACAMPTERIA, in eccleſiaſtical antiquity, a kind of little edifices adjacent to the churches, deſigned for the entertainment of ſtrangers and poor perſons.

ANACAMPTIC, a name applied by the ancients to that part of optics which treats of reflection, being the ſame with what is now called CATOPTRICS.

ANACARDIUM, or CASHEW-NUT TREE: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The characters are theſe: The *calyx* is divided into five parts, the diviſions ovate and deciduous. The *corolla* conſiſts of five reflected petals, twice the length of the calyx. The *ſtamina* conſiſt of ten capillary filaments ſhorter than the calyx, one of them caſtrated; the antheræ are ſmall and roundiſh. The *piſtillum* has a roundiſh germen; the ſtylus is ſubulated, inflected, and the length of the corolla; the ſtigma oblique. There is no *pericarpium*; the receptaculum is very large and fleſhy. The *ſeed* is a large kidney-ſhaped nut, placed above the receptaculum.

Of this only one ſpecies is as yet known to botaniſts, viz. the occidentale, which grows naturally in the Weſt Indies, and arrives at the height of 20 feet, but cannot be preſerved in Britain without the greateſt difficulty. The fruit of this tree, (ſee Pl. 5.) is as large as an orange; and is full of an acid juice, which is frequently made uſe of in making punch. To the apex of this fruit grows a nut, of the ſize and ſhape of a hare's kidney, but much larger at the end which is next the fruit than at the other. The ſhell is very hard; and the kernel, which is ſweet and pleaſant, is covered with a thin film. Between the two layers or tables which compoſe the ſhell, is lodged a dark inflammable oil, of ſuch a cauſtic nature in the freſh nut, that if the lips chance to touch it, bliſters will immediately follow. The kernels are eaten raw, roaſted, or pickled. The cauſtic oil juſt mentioned is employed in the Weſt Indies by ſuch young ladies as wiſh to renovate their complexions; but they ſuffer ſome pain in its application; and ſubmit alſo to nearly a fortnight's confinement; after which time their new ſkin looks as fair as that of a new-born child. An empiric in this country once employed this remedy with great ſucceſs in curing thoſe florid eruptions with which the faces of ſome ladies are diſfigured. This indeed is very eaſily done by other applications beſides the caſhew oil; for the cure depends ſimply on inflaming the ſurface ſo as to excite a healthy action in place of the diſeaſed action, or elſe it conſiſts in removing the old ſkin altogether by carrying the ſtimulus ſtill farther. The milky juice of this tree will ſtain linen of a good black, which cannot be waſhed out.

This plant is eaſily raiſed from the nuts, which ſhould be planted each in a ſeparate pot filled with light ſandy earth, and plunged into a good hot-bed of tanners' bark; they muſt alſo be kept from moiſture till the plants come up, otherwiſe they are apt to rot. If the nuts are freſh, the plants will come up in about a month; and in two months more, they will be 4 or 5 inches high, with large leaves. From this quick progreſs many people have been deceived, imagining they would continue the like quick growth afterwards; but with all the care that can be taken, they never exceed the height of 2 feet and an half, and for the moſt part ſcarce half as much.

ANACEPHALÆOSIS, in rhetoric, the ſame with recapitulation. See RECAPITULATION.

ANACHARSIS, a famous Scythian philoſopher, who converſed with Solon, and lived an auſtere life. He flouriſhed in the time of Crœſus.

ANACHORET, in church-hiſtory, denotes a hermit, or ſolitary monk, who retires from the ſociety of mankind into ſome deſert, with a view to avoid the temptations of the world, and to be more at leiſure for meditation and prayer. Such were Paul, Anthony, and Hilarion, the firſt founders of monaſtic life in Egypt and Paleſtine.

ANACHRONISM, in matters of literature, an error with reſpect to chronology, whereby an event is placed earlier than it really happened. The word is compounded of ανα higher, and χρονος time. An error on the other ſide, whereby a fact is placed later and lower than it ſhould be, is called a *parachroniſm*.

ANACLASTIC GLASSES, a kind of ſonorous phials, or glaſſes, chiefly made in Germany, which have the property of being flexible, and emitting a vehement noiſe by the human breath. Theſe glaſſes are a low kind of phials with flat bellies, reſembling inverted funnels, whoſe bottoms are very thin, ſcarce ſurpaſſing the thickneſs of an onion peel. This bottom is not quite flat, but a little convex; but upon applying the mouth to the orifice, and gently inſpiring, or as it were ſucking out the air, the bottom gives way with a prodigious crack, and of convex becomes concave. On the contrary, upon exſpiring or breathing gently into the orifice of the ſame glaſs, the bottom with no leſs noiſe bounds back to its former place, and becomes gibbous as before. They are commonly made in our glaſs-houſes, and with children have the name of *ſinging-glaſſes*, becauſe they are made to vibrate very powerfully when the mouth is placed at the edge, and the breath in ſinging is thrown forward towards the hole in the centre.

ANACLASTICS, that part of optics which conſiders the

refraction of light, and is commonly called *Dioptrics*. See DIOPTRICS.

ANACLETERIA, in antiquity, a ſolemn feſtival celebrated by the ancients when their kings or princes came of age, and aſſumed the reins of government. It is ſo called, becauſe proclamation being made of this event to the people, they went to ſalute their prince during the anacleteria, and to congratulate him upon his new dignity.

ANACLETICUM, in the ancient art of war, a particular blaſt of the trumpet, whereby the fearful and flying ſoldiers were rallied, and recalled to the combat.

ANACLINOPALE, Ανακλινοπαλη, in antiquity, a kind of wreſtling, wherein the champions threw themſelves voluntarily on the ground, and continued the combat by pinching, biting, ſcratching, and other methods of offence. The *Anaclinopale* was contradiſtinguiſhed from the *Orthopale*, wherein the champions ſtood erect. In the *Anaclinopale*, the weaker combatants ſometimes gained the victory.

ANACLINTERIA, in antiquity, a kind of pillows on the dining bed, whereon the gueſts uſed to lean. The ancient triclinary beds had four pillows, one at the head, another at the feet, a third at the back, and a fourth at the breaſt. That on which the head lay, was properly called by the Greeks ανακλινηριον, or ανακλινηρον; by the Romans *fulcrum*, ſometimes *pluteus*.

ANACOLLEMA, a compoſition of aſtringent powders, applied by the ancients to the head, to prevent defluxions on the eyes.

ANACONDO, in natural hiſtory, a name given in the iſle of Ceylon to a very large and terrible rattle-ſnake, which often devours the unfortunate traveller alive, and is itſelf accounted excellent and delicious fare.

ANACREON, a Greek poet, who was born at Teos, a city of Ionia, and flouriſhed about 532 years before the Chriſtian æra. Polycrates, tyrant of Samos, invited him to his court, and made him ſhare in his buſineſs and his pleaſures. He had a delicate wit, as may be judged from the inexpreſſible beauties and graces that ſhine in his works; but he was fond of pleaſure, was of an amorous diſpoſition, and addicted to drunkenneſs. Yet, notwithſtanding his debaucheries, he lived to the age of 85; when, we are told, he was choaked by a grape-ſtone which ſtuck in his throat as he was regaling on ſome new wine. There is but a ſmall part of Anacreon's works that remain; for, beſides his odes and epigrams, he compoſed elegies, hymns, and iambics. His poems which are extant were reſcued from oblivion by Henry Stephens, and are univerſally admired. The verſes of Anacreon are ſweeter, ſays Scaliger, than Indian ſugar. His beauty and chief excellence, ſays Madam Dacier, lay in imitating nature, and in following reaſon; ſo that he preſented to the mind no images but what were noble and natural. The odes of Anacreon, ſays Rapin, are flowers, beauties, and perpetual graces; it is familiar to him to write what is natural and to the life, he having an air ſo delicate, ſo eaſy, and graceful, that among all the ancients there is nothing comparable to the method he took, nor to that kind of writing he followed. He flows ſoft and eaſy, every where diffuſing the joy and indolence of his mind through his verſe, and tuning his harp to the ſmooth and pleaſant temper of his ſoul. But none has given a juſter character of his writings than the God of Love, as taught to ſpeak by Mr. Cowley:

> All thy verſe is ſofter far
> Than the downy feathers are,
> Of my wings, or of my arrows,
> Of my mother's doves and ſparrows:
> Graceful, cleanly, ſmooth or round,
> All with Venus' girdle bound.

ANACREONTIC VERSE, in ancient poetry, a kind of verſe, ſo called from its being much uſed by the poet Anacreon. It conſiſts of 3 feet and an ½, uſually ſpondees and iambuſes, and ſometimes anapeſts: Such is that of Horace, *Lydia, dic per omnes*.

ANACRISIS, among the ancient Greeks, was a kind of trial or examination, which the archons, or chief magiſtrates of Athens, were to undergo before their admiſſion into that office. The *anacriſis* ſtands diſtinguiſhed from the *docimaſia*, which was a ſecond examination, in the forum.

ANACRISIS, among civilians, was an inveſtigation of truth, interrogation of witneſſes, and inquiry made into any fact, eſpecially by torture.

ANACROSIS, in antiquity, denotes a part of the Pythian ſong, wherein the combat of Apollo and Python are deſcribed. The anacroſis was the firſt part, and contained the preparation to the fight.

ANACYCLUS, in botany; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants, and, in the natural method, ranking under the 49th order, *Compoſitæ-diſcoides*. The characters are theſe: The *calyx* is hemiſpheric and imbricated; the *corolla* radiated. The *ſtamina* conſiſt of five very ſhort capillary filaments; the anthera cylindric and tubular. The *piſtillum* has an oval germen; a filiform ſtylus; a biſid ſtigma in the hermaphrodites, two ſlender reflected ſtigmata in the females. There is no *pericarpium*; but the calyx unchanged. The *ſeeds* are ſolitary, with membranous wings; the *receptaculum* is chaffy.

ANADAVADÆA, in ornithology, a barbarous name for a ſpecies of alauda. See ALAUDA.

ANADEMA, among the ancients, denotes an ornament of the head, wherewith victors at the ſacred games had their temples bound.

ANADIPLOSIS, in rhetoric and poetry, a repetition of the laſt word of a line, or clauſe of a ſentence, in the beginning of the next: Thus,

> *Pierides, vos hæc facietis maxima Gallo:*
> *Gallo cujus amor, &c.*
> *Et matutinis accredula vocibus inſtat,*
> *Vocibus inſtat, & aſſiduas jacit ore querelas.*

ANADROMOUS, among ichthyologiſts, a name given to ſuch fiſhes as go from the ſea to the freſh waters at ſtated ſeaſons, and return back again; ſuch as the ſalmon, &c. See SALMON.

ANADUOMENE VENUS, in the Grecian mythology, anſwered to the Sea Venus in the Roman, and was the appellation given to one of the chief deities of the ſea. The moſt celebrated picture in all antiquity was that of this goddeſs by Apelles; and the famous Venus of Medici is a Sea-Venus.

ANÆDEIA, in antiquity, a denomination given to a ſilver ſtool placed in the Areopagus, on which the defendant, or perſon accuſed, was ſeated for examination. The word is Greek, Αναιδεια, which imports imprudence; but according to Junius's correction, it ſhould rather be Αναιδια, q. d. *innocence*. The plaintiff, or accuſer, was placed on an oppoſite ſtool, called *hybris*, or injury; here he propoſed three queſtions to the party accuſed, to which poſitive anſwers were to be given. The firſt, Are you guilty of this fact? The ſecond, How did you commit the fact? The third, Who were your accomplices?

ANÆSTHESIA, ſignifies a privation of the ſenſes.

ANAGALLIS, PIMPERNEL; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 20th order, *Rotaceæ*. The characters are: The *calyx*, a quinquepartite perianthium, which is perſiſtent. The *corolla* conſiſts of one rotated petal. The *ſtamina* conſiſt of five erect filaments ſhorter than the co-

rolla; the antheræ are ſimple. The *piſtillum* has a globular germen. The ſtylus ſlightly declinated, the ſtigma headed. The *pericarpium* is a globular capſule, unilocular and circumciſed. The *ſeeds* are numerous and angled; the receptaculum globular and very large. Of this there are four ſpecies. 1. The arvenſis, or common pimpernel, with a red flower. 2. The fœmina, with a blue flower. 3. The monelli or narrow-leaved pimpernel. 4. The latifolia, or Spaniſh pimpernel. The firſt ſort is very common in corn-fields, and other cultivated places in Britain. The ſecond is alſo found wild in the fields. The third is a beautiful ſmall perennial plant, and produces numbers of fine blue flowers. The fourth is a native of Spain, and likewiſe produces blue flowers. Theſe plants are very eaſily propagated by ſeeds; and if ſuffered to remain till their ſeeds ſcatter, they become troubleſome weeds. The arvenſis makes no unpleaſant ſalad, and in ſome parts of this kingdom is a common pot-herb.

ANAGNOSTA, or ANAGNOSTES, in antiquity, a kind of literary ſervant, retained in the families of perſons of diſtinction, whoſe chief buſineſs was to read to them during meals, or at any other time when they were at leiſure. Cornelius Nepos relates of Atticus, that he had always an agnoſtes at his meals.

ANAGOGICAL, ſignifies myſterious, tranſporting; and is uſed to expreſs whatever elevates the mind, not only to the knowledge of divine things, but of divine things in the next life. This word is ſeldom uſed, but with regard to the different ſenſes of Scripture.

ANAGOGY, or ANAGOGE, among eccleſiaſtical writers, the elevation of the mind to things celeſtial and eternal. It is particularly uſed, where words, in their natural or primary meaning, denote ſomething ſenſible, but have a further view to ſomething ſpiritual or inviſible.

ANAGOGY, in a more particular ſenſe, denotes the application of the types and allegories of the Old Teſtament to ſubjects of the New; thus called, becauſe the veil being here drawn, what before was hidden, is expoſed.

ANAGRAM, from *ανα backwards*, and *γραμμα letter*, in matters of literature, a tranſpoſition of the letters of ſome name, whereby a new word is formed, either to the advantage or diſadvantage of the perſon or thing to which the name belongs. Thus, the anagram of Galenus is *angelus;* that of Logica, *caligo*; that of Alſtedius *ſedulitas*, &c. Calvin, in the title of his *Inſtitutions*, calls himſelf *Alcuinus*, which is the anagram of Calvinus, and the name of an eminently learned perſon in the time of Charlemagne.

Thoſe who adhere ſtrictly to the definition of an anagram, take no other liberty than that of omitting or retaining the letter H, at pleaſure; whereas others make no ſcruple to uſe E for Æ, V for W, S for Z, and C for K; and *vice verſa*. But beſides anagrams formed as above, we meet with another kind in ancient writers, made by dividing a ſingle word into ſeveral; thus, *ſus tinea mus*, are formed out of the word *ſuſtiniamus*. Anagrams are ſometimes alſo made out of ſeveral words: ſuch is that on the queſtion put by Pilate to our Saviour, *Quid eſt veritas?* whereof we have this admirable anagram, viz. *Eſt vir qui adeſt*.

The Cabbaliſts among the Jews are profeſſed anagrammatiſts; the third part of their art which they call *themuru*, i. e. "changing," being nothing but the art of making anagrams, or of finding hidden and myſtical meanings in names; which they do by changing, tranſpoſing, and differently combining, the letters of thoſe names.—Thus, of נח the letters of Noah's name, they make חן *grace*; of משיח the *Meſſiah*, they make ישמח *he ſhall rejoice*.

ANAGRAMMATIST, a maker or compoſer of anagrams. Thomas Billon, a provincial, was a celebrated anagrammatiſt, and retained by Lewis XIII. with a penſion of 1200 livres, in quality of anagrammatiſt to the king.

ANAGROS, in commerce, a meaſure for grain uſed in ſome cities of Spain, particularly at Seville; 46 anagros make about 10¼ quarters of London.

ANAGYRIS, STINKING BEAN-TREFOIL: A genus of the monogynia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a bell-ſhaped perianthium; the *corolla* papilionaceous; the vexillum cordated, ſtraight, emarginated, and twice as long as the calyx; the alæ ovate, and longer than the vexillum; the carina ſtraight and very long. The *ſtamina* conſiſt of 10 filaments; the antheræ ſimple. The *piſtillum* has an oblong germen, a ſimple ſtylus, and a villous ſtigma. The *pericarpium* is an oblong legumen. The *ſeeds* are ſix or more, and kidney-ſhaped.—Of this genus there is but one ſpecies, the fetida, which grows naturally in the ſouthern parts of Europe. It is a ſhrub which uſually riſes to the height of 8 or 10 feet, and produces its flowers in April or May. Theſe are of a bright yellow colour, growing in ſpikes, ſomewhat like the laburnum.

This plant may be propagated either by ſeeds, or by laying down the tender branches in the ſpring; but the firſt method is preferable.

ANAGYRIS, or ANAGYRUS, the name of a place in Attica, of the tribe Erechtheis, where a fetid plant, called *Anagyris*, probably the ſame with the foregoing, grew in great plenty.

ANALECTA, or ANALECTES, in antiquity, a ſervant whoſe employment it was to gather up the off-falls of tables.

ANALECTA, *Analects*, in a literary ſenſe, is uſed to denote a collection of ſmall pieces; as eſſays, remarks, &c.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt or weſt points of the horizon.

ANALEMMA denotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn, with an horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye, will be ellipſes; and all circles whoſe planes paſs through the eye, will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPSIS, the augmentation of an emaciated body.

ANALEPTICS, reſtorative or nouriſhing medicines.

ANALOGY, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different. There is likewiſe an analogy between beings that have ſome conformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between animals of two different ſpecies.

Analogy enters into all our reaſoning, and ſerves to explain and illuſtrate. A great part of our philoſophy, indeed, has no other foundation. It is natural to mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them and things more familiar or better known. And where the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a conſiderable degree of probability in concluſions drawn from analogy. Thus we may obſerve a very great ſimilitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the ſun, as the earth does, although at different diſtances, and in different periods. They borrow all their light from the ſun, as the earth does. Several of them

are known to revolve round their axis like the earth, and, by that means, muſt have a like ſucceſſion of day and night. Some of them have moons, that ſerve to give them light in the abſence of the ſun, as our moon does to us. They are all, in their motions, ſubject to the ſame law of gravitation, as the earth is. From all this ſimilitude, it is not unreaſonable to think, that thoſe planets may, like our earth, be the habitation of various orders of living creatures. There is ſome probability in this concluſion from analogy. But it ought to be obſerved, that, as this kind of reaſoning can afford only probable evidence at beſt, ſo unleſs great caution be uſed, we are apt to be led into error by it. To give an inſtance of this: Anatomiſts, in former ages, ſeldom diſſected human bodies; but very often thoſe of quadrupeds, whoſe internal ſtructure was thought to approach neareſt to that of the human body. Modern anatomiſts have diſcovered many miſtakes which the ancients were led into, by their conceiving a greater ſimilitude between the ſtructure of men and of ſome beaſts than there really is.

That analogical reaſoning from a ſuppoſed ſimilitude of mind to body, which appears to be the moſt fruitful ſource of error with regard to the operations of our minds, may be illuſtrated by the following inſtance. When a man is urged by contrary motives, thoſe on one hand inciting him to do ſome action, thoſe on the other to forbear it; he deliberates about it, and at laſt reſolves to do it, or not to do it. The contrary motives are here compared to the weights in the oppoſite ſcales of a balance; and there is not perhaps any inſtance that can be named of a more ſtriking analogy between body and mind. Hence the phraſes of weighing motives, of deliberating upon actions, are common to all languages. From this analogy, ſome philoſophers draw very important concluſions. They ſay, that, as the balance cannot incline to one ſide more than the other, when the oppoſite weights are equal; ſo a man cannot poſſibly determine himſelf if the motives on both hands are equal; and as the balance muſt neceſſarily turn to that ſide which has moſt weight, ſo the man muſt neceſſarily be determined to that hand where the motive is ſtrongeſt. And on this foundation ſome of the ſchool-men maintained, that if a hungry aſs were placed between two bundles of hay equally inviting, the beaſt muſt ſtand ſtill and ſtarve to death, being unable to turn to either, becauſe there are equal motives to both. This is an inſtance of that analogical reaſoning, which, it is conceived, ought never to be truſted; for the analogy between a balance and a man deliberating, though one of the ſtrongeſt that can be found between matter and mind, is too weak to ſupport any argument. A piece of dead inactive matter, and an active intelligent being, are things very unlike; and becauſe the one would remain at reſt in a certain caſe, it does not follow that the other would be inactive in a caſe ſomewhat ſimilar. The argument is no better than this, that, becauſe a dead animal moves only as it is puſhed, and, if puſhed with equal force in contrary directions, muſt remain at reſt; therefore the ſame thing muſt happen to a living animal; for ſurely the ſimilitude between a dead animal and a living, is as great as that between a balance and a man.

According to profeſſor Caſtillon of Berlin, the principal uſes of analogy in the inveſtigation of phyſical and moral truth, may be reduced to theſe four: 1. By means of our ſenſes to improve, firſt our own judgment, and afterwards that of others, with reſpect to intellectual ſubjects. 2. To deduce a general from a particular truth. Having diſcovered and proved the truth of a propoſition with reſpect to any particular object, examine whether this truth flows from a quality peculiar to this ſingle object, or common to ſeveral objects. In the latter caſe all theſe objects may be comprehended under one general idea, founded on their common quality. Subſtitute this general idea inſtead of the particular object, and the propoſition will become general, without ceaſing to be true; becauſe whatever evidently and ſolely reſults from the identity, on which an analogy is founded, muſt neceſſarily be true with reſpect to all thoſe objects in which the analogy is the ſame. 3. To prove the truth or falſehood of propoſitions which cannot be otherwiſe demonſtrated. 4. To diſcover new truths in both natural and moral philoſophy.

ANALOGY, among grammarians, is the correſpondence which a word or phraſe bears to the genius and received forms of any language.

ANALYSIS, in a general ſenſe, implies the reſolution of ſomething compounded into its original and conſtituent parts. The word is derived from *αναλυω*, to reſolve.

ANALYSIS, in mathematics, is properly the method of reſolving problems by means of algebraical equations; whence we often find that theſe two words, *analyſis* and *algebra*, are uſed as ſynonymous. It is this which furniſhes us with the moſt perfect examples of the art of reaſoning; gives the mind an uncommon readineſs at deducing and diſcovering, from a few data, things unknown; and, by uſing ſigns for ideas, preſents things to the imagination, which otherwiſe ſeemed out of its ſphere. By this, geometrical demonſtrations may be greatly abridged, and a long ſeries of argumentations, wherein the mind cannot without the utmoſt effort and attention diſcover the connection of ideas, are hereby converted into ſenſible ſigns, and the ſeveral operations required therein effected by the combination of thoſe ſigns. But, what is more extraordinary, by means of this art, a number of truths are frequently expreſſed by a ſingle line, which in the common way of explaining and demonſtrating things would fill whole volumes. Thus, by mere contemplation of one ſingle line, whole ſciences may be ſometimes learnt in a few minutes time, which otherwiſe could ſcarce be attained in many years.

ANALYSIS is divided, with regard to its object, into that of *finites* and *infinites*. ANALYSIS *of Finite Quantities*, is what we otherwiſe call ſpecious arithmetic or algebra. See ALGEBRA. ANALYSIS *of Infinites*, called alſo the *New Analyſis*, is particularly uſed for the method of fluxions, or the differential calculus. See FLUXIONS.

ANALYSIS, in logic, ſignifies the method of tracing things backward to their ſource, and of reſolving knowledge into its original principles. This is alſo called the method of *reſolution*, and ſtands oppoſed to the ſynthetic method, or that of *compoſition*.

ANALYSIS, in rhetoric, is that which examines the connections, tropes, figures, and the like, inquiring into the propoſition, diviſion, paſſions, arguments, and other apparatus of rhetoric. A collection has been made of the analyſes formed by the moſt celebrated authors of the 16th century, in 3 vols. folio.

ANALYSIS is alſo uſed, in chemiſtry, for the decompounding of a mixed body, or the ſeparation of the principles and conſtituent parts of a compounded ſubſtance. To analyſe bodies, or reſolve them into their component parts, is indeed the chief object of the art of chemiſtry.

ANALYSIS is alſo uſed for a kind of ſyllabus, or table of the principal heads or articles of a continued diſcourſe, diſpoſed in their natural order and dependency.

ANALYSIS is likewiſe uſed for a brief, but methodical, illuſtration of the principles of a ſcience; in which ſenſe it is nearly ſynonymous with what we otherwiſe call a *ſynopſis*.

ANALYTIC, or ANALYTICAL, ſomething that belongs to, or partakes of, the nature of analyſis.—Thus we ſay, an analytical demonſtration, analytical proceſs, &c. The analytic method ſtands oppoſed to the ſynthetic.

ANALYTICS, *Analytica*, the ſcience and uſe of analyſis. The great advantage of the modern mathematics above the an-

cient is in point of analytics. Pappus, in the preface to his ſeventh book of Mathematical Collections, enumerates the authors on the ancient analytics; being Euclid, in his *Data* and *Poriſmata*; Apollonius, *de Sectione Rationis*, and in his *Conics*; Ariſtæus, *de Locis Solidis*; and Eratoſthenes, *de Mediis Proportionalibus*. But the ancient analytics were very different from the modern. To the modern analytics principally belong ALGEBRA, which ſee.

ANAMABOA, a populous town in the kingdom of Fantin, in Guinea; it is much reſorted to by the Engliſh ſhips for corn and ſlaves, which laſt are ſometimes to be had in great numbers.

ANAMELECH, an idol of the Sepharvaites, who are ſaid in Scripture to have burned their children in honour of Adrammelech and Anamelech.

ANAMORPHOSIS, in perſpective drawings, is a deformed or diſtorted portrait or figure, generally confuſed and unintelligible to the common unaſſiſted view; but when ſeen at a certain diſtance and height, or as reflected from a plain or curved mirror, will appear regular and in right proportion.

ANANAS, in botany, the trivial name of a ſpecies of bromelia. See BROMELIA.

ANANCITIS, in antiquity, a kind of figured ſtone, otherwiſe called *ſynochitis*, celebrated for its magical virtue of raiſing the ſhadows of the infernal gods.

ANANISABTA, or ANANISAPTA, a magical word frequently found inſcribed on coins and other amulets, ſuppoſed capable of preſerving the wearer from the plague.

ANAPÆST, in ancient poetry, a foot conſiſting of two ſhort ſyllables and one long: Such is the word ſcŏpŭlōs. It is juſt the reverſe of the dactyl.

ANAPÆSTIC VERSES, thoſe conſiſting wholly or chiefly of anapeſts.

ANAPHORA, in rhetoric, the repetition of the ſame word or words in the beginning of a ſentence or verſe: Thus Virgil,

Pan etiam Arcadia mecum ſe judice certet,
Pan etiam Arcadia dicat ſe judice victum.

ANAPHORA, among phyſicians, the throwing off purulent matter by the mouth.

ANAPHRODISIA, ſignifies impotence, or want of power to procreate. See IMPOTENCE.

ANAPLASIS, ſignifies the replacing or ſetting a fractured bone.

ANAPLORETICS, medicines that promote the growth or granulation of fleſh in wounds, ulcers, &c.

ANARCHI; Ἀναρχοι, in antiquity, a name given by the Athenians to four ſupernumerary days in their year, during which they had no magiſtrates. The Attic year was divided into ten parts, according to the number of tribes, to whom the preſidency of the ſenate fell by turns. Each diviſion conſiſted of 35 days; what remained after the expiration of theſe, to make the lunar year complete, which according to their computation conſiſted of 354 days, were employed in the creation of magiſtrates, and called ἀναρχοι ἡμεραι, and ἀρχαιρεσιοι.

ANARCHY, the want of government in a nation, where no ſupreme authority is lodged, either in the prince or other rulers; but the people live at large, and all things are in confuſion. The word is from the Greek privative α, and αρχη *command, principality*.

ANARCHY is alſo applied to certain troubleſome and diſorderly periods, even in governments otherwiſe regular. The unſettled ſtate of France during what was termed the revolutionary government is a ſtriking inſtance of this.

ANARRHICAS, in ichthyology, a genus of fiſhes of the order of apodes. There is but one ſpecies of this genus, viz. the anarrhicas lupus, or ſea-wolf; which ſeems to be confined to the northern parts of the globe. We find it in the ſeas of Greenland; in thoſe of Iceland and Norway; on the coaſts of Scotland and of Yorkſhire; and laſtly, in that part of the German ocean which waſhes the ſhores of Holland, the moſt ſouthern of its haunts that we can with any certainty mention. It is a moſt ravenous and fierce fiſh, and, when taken, faſtens on any thing within its reach: the fiſhermen dreading its bite, endeavour as ſoon as poſſible to beat out its fore-teeth, and then kill it by ſtriking it behind the head. It feeds almoſt entirely on cruſtaceous animals and ſhell-fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, large whelks, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. Yet it does not appear they are diſſolved in the ſtomach, but are voided with the fœces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize.

It is found of the length of 4 or, as ſome ſay, 7 feet. The head is a little flatted on the top; the noſe blunt; the noſtrils very ſmall; the eyes ſmall, and placed near the end of the noſe. The teeth are very formidable, and remarkably well adapted to its way of life. They are often found foſſil; and in that ſtate are called *buſonites*, or *toad-ſtones*. The two bones that form the under jaw are united before by a looſe cartilage; which mechaniſm admitting of a motion from ſide to ſide, moſt evidently contributes to the deſign of the whole, viz. a facility of breaking, grinding, and comminuting, its teſtaceous and cruſtaceous food. At the entrance of the gullet, above and below, are two echinated bones. Theſe are very ſmall, being the leſs neceſſary, as the food is in a great meaſure comminuted in the mouth by aid of the grinders. The body is long, and a little compreſſed ſidewiſe; the ſkin ſmooth and ſlippery. It wants the lateral line. The pectoral fins conſiſt of 18 rays. The dorſal fin extends from the hind-part of the head almoſt to the tail; the rays in the freſh fiſh are not viſible. The anal fin extends as far as the dorſal fin. The tail is round at its end, and conſiſts of 13 rays. The ſides, back, and fins, are of a livid lead colour; the two firſt marked downwards with irregular obſcure duſky lines: theſe in different fiſh have different appearances. The young are of a greeniſh caſt, reſembling the ſea-wrack, amongſt which they reſide for ſome time after their birth.

ANARROPIA, among the old phyſicians, a tendency of the humours to the head or ſuperior parts.

ANAS, in ornithology, a genus of birds belonging to the order of anſeres. The beak of this genus is a little obtuſe, covered with an epidermis or ſkin, gibbous at the baſe and broad at the apex: the tongue is obtuſe and fleſhy; the feet are webbed and fitted for ſwimming. The ſpecies are,

1. The cygnus, *ferus & manſuetus*. The *ferus*, with a ſemicylindrical black bill, yellow wax, and a white body, is the whiſtling or wild ſwan of Engliſh authors, and is leſs than the tame or mute ſpecies, being about five feet in length. This ſpecies has ſeveral diſtinctions from the ſpecies which we in Britain call the *tame ſwan*. In Ruſſia this ſpecies more fitly claims the name, it being the kind moſt commonly tamed in that empire. The whiſtling ſwan carries its neck quite erect, the other ſwims with it arched. This is far inferior in ſize; has twelve ribs on a ſide, the mute only eleven. But what is moſt remarkable is the ſtrange figure of the windpipe; which falls into the cheſt, then turns back like a trumpet, and afterwards makes a ſecond bend to join the lungs. Thus it is enabled to utter a loud and ſhrill note. The other ſwan, on the contrary, is the moſt ſilent of birds: it can do nothing more than hiſs, which it does on receiving any provocation. The vocal kind emits its loud notes only when flying or calling. Its ſound is, *whoogh, whoogh*, very loud and ſhrill, but not diſagreeable, when heard far above one's head and modulated

by the winds. It is from this ſpecies alone that the ancients have drawn the fable of the ſwan being endued with the powers of melody. Embracing the Pythagorean doctrine, they made the body of this bird the manſion of the ſouls of departed poets; and after that, attributed to the birds the ſame faculty of harmony which their inmates poſſeſſed in a pre-exiſtent ſtate. The vulgar, not diſtinguiſhing between ſweetneſs of numbers and melody of voice, thought that real which was only intended figuratively.

The *manſuetus*, or mute ſwan, is the largeſt of the Britiſh birds. It is diſtinguiſhed externally from the wild ſwan; firſt, by its ſize, being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob: the whole plumage, in old birds, is white; in young ones, aſh-coloured, till the ſecond year; the legs are duſky; but Dr. Plott mentions a variety found on the Trent near Rugely, with red legs.

The ſwan is found wild in Ruſſia and Siberia; moſt plentiful in the laſt. It arrives later from the ſouth, and does not ſpread ſo far north. Thoſe about the ſouthern part of the Caſpian Sea are very large, and much eſteemed for the uſe of the table. The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceedingly fierce. It has not unfrequently been known to throw down and trample under feet youths of fifteen or ſixteen years of age, and an old one to break the leg of a man with a ſtroke of the wings. It is ſaid to be very long-lived, and frequently to arrive at the hundredth year. The young are not perfect in plumage till the ſecond year. The ſwan lays the firſt egg in February, and continues laying every other day to the amount of ſix, ſeven, or eight eggs; theſe it places on a bed of graſs near the water, and ſits ſix weeks. It feeds on both fiſh and herbage. No bird, perhaps, makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes on that element, as the ſwan. Almoſt every poet indeed has taken notice of it.

2. The cygnoides, with a ſemicylindrical bill, gibbous wax, and tumid eye-brows. It is the ſwan-gooſe of Ray, from Guinea. There is likewiſe a variety of this ſpecies, of a leſs ſize, called the *gooſe of Muſcovy*. They are ſufficiently common in Britain, and readily mix with the common gooſe; the breeds uniting as freely, and continuing to produce as certainly, as if no ſuch mixture had taken place. They are much more noiſy than the common tame geeſe, taking alarm at the leaſt noiſe; and even without diſturbance will emit their harſh and diſagreeable ſcream the whole day through. They walk very erect, with the neck much elevated; and as they bear a middle line between that of the ſwan and gooſe, they have not improperly been called *ſwan-gooſe*.

3. The tadorna, or ſhieldrake, has a flat bill, a compreſſed forehead, a greeniſh black head, and the body is variegated with white. This ſpecies is found as far as Iceland to the north. It viſits Sweden and the Orkneys, is found in Aſia about the Caſpian Sea, and in Kamtſchatka. It breeds in deſerted rabbit holes, or occupies them in the abſence of the owners, who rather than make an attempt at diſlodging the intruders, form others; though, in defect of ready-made quarters, theſe birds will frequently dig holes for themſelves. They lay fifteen or ſixteen roundiſh white eggs. The young, as ſoon as hatched, take to the water, and ſwim ſurpriſingly well; but do not come to their full plumage till the ſecond year. This ſpecies, Mr. Latham informs us, may be hatched under a tame duck, and the young readily brought up; but are apt, after a few years, to attempt the maſtery over the reſt of the poultry. Their fleſh is rank and unſavoury, though their eggs have at all times been thought very good.

3. The ſpectabilis, has a compreſſed bill, gibbous at the baſe, a black feathered carina, and a hoary head. It is the grey-headed duck of Edwards, and the king-duck of Pennant. This beautiful ſpecies is found at Hudſon's Bay, at Churchill River, and (though ſcarce) at York Fort; in winter it is met with as far ſouth as New York. It is pretty frequent in the north of Siberia and Kamtſchatka; it is found alſo on the coaſt of Norway, and has been killed in the Orkneys. It is common in Greenland; where the fleſh is accounted excellent. It produces a down as valuable as the eider; and the ſkins, ſewed together, make very warm garments. This ſpecies builds on the ſides of ponds and rivers, making its neſt of ſticks and moſs, and lining it with feathers from the breaſt. It lays four or five whitiſh eggs, as large as thoſe of the gooſe.

5. The fuſca, or velvet duck, is of a blackiſh colour, has a white ſpot behind the eyes, and a white line on the wings. The male of this ſpecies is diſtinguiſhed by a gibboſity at the baſe of the bill. It is the black duck of Ray, and is in length about 20 inches. This ſpecies frequents Hudſon's Bay in ſummer, where it breeds. The neſt is compoſed of graſs; in which it lays from four to ſix white eggs, and hatches in July. It feeds on graſs, and is known by the name of *cus cuſi qua tum*. It retires ſouth in winter; when it is frequently ſeen as far ſouth as New York. It is now and then ſeen on the coaſts of England, but more frequently on the continent, in Denmark and Ruſſia.

6. The nigra, or ſcoter, is totally black, and has a gibboſity at the baſe of the bill; the tail reſembles a wedge; the female is browniſh. It is the leſſer black diver of Ray, and meaſures in length 22 inches. Theſe birds are found on the northern coaſts of England and thoſe of Scotland in the winter ſeaſon; but no where ſo common as on the French coaſts, where they are ſometimes ſeen in prodigious numbers. Their chief food is a gloſſy bivalve ſhell, near an inch long, called by the French *vaimeaux*. Theſe they are perpetually diving after, frequently to the depth of ſome fathoms; and by placing nets under the water, in places where theſe ſhells are moſt numerous, 30 or 40 dozen of them have been taken in one tide.

7. The anſer, *ferus et manſuetus;* or grey lag, and tame gooſe. The *grey lag*, or *wild gooſe*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a fleſh colour, tinged with yellow; the head and neck cinereous; breaſt and belly whitiſh, clouded with grey or aſh colour; back, grey; the legs of a fleſh colour. This ſpecies reſides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, eaſily tamed, and eſteemed moſt excellent meat, ſuperior to the domeſtic gooſe. Towards winter they collect in great flocks, but in all ſeaſons live and feed in the fens. On the continent they are migratory, changing place in large flocks, generally arranged in a triangle, and conſiſting often of 500 or more.

The *manſuetus*, is the grey lag in a ſtate of domeſtication, and from which it varies in colour, though much leſs ſo than either the mallard or cock, being ever more or leſs verging to grey; though in all caſes the whiteneſs of the vent, and upper tail coverts, is manifeſt. It is frequently found quite white, eſpecially the males. The gooſe in general breeds only once a year; but frequently has two hatches in a ſeaſon, if well kept. It is ſaid to be very long-lived, as we have authority for their arriving at no leſs than 100 years. By ſome of the barbarous methods which luxury has invented, the weight of a gooſe, which is naturally between 14 and 16 lb. may be increaſed to 28 or even 30 lb.

8. The *bean gooſe* is two feet ſeven inches in length; in extent four feet eleven. The bill, which is the chief diſtinction between this and the former, is ſmall, much compreſſed near the end, whitiſh, and ſometimes pale red in the middle, and black at the baſe and nail: the head and neck are cinereous brown,

tinged with ferruginous; breaſt and belly dirty white, clouded with cinereous; the back of a plain aſh colour; feet and legs of a ſaffron colour; claws black. This ſpecies arrives in Lincolnſhire in autumn, and retreats to the N. of Europe in May. It is called the *bean gooſe*, from the likeneſs of the nail of the bill to a horſe-bean.

9. The erythropus, or laughing gooſe of Edwards, is a native of Europe and America. Its length is about two feet four inches; the extent four feet ſix; the bill is elevated, of a pale yellow colour, with a white ring at the baſe; the fore-head is white; the breaſt and belly are of a dirty white, marked with great ſpots of black; and the legs yellow. Theſe viſit the fens during winter, in ſmall flocks; and diſappear by the middle of March. Linnæus makes this gooſe the female of the *bernacle*; but Mr. Pennant thinks his opinion not well founded.

The *bernacle* (erythropus *mas*, Lin.) is two feet one inch in length, its breadth four feet five inches. The bill is black; the forehead and cheeks white; from the bill to the eyes, there is a black line; the hind part of the head, the whole neck, and upper part of the breaſt and back, are of a deep black; the tail is black, the legs are of the ſame colour, and ſmall. Theſe birds appear in vaſt flocks during winter, on the N. W. coaſts of this kingdom. They are very ſhy and wild; but on being taken, grow in a few days as familiar as our tame geeſe. In February they quit our ſhores, and retire as far as Lapland, Greenland, and even Spitzbergen, to breed.

10. The race-horſe or loggerhead gooſe, is in length 32 inches, and weighs from 20 to 30 pounds. The bill is 3 inches long, and of an orange colour; the irides are orange, ſurrounded with black, and then with orange. The head, neck, and upper parts of the body are of a deep aſh-colour; the outer edge of the ſecondaries white, forming a band of the ſame on the wing; the under parts of the body duſky down the middle; over the thighs cinereous blue; vent white; quills and tail black; the wings are very ſhort, not reaching to the rump. On the bend of the wing is a yellow knob, half an inch in length; the legs are browniſh orange, the webs duſky, and the claws black. Theſe inhabit Falkland Iſlands, Staaten Land, &c. and were moſtly ſeen in pairs, though ſometimes in large flocks. From the ſhortneſs of the wings they were unable to fly; but they made conſiderable uſe of them when in the water, on which they ſeemed as it were to run, at leaſt they ſwam, with the aſſiſtance of the wings uſed as oars, at an incredible rate.

11. The ſnow-gooſe, is in length 2 feet 8 inches, and weighs between 5 and 6 pounds. The bill is ſomewhat ſerrated at the edges; the upper mandible ſcarlet, the lower whitiſh: the general colour of the plumage is ſnow white, except the firſt ten quills, which are black, with white ſhafts; the legs are of a deep red. The young are of a blue colour, till they are a year old. Theſe are very numerous at Hudſon's Bay, and called by the natives *Way way*, and *Wapa whe whe*. They viſit Severn River in May, and ſtay a fortnight; but go farther north to breed. They return to Severn Fort the beginning of September, and ſtay to the middle of October, when they depart for the ſouth, and are attended by their young, in amazing flocks. In the ſummer months, they are plenty on the arctic coaſt of Siberia, but never migrate beyond longitude 130. This ſpecies is the moſt numerous and the moſt ſtupid of all the gooſe race. They ſeem deficient of inſtinct, as they arrive at the mouths of the arctic Aſiatic rivers before the ſeaſon in which they can poſſibly ſubſiſt, a miſtake of which they are annually guilty, and compelled to make a new migration to the ſouth in queſt of food.

12. The great gooſe is of a very large ſize, weighing near 25 or 30 Ruſſian pounds. The bill is black; baſe of it tawny; body duſky; the under parts white; the legs ſcarlet. It is found in the eaſt of Siberia, from the river Lena to Kamtſchatka; and is taken in great numbers, together with the red-necked gooſe, in glades, as we do woodcocks in England, but upon a larger ſcale.

13. The ruficolis, or red-breaſted gooſe, is in length 21 inches; weight 3 lb. troy. The bill is ſmall, and brown; the tail black; the irides are yellow brown; round the eyes fringed with brown; fore part of the head and crown black, paſſing backwards in a narrow ſtripe quite to the back. On the breaſt is a narrow band of white feathers with black ends, forming a band of white and another of black. The ſides are ſtriped with black; back and wings black, the laſt even with the tail; legs black. This moſt elegant of geeſe is found to breed from the mouth of the Ob, along the coaſts of the Icy Sea, to that of the Lena. Its winter quarters are not certainly known. Their winter retreat is probably in Perſia.

14. The caſarca, or ruddy gooſe, is larger than a mallard, and ſeems even larger than it really is, from its length of wing, and ſtanding high on its legs. The bill is black; the irides are yellowiſh brown; forehead, cheeks, and throat, yellowiſh; fore-part of the neck ferruginous, encircled with a collar of black, inclining to deep rufous on the throat; the breaſt and ſides are pale rufous; the belly is obſcure; the back is pale; the lower part is undulated, hoary, and brown, not very diſtinct; the rump and tail are greeniſh black; the legs long and black. This ſpecies is found in all the ſouthern parts of Ruſſia and Siberia in plenty. In winter it migrates into India, and returns northward in ſpring. They have been attempted to be domeſticated, by rearing the young under tame ducks; but without ſucceſs, as they make their eſcape the firſt opportunity. The fleſh is thought very delicate.

15. The bernicla, is of a brown colour; with the head, neck, and breaſt, black; and a white collar. Theſe birds, like the bernacles, frequent our coaſts in winter; and are particularly plenty, at times, on thoſe of Holland and Ireland, where they are taken in nets placed acroſs the rivers. In ſome ſeaſons they have reſorted to the coaſts of Picardy, in France, in ſuch prodigious flocks as to prove a peſt to the inhabitants. They breed pretty far north, and return ſouthward in autumn. They fly in the ſhape of a wedge, like the wild geeſe, with great clamour. They are called in Shetland, *Horra geeſe*, from being found in that ſound. They are common alſo in America.

16. The canadenſis is brown; its neck and head are black, and the throat white. It meaſures $3\frac{1}{2}$ feet in length. It is found during the ſummer in Hudſon's Bay, and parts beyond; alſo in Greenland; and, in the ſummer months, in various parts of North America, as far as Carolina. Numbers breed at Hudſon's Bay, and lay 6 or 7 eggs; but the major part retire ſtill farther north. Their firſt appearance in the Bay is from about the middle of April to about the middle of May, when the inhabitants wait for them with impatience, and, in ſome ſeaſons, kill 3000 or 4000, which are ſalted and barrelled. The Indians at Hudſon's Bay call them *Apiſtiſkiſh*. This ſpecies is now pretty common, in a tame ſtate, both on the continent and in England, where they are thought a great ornament to the pieces of water in many gentlemen's ſeats.

17. The molliſſima, or eider-duck, is double the ſize of the common duck, has a cylindrical bill, and the wax is divided behind, and wrinkled. The feathers, which are very ſoft and valuable, fall off during incubation. The male is white above, but black below and behind: the female is greeniſh. This ſpecies is found in the Weſtern Iſles of Scotland, and on the Farn Iſles; but in greater numbers in Norway, Iceland, and Greenland; from whence a vaſt quantity of the down, known by the name of *eider* or *edder*, which theſe birds furniſh, is annually imported. Its remarkably

light, elaſtic, and warm qualities make it highly eſteemed as a ſtuffing for coverlets. This down is produced from the breaſt of the birds in the breeding ſeaſon. It lays its eggs among the ſtones or plants near the ſhore; and prepares a ſoft bed for them, by plucking the down from its own breaſt. The natives watch the opportunity, and take away both eggs and neſt: the duck lays again, and repeats the plucking of its breaſt: if ſhe is robbed after that, ſhe will ſtill lay; but the drakes muſt ſupply the down, as her ſtock is now exhauſted: but if her eggs are taken a third time, ſhe wholly deſerts the place. In America this bird is found as far ſouth as New York, and breeds on the deſert iſles of New England; but is moſt common every where to the north. They are very numerous in the Eſquimaux lands, where and in Greenland they are called *mettek*.

18. The maula, or ſcaup-duck, is leſs than the common duck. The bill is broad, flat, and of a greyiſh blue colour; the head and neck are black, gloſſed with green; the breaſt is black; the back, the coverts of the wings, and the ſcapulars, are finely marked with numerous narrow tranſverſe bars of black and grey; the legs are duſky. Theſe birds are ſaid to take their name from feeding on ſcaup, or broken ſhell fiſh; they differ infinitely in colours, ſo that in a flock of 40 or 50 there are not two alike.

19. The moſchata, or Muſcovy duck of Ray, has a naked papillous face, and is a native of India.—It is bigger than the wild duck, being in length two feet. This ſpecies is pretty common in a domeſticated ſtate in almoſt every nation. The male will not unfrequently aſſociate and produce a mongrel breed with the common ducks. The name ariſes from their exhaling a muſky odour, which proceeds from the gland placed on the rump in common with other birds.

20. The clypeata, or ſhovelar of Ray, has the end of its bill broad, rounded, and furniſhed with a ſmall hook. It is in length 21 inches; the female a trifle ſmaller. Both ſexes are apt to vary much in colour: the male likewiſe differs from the female inwardly, having, juſt above the divarication of the windpipe where it paſſes into the lungs, an enlargement, or, as it is called by ſome, a *labyrinth*.—Theſe birds are now and then met with in England, though not very commonly. It is ſaid they appear in France in February, and ſome of them to ſtay during the ſummer. This ſpecies is alſo found in moſt parts of Germany; throughout the Ruſſian dominions, as far as Kamtſchatka; and in North America, in New York and Carolina, during the winter ſeaſon.

21. The ſtrepera, or gad-wal, has the wings variegated with black, white, and red. It inhabits England in the winter months, and is alſo found at the ſame ſeaſon in various parts of France and Italy. It migrates as far as Sweden, as ſummer advances, in order to breed; and is found throughout Ruſſia and in all except the eaſtern part of Siberia and Kamtſchatka.

22. The clangula, or golden eye of Ray, is variegated with black and white, and the head is interſperſed with blackiſh green feathers; it has a white ſpot near the mouth; and the eyes are of a ſhining gold colour. It is not unfrequent on our ſea-coaſt in winter, and appears in ſmall flocks; but paſſes to the north in ſpring in order to breed. It inhabits Sweden and Norway during the ſummer, is an excellent diver, and feeds on ſmall ſhells. It has been attempted to be domeſticated, but ſeems out of its element on land.

23. The merſa, or Ural duck of Pallas, is ſomewhat bigger than the common teal. This ſpecies is not unfrequent in the greater lakes of the Ural mountains, and the rivers Ob and Irtiſch. It is not ſeen on the ground, as from the ſituation of its legs it is unable to walk; but it ſwims very well and quick; at which time the tail is immerſed in the water as far as the rump, ſerving by way of rudder, contrary to the common method of a duck's ſwimming.

24. The American wigeon (*le canard jenſen* of Buffon), is rather bigger than our wigeon. The bill is of a lead-colour; the crown and fore-head of a yellowiſh white: the hind-part of the head and neck is black and white, ſpeckled: and behind the eye is a black mark, changing in ſome lights to green: the back and ſcapulars are of a pale ruſt-colour, waved with tranſverſe black lines; in the middle of the wing coverts there is a large bed of white; the quills and tail are deep brown; the legs duſky. It inhabits North America, from Carolina to Hudſon's Bay; but is no where a common bird. It is called at New York the *Pheaſant Duck*; but it is more plenty at St. Domingo and Cayenne, where it is called *vingeon* or *gingeon*.

25. The acuta, pin-tail, or ſea-pheaſant of Ray, has a long accumulated tail, black below, with a white line on each ſide of the back part of the head. It is a native of Europe. Theſe birds, it is ſaid, are found in great abundance in Connaught in Ireland, in the month of February only; and that they are much eſteemed for their delicacy.

26. The glacialis, or long-tailed duck, is inferior in ſize to the former. The bill is ſhort, black at the tip and baſe, orange-coloured in the middle; the cheeks are of a pale brown; the hind part of the head, and the neck both before and behind, are white; the breaſt and back are of a deep chocolate colour; the four middle feathers of the tail are black, and two of them near four inches longer than the others, which are white; the legs duſky. Theſe birds breed in the moſt northern parts of the world; and only viſit our coaſts in the ſevereſt winters.

27. The ferina, pochard, or red-headed wigeon of Ray, has a lead-coloured bill. The head and neck are of a bright grey colour; the breaſt and part of the back where it joins the neck, are black. The coverts of the wings, the ſcapulars, back and ſides under the wings, are of a pale grey, elegantly marked with narrow lines of black. The tail conſiſts of 12 ſhort feathers, of a deep grey colour; the legs are lead coloured; and the irides of a bright yellow, tinged with red. The head of the female is of a pale reddiſh brown. With us, theſe birds frequent the fens in the winter ſeaſon, and are brought up to the London markets ſometimes in conſiderable numbers, where they are known by the name of *Dun Birds*, and are eſteemed excellent eating. In winter, they paſs pretty far to the ſouth.

28. The querquedula, garganey, or firſt teal of Aldrovandus, has a green ſpot on the wings, and a white line above the eyes. It frequents the freſh waters of Europe. In many places it is called the *ſummer-teal*.

29. The crecca, or common teal, has a green ſpot on the wings, and a white line both above and below the eyes. It is of a ſmall ſize, only 14 inches in length. The teal is frequent in the London markets, along with the wild duck. In France it ſtays through the year. It is found to the north as high as Iceland; and is mentioned as inhabiting the Caſpian Sea to the ſouth.

30. The hiſtrionica, or duſky ſpotted duck of Edwards, is of a brown colour, variegated with white and blue; it has a double line on the ears and temples; the collar is white, and there is a white ſtreak on the neck. It inhabits from Carolina to Greenland. In winter it ſeeks the open ſea, flies high and ſwiftly, and is very clamorous. It is found in Iceland, as low as Sondmor; and is common from the lake Baikal to Kamtſchatka.

31. The minuta, or little white and brown duck of Edwards, is of a greyiſh colour, with white ears, and the prime feathers of the wings blackiſh. This and the former, accord-

ing to Latham, are found both on the old and new continents. On the firſt, it is ſeen as far ſouth as the lake Baikal, and from thence to Kamtſchatka, particularly up the river Ochotſka; alſo in Iceland, and as low as Sandmor. In America, it is found from Carolina to Newfoundland and Hudſon's Bay; alſo in Greenland, where it frequents, during ſummer, bays and rivers, eſpecially near their mouths, and is a very noiſy ſpecies. It is pretty frequent in the ſmall rivulets of Hudſon's Bay, about 90 miles inland, but ſeldom in large rivers.

32. The boſchas, common wild duck of Ray, or mallard; the intermediate tail-feathers of the drake are turned backward, and the bill is ſtrait. It frequents the lakes of different countries, and feeds upon frogs and ſeveral ſorts of inſects. They abound particularly in Lincolnſhire, the great magazine of wild-fowl in this kingdom; where prodigious numbers are taken annually in the DECOYS. Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills: theſe nerves are remarkably conſpicuous in the head and bill of the wild-duck, and are larger than thoſe of a gooſe or any other bird yet known: this is the reaſon they grope for food more than any other bird whatever.—The common tame ſpecies of ducks take their origin from theſe, and may be traced to it by unerring characters. The drakes, however they vary in colours, always retain the curled feathers of the tail, and both ſexes the form of the bill, of the wild kind.

33. The galericulata, or Chineſe teal of Edwards, has a hanging creſt; and on the hinder part of the back, on both ſides, there is a crooked, flat, elevated feather. The creſt is green and red; and the back is brown, and ſpotted with blue. The erect feathers on the back are red and blunt; one edge of the inmoſt wing-feather, when the wings are ſhut, is raiſed over the back, and is red, and like a ſickle before. This moſt ſingular and elegant ſpecies is a native of China and Japan, where it is kept by the inhabitants for the ſake of its beauty. It is known in Japan by the name of *Kimnodſui*. The Engliſh in China give it the name of *mandarin duck*.

34. The ſponſa, or ſummer-duck of Cateſby, is a moſt elegant ſpecies. It has a depending green creſt, variegated with blue and white; the back is likewiſe variegated with blue and white; the breaſt is grey, and ſpotted with white; and the throat is white. It inhabits Mexico, and ſome of the Weſt India iſles, migrating in the ſummer ſeaſon as far north as 40 degrees, or a little beyond. Theſe birds are often kept tame in our menageries, and will breed there.

35. The aborea, or black-billed whiſtling duck of Edwards, is of a reddiſh brown colour, with a ſort of creſt on the head; the belly is ſpotted with black and white. It is a native of America, about 20 inches long from the end of the bill to the point of the tail; and makes a kind of whiſtling noiſe, from which circumſtance it has received its name.

36. The filigula, or tufted duck of Ray, has a hanging creſt, a black body, and the wings and belly ſpotted with white. This ſpecies is found in Europe as far as Norway. In the winter months it is not unfrequent in England; it is common alſo throughout the Ruſſian empire, going northward to breed.—There are 62 other ſpecies enumerated by ornithologiſts; the whole number hitherto deſcribed being 98.

ANASARCA, a ſpecies of dropſy. See MEDICINE.

ANASTATICA, the ROSE of JERICHO; a genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, *Siliquoſæ*. The characters are theſe: The *calyx* is a perianthium conſiſting of 4 leaves, and perſiſtent. The *corolla* conſiſts of 4 cruciform petals. The *ſtamina* conſiſt of 6 ſubulated filaments the length of the calyx; the antheræ are roundiſh. The *piſtillum* has a ſmall bifid germen; the ſtylus mucronated and oblique; the ſtigma headed. The *pericarpium* is a ſhort bilocular ſilicle, retuſe, and crowned on the margin with valvulæ twice as long as the partition. The *ſeeds* are ſolitary and roundiſh. Of this genus there are two ſpecies. 1. The ſyriaca, a native of Syria, not cultivated or known in Britain. 2. The hierochuntica, a native of the ſandy parts of Paleſtine and the Red Sea. It is a low annual plant, dividing into many irregular woody branches near the root. When the ſeeds of this plant are ripe, the branches will draw up and contract; ſo that the whole plant forms a kind of ball or globular body, which will expand on laying it a ſhort time in warm water. This property it retains for many years, on which account it is preſerved as a curioſity by ſome people. From this property the monks have given it the name of *Roſa Mariæ*, pretending that the flowers open on the night in which our Saviour was born. This plant is propagated by ſeeds, which ſhould be ſown in the beginning of March, in a moderate hot-bed in pots, in which the plants are deſigned to remain. If the ſeaſon proves favourable, they will flower in Auguſt.

ANASTOMOSIS, in anatomy, the opening of the mouths of veſſels, in order to diſcharge their contained fluids. It is likewiſe uſed for the communication of two veſſels at their extremities; as the inoſculation of a vein with a vein, of an artery with an artery, or of an artery with a vein.

ANASTOMATICS; medicines ſuppoſed to have the power of opening the mouths of the veſſels, and promoting the circulation.

ANASTROPHE, in rhetoric and grammar, denotes the inverſion of the natural order of the words: ſuch is, *ſaxa per et ſcopulos*, for *per ſaxa et ſcopulos*.

ANATHEMA, among eccleſiaſtical writers, imports whatever is ſet apart, ſeparated, or divided; but is moſt uſually meant to expreſs the cutting off a perſon from the privileges of ſociety and communion with the faithful. The anathema differs from excommunication in the circumſtance of being attended with curſes and execrations. There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a biſhop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the hereſy he abjures.

ANATHEMA, in heathen antiquity, was an offering or preſent made to ſome deity, and hung up in the temple. Whenever a perſon left off his employment, it was uſual to dedicate his tools to the patron-deity of the trade. Perſons too who had eſcaped from imminent danger, or had met with any remarkable inſtance of good fortune, ſeldom failed to teſtify their gratitude by ſome preſent of this kind.

ANATHOTH, a hamlet of Paleſtine, very near Jeruſalem, about three miles and a half to the north; the ruins of which are ſtill to be ſeen.

ANATIFERA CONCHA, the trivial name of a ſpecies of the lepas, a teſtaceous animal. See LEPAS.

ANATOCISM, ANATOCISMUS, an uſurious contract wherein the intereſts ariſing from the principal ſum are added to the principal itſelf, and intereſt exacted upon the whole. It is, in fact, what we call *intereſt upon intereſt*, or *compound intereſt*. This is the worſt kind of uſury, and has been ſeverely condemned by the Roman law, as well as by the common laws of moſt other countries.

ANATOLIA. See NATOLIA.

ANATOMY.

THE art of diſſecting, or artificially taking to pieces the various parts which compoſe an animal body, for the purpoſe of obtaining an accurate knowledge of their ſtructure and œconomy.

Introduction.

The human body is compoſed of *ſolids* and *fluids*. The ſolid parts are the chief ſubject of anatomy properly ſo called: the hiſtory of the fluid parts occurs only occaſionally; becauſe it properly belongs to what is called *phyſiology*, or the *animal œconomy*.

All the ſolid parts have been reduced under certain general claſſes, expreſſed by the generical names of *bone*, *cartilage*, *ligament*, *fibre*, *membrane*, *artery*, *vein*, *nerve*, *muſcle*, *gland*, &c. Theſe terms it is neceſſary we ſhould explain.

Explanation of the General Terms of Anatomy.

A *bone* is that hard, ſolid, and moſt inflexible part of the body, which aſſiſts in forming the great frame-work of the human machine.

A *cartilage* is that whitiſh or pearl-coloured ſubſtance, which uſually covers the extreme ends of a bone, ſofter than bone, but harder than any other part, ſmooth, pliable, and elaſtic.

A *ligament* is a white, fibrous, compact ſubſtance, more pliable than a cartilage, difficult to be broken or torn, and yielding but a very little when ſtretched. Bone, cartilage, and ligament, will be deſcribed in their proper places.

The name of *fibre* is given to thoſe ſmall and ſimple filaments, which, by their different diſpoſition and connections, compoſe all the other parts. Fibres may be either membranous, fleſhy, tendinous, or bony, and may run in various directions, according to the nature of the parts they are intended to form.

By *membrane*, we underſtand a pliable network of fibres interwoven together in the ſame plane. They differ in thickneſs, according to the ſmallneſs of their fibres and number of their planes. Theſe planes are termed *laminæ*, and are diſtinguiſhed according to their ſituation.

Veſſels are canals, more or leſs flexible, compoſed of different membranes, termed *coats*. Some of them divide into branches, more and more minute, but ſtill remain hollow. The general deſign of the veſſels is to convey fluids. They are diſtinguiſhed into blood-veſſels, vaſa lactea, lymphatica, &c. The very laſt and ſmalleſt extremities of theſe are termed *capillaries*.

Thoſe veſſels which receive the blood from the heart, and diſtribute it throughout the body, are named *arteries*; thoſe which bring the blood back to the heart, are called *veins*.

Arteries may be diſtinguiſhed from veins in a dead body, by their greater thickneſs, and by their diameter being preſerved when divided, which is not the caſe with a vein.

Nerves are thoſe white chords which proceed from the cerebrum, cerebellum, and ſpinal marrow, and are ramified over all the parts of the body.

The *abſorbents* are a ſyſtem of veſſels whoſe office is to take up and convey away whatever comes in contact with their mouths or orifices. This ſyſtem conſiſts of the *lacteals* and *lymphatics*.

Muſcles are bundles or maſſes of red fibres of various lengths. The middle portion of each muſcle is ſaid to be fleſhy. The extremities are called *tendinous*, and that ſhining, tough, inelaſtic, inſenſible ſubſtance iſſuing from them, *tendon*.

Glands are cluſters or moleculæ, compoſed of blood veſſels and nerves, united together in different folds, contortions, and intertextures, and inveſted by a membranous covering. Their office is to ſeparate from the maſs of blood certain fluids, which they diſcharge either immediately, or by other veſſels, termed *excretory*.

By *fat* we underſtand an oily, ſoft ſubſtance, collected between the ſkin and the muſcles, in the interſtices of the muſcles, about the viſcera, &c. and contained in a fine ſpongy kind of network, called *cellular membrane*.

By the term *viſcera*, is underſtood parts contained in a great cavity, without being connected to it through their whole extent. Such are the ſtomach, inteſtines, &c. in the abdomen.

PART I.

Sect. I. *Of the Bones in general.*

Nature evidently deſigned the bones to give ſhape and firmneſs to the human fabric; to form levers for the muſcles to act upon, and to defend thoſe parts from external injury, which are moſt immediately neceſſary to life; as the brain, ſpinal marrow, heart, lungs, &c. The fibres of a bone, when firſt formed, are very ſoft and gelatinous; until, by the addition of ſolid matter, they grow by degrees to the hardneſs of cartilage, and at length arrive at the ſtate of perfect bone. But this change is neither made in a very ſhort period, nor begun in all the parts of the ſame bone at the ſame time. Flat bones, that have their fibres directed to all ſides, begin to oſſify in or near a middle point; but the cylindrical bones, and all others whoſe fibres are nearly parallel, begin about the middle of each fibre, and thence ſhoot forth to their extremities; not always indeed in continued lines, but frequently beginning new oſſifications, which ſoon join the former; and by the continual addition of this oſſifying matter, the bones increaſe till they become ſufficiently hard.

The oſſification of bones depends principally on their veſſels being ſo diſpoſed, and of ſuch diameters, as to ſeparate a liquor, which may eaſily turn into a bony ſubſtance, when it is deprived of its thinner parts; as ſeems plain from the obſervation of the callous matter ſeparated after fractures and ulcers, where part of the bone is taken out: For, in theſe caſes, the veſſels extending themſelves, and the liquors added to them, are gradually formed into granulated fleſh; which fills up all the ſpace where the bone is taken from, then hardens till it becomes as firm as any other part of the bone. This happens frequently, even when the ends of the diſeaſed bone are at a conſiderable diſtance from each other.

The induration of bones is alſo greatly aſſiſted by their being expoſed, more than any other parts, to the ſtrong preſſure of

the great weights they ſupport, to the violent contraction of the muſcles fixed to them, and to the force of the parts they contain, which endeavour to make way for their own further growth. By all this preſſing force, the ſolid fibres and veſſels of bones are thruſt cloſer, and ſuch particles of the fluids conveyed in theſe veſſels as are fit to be united to the fibres are ſooner and more firmly incorporated with them, while the remaining fluids are forcibly driven out by the veins, to be mixed with the maſs of blood. In conſequence of this, the veſſels gradually diminiſh as the bones harden.

In old and conſumptive perſons, and ſometimes in diſeaſed or wounded limbs, bones decreaſe as well as the fleſhy parts, though not ſo faſt, becauſe of their hardneſs. Sometimes the oſſifying matter ſhoots out of the bones, and forms bony excreſcences; and frequently in very old men it is depoſited in the coats of the arteries, and renders them incapable of their functions, ſo that they no longer have power to propel the blood, and the extreme parts mortify. Though the cartilages and arteries are moſt ſubject to theſe changes, yet no part is exempt from them; for a large portion of the muſcular ſubſtance of the heart itſelf has been found perfectly oſſified. On the other hand, it ſometimes happens, that there is a deficiency of this oſſifying matter. This is evident in ſome fractures, where no callus will form, and conſequently the bone remains diſunited. The ſame thing occurred originally in the lower jaw of an adult body; where all that part on one ſide, which is beyond the teeth, was of a ſubſtance between that of a cartilage and a ligament. In children that have died of the rickets, the bones have proved ſoft and ſpongy; and the perioſteum in ſome places many times its natural thickneſs; but the cartilages and cartilaginous epiphyſes had no apparent alteration in their texture, though enlarged to more than twice their natural diameters.

Every cylindrical bone has a large middle cavity, which contains an oily marrow, and a great number of leſſer cells towards their extremities, which contain a bloody marrow. The marrow is of very conſiderable uſe to the bones; for by entering their tranſverſe canals, and paſſing from them into the longitudinal ones, it is communicated to all the plates to ſoften and connect their fibres, whereby they are preſerved from becoming too brittle; as we ſee they do in burnt bones, or thoſe long expoſed to the air, in people labouring under old age, lues, or ſcurvy. In all which caſes, the oil is either in too little quantity, or has its natural good qualities impaired.

Beſides this advantage which the ſubſtance of bones has from the marrow, their articulations are ſaid to receive no leſs benefit from it: for it is thought that the marrow paſſes into the articular cavities through the holes which are in the bones near the large joints. And as a proof of this it is alleged, that butchers, upon ſeeing the greater or leſſer quantity of marrow in the bones of cows, can tell whether they have travelled far or little before they were ſlaughtered. Every one of the cells that contain the marrow, is lined with a fine membrane, and that in the larger cells is alſo contained in thin membraneous veſicles. Through the ſubſtance of theſe membranes, to which anatomiſts have given the name of *internal perioſteum*, the blood-veſſels are alſo ſpread; their trunks entering obliquely, about the middle of the cylindrical bones. It is from the branches of theſe veſſels that the marrow is ſecreted, while other branches enter the internal ſubſtance of the bones for their nouriſhment; and the reaſon why they enter obliquely is, that they may not weaken the bones by dividing too many fibres in the ſame place. If the bones had been formed of the ſame quantity of matter without any cavities, they would, if they were ſtraight, be able to ſuſtain the ſame weight. But being made hollow, their ſtrength to reſiſt breaking tranſverſely is increaſed as much as their diameters are increaſed, without increaſing their weights: a mechaniſm which proves yet more convenient for birds, the bones of whoſe wings, and for the ſame reaſon their quills, have very large cavities. But the bones in the legs of all animals are more ſolid, being formed to ſupport weight; and mens bodies being ſupported by two limbs, the bones of thoſe limbs are therefore made more ſolid than thoſe of quadrupeds. In a fractured bone, in which the ſame kind of matter that produced bone at firſt is thrown out from the broken ends, there is formed a maſs of callous matter, of equal ſolidity with any part of the bone, and of equal or greater diameter. Hence the ſtrength of the bone in that place is even greater than it was before: a wiſe proviſion of nature, ſince bones, when once broken, are ſeldom ſet in ſo good a direction as at firſt; and therefore they would be more liable to be broke in the ſame place again, and would be reunited with greater difficulty, or perhaps not at all.

Bones that are not calculated for motion, as thoſe of the ſcull, the oſſa innominata, &c. alſo bones with their epiphyſes, when they meet, preſs into each other, and form ſutures, which ſoon diſappear in thoſe that join, while their oſſific matter is ſoft; but thoſe that grow harder before they meet, preſs more rudely into each other, and make more uneven ſutures, ſome of which in the ſcull remain to the greateſt age. It alſo happens ſometimes, that while a bone is oſſifying from its centre, a diſtant part begins a new oſſification, and forms a diſtinct bone, which may happen to be of any figure. Theſe bones are oftenеſt found in the lambdoidal ſuture, and are there called oſſa triquetra. But the ends or ſides of bones that are intended for motion, are hindered from uniting, by the cartilages which cover them; for when theſe cartilages are croded, the bones very readily unite, and form an anchyloſis.

The extreme ends of all thoſe bones that are articulated for very manifeſt motions, or that are not placed againſt other bones, are tipped with epiphyſes or additional bones, which in ſome meaſure determine their growth and figure. The epiphyſes are united chiefly to ſuch bones as are deſtined for frequent and violent motion; and for this purpoſe they are wiſely framed of a larger diameter than the bone they belong to. By this means, the ſurface of contact between the two bones of any articulation being increaſed, their conjunction becomes firmer, and the muſcles inſerted into them act with greater force by reaſon of their axes being further removed from the centre of motion.

Bones are compoſed of a great many plates, each of which is made up of fibres or ſtrings united by ſmaller fibrils; which being irregularly diſpoſed, and interwoven with the other larger fibres, make a reticular work. This texture is plainly ſeen in the bones of fœtuſes, which have not their parts cloſely compacted; and in the bones of adults which have been burnt, long expoſed to the weather, or whoſe compoſition has been made looſe by diſeaſes. The chinks which are generally made according to the directions of the larger fibres of bones that have undergone the action of fire or of the weather, ſhew the greater ſtrength of theſe than of the fibres which connect them.

The plates are ſaid to be firmly joined to each other by a great number of *claviculi*, or ſmall bony proceſſes, which, riſing from the inner plates, pierce through ſome, and are fixed into the more external ones. Of theſe nails, four kinds have been deſcribed by anatomiſts, viz. the *perpendicular*, *oblique*, *headed*, and *crooked*; but, in bones fitly prepared, numerous irregular proceſſes riſing out from the plates, are perceptible.

Though the exterior part of bones is compoſed of firm compact plates, yet they are all more or leſs cavernous internally. In ſome (*e. g.* the thin part of the *ſcapula*) the ſolid ſides are brought ſo near, that little cavity can be ſeen; and in others (*os humeri*, *os femoris*, &c.) the cavities are ſo large, that ſuch

bones are generally eſteemed to be hollow or fiſtular. But the internal ſpongy texture is evident in young animals; and ſome of it may be ſeen in thoſe of the greateſt age. This ſpongy cavernous internal part of bones is generally called their *cancelli*, or *lattice-work*.

All the bones in the human body, except the teeth, and thoſe parts of bones which are covered with cartilage, or where muſcles or ligaments ariſe or are inſerted, are covered with a fine membrane, which upon the ſcull is called *pericranium*, but in all other parts *perioſteum*. It ſerves for the muſcles to ſlide eaſy upon, and to prevent their being lacerated by the rough fibres which compoſe the bones. It is every where full of ſmall blood veſſels, which enter the bones for their nouriſhment; but the internal ſubſtance of the larger bones is nouriſhed by the veſſels, which, as has been already obſerved, enter obliquely through their middles.

Sect. II. *Of the Sutures and Bones of the Cranium.*

The mutual indentation of one bone with another, forms what is called a *future*. Thoſe which have proper names we ſhall deſcribe; thoſe which have not, will be found to derive their names from the bones which they ſurround.

1. The *coronal future* runs acroſs the ſcull, from one upper edge of the ſphenoidal bone to the other, and joins the parietal to the frontal bones.

2. The *ſagittal future* joins the parietal bones; begins at the os occipitis, and is continued to the os frontis. In children it deſcends to the noſe, the os frontis in them being two bones; and ſometimes it is found in adult ſubjects.

3. The *lambdoidal future* joins the back part of the oſſa bregmatis, or parietal bones, to the upper part of the occipital. In this future are frequently obſerved ſmall bones called oſſa triquetra, and ſometimes they occur in other ſutures.

4. The *ſquamous future* is formed by the upper part of the temporal and ſphenoidal bones wrapping over the lower edges of the parietal bones.

5. The *tranſverſe future* runs acroſs the face through the bottoms of the orbits of the eyes. It joins the lower edge of the frontal bone to the os ſphenoides, maxillæ ſuperioris, oſſa naſi, ungues, plana, palati, and malarum.

The advantage ariſing from the ſcull being divided into ſo many bones is, that it is neither ſo liable to be fractured, nor to have fractures extended ſo far as would happen were it compoſed of one bone only. This ſtructure is alſo convenient to the proceſs of oſſification, as has been already ſhewn; and it is ſtill more important to infants in the birth, becauſe theſe bones not being perfect at that time, admit of being preſſed together, ſo as to make the head conform to the ſhape and dimenſions of the parts through which it is to be expelled.

Ten of the bones of the head compoſe the *cranium*, the uſe of which is, to contain the brain and defend it from external injuries. Of theſe bones we ſhall deſcribe,

1. *Oſſa parietalia*; the two large bones which compoſe the ſuperior and lateral parts of the ſcull. On their inſide they are remarkably imprinted by the arteries of the dura mater, exhibiting ſomewhat the appearance of the branches of a tree.

2. The *os frontis* forms the upper and fore-part of the cranium. Its inferior parts compoſe the ſuperior portions of the orbits of the eyes, where, on its inſides, are impreſſed the volvuli of the brain. In its middle above the os ethmoides uſually ariſes a thin ſpine, which ſtrengthens that part of the bone, it being otherwiſe weak from its flatneſs. In ſome ſculls this ſpine is wanting; but then the bone is uſually thicker in that place, and from its middle, externally, goes a proceſs which ſupports the bones of the noſe. Immediately above the os ethmoides in this bone is a ſmall blind hole, through which runs a vein into the beginning of the longitudinal ſinus of the dura mater; and on the upper edge of each orbit, a ſmall perforation, or notch, through which nerves and an artery paſs to the forehead; it has alſo a ſmall hole in each orbit, near the os planum, through which paſſes a branch of the fifth pair of nerves. In the ſubſtance of this bone near the noſe are two, three, four, and ſometimes five ſinuſes, which open into the noſe; they differ very much in different perſons, and are very rarely found in children. Theſe ſinuſes, and the ſpine in this bone, make it very dangerous, if not impracticable, to apply a trephine on the middle and lower part of the forehead.

3. The *os ethmoides*, or *ſieve-like bone*, is about two inches in circumference, and is ſeated in the anterior part of the baſis of the ſcull, being almoſt ſurrounded by the bone laſt deſcribed. It is pierced with a number of holes, through which the olfactory nerves paſs. From its middle ariſes a large proceſs named criſta galli; and oppoſite to this a thin one which in part divides the noſe. The greater part of the laminæ ſpongioſæ in the noſe belong to this bone.

4. *Os ſphenoides* is of ſo very irregular a ſhape as ſcarcely to allow of verbal deſcription. It is ſeated in the middle of the baſis of the ſcull, and is bounded by the os frontis, ethmoides, vomer, occipitis, maxillæ ſuperioris, oſſa parietalia, palati, malarum, temporum, and petroſa, which are parts of the former bones. In its inſide, next the brain, is a cavity named ſella turcica, which is bounded by four proceſſes called clinoides; under the two foremoſt of which paſs the internal carotid arteries, and from their outſides are continued two thin long proceſſes upon that part of the frontal bone, which ſeparates the anterior lobes of the brain from the poſterior. Oppoſite to the ſella turcica is a proceſs which makes part of the ſeptum narium. On the outſide of the ſcull adjoining to the upper jaw, are two proceſſes of this bone on each ſide, named pterygoides, from which ariſe one on each ſide near the palate, which have no name. Over theſe paſs the tendons of the pterygoſtaphilina externi muſcles; and nearer towards the occiput, between theſe and the ſtyloid proceſſes of the oſſa petroſa, ariſe two more ſmall rugged proceſſes. Under the ſella turcica, in this bone, is a ſinus or two, moſtly found in adults, but in children, conſiſting only of ſuch a ſpongy ſubſtance as is ſeen in the ends of ſome of the bones. According to ſome writers, this ſinus belongs properly to the os ethmoides. At the inſide of the baſis of the two anterior clinoid proceſſes are two round holes, which are the firſt foramina of the ſcull; through theſe the optic nerves paſs. Almoſt under theſe, towards the ſides of the ſcull, are two irregular ſlits, named foramina lacera, or the ſecond foramina of the ſcull, through which paſs nerves and blood-veſſels into the orbits of the eyes. Under theſe again, towards the occiput, are two round holes, which make the third foramina, and through which paſs nerves to the face. About half an inch nearer the occiput are two more, of an oval figure, which are the fourth foramina, and through which paſs the largeſt branches of the fifth pair of nerves. A ſtraw's breadth farther are two very ſmall ones, called the fifth foramina, through which thoſe branches of the carotid arteries enter that are beſtowed upon the dura mater. Between this laſt deſcribed bone and the oſſa petroſa are two large rough holes, in which are ſometimes ſeen large veins; and from theſe holes, through part of the os ſphenoides, under the pterygoid proceſſes proceed the ſmall apertures, through which paſs arteries to the back part of the noſe.

5. *Oſſa temporum* are ſituated below the parietal bones, at the middle and lower parts of the ſides of the ſcull. They have each, at their back parts, one large ſpongy proceſs called mammillaris, or maſtoideus; and from the lower and middle parts of each, a proceſs iſſues, which joins the oſſa malarum, and which is named jugalis or zygomaticus.

6. *Ossa petrosa* lie between the former bones and the occipital bones, or are in fact portions of the former, as they are never found separate in adult bodies. Each on its outside has one long slender process called styliformis, and near the side of this process a foramen, running obliquely forwards into the scull, and through which the carotid arteries pass to the brain. These are the sixth foramina, and one foramen in the inside of the scull leading to the organs of hearing, which are the seventh foramina. The ridge on the upper parts of each of these bones helps to keep the brain steady, and are strong supports to the thin and flat parts of the scull. What remains to be said of this bone belongs properly to the description of the organs of hearing, to which we refer.

Between the last described bones and the following bone are two large holes, which are the eighth foramina. Through these pass the eighth pair of nerves and the lateral sinuses. Sometimes there are two on each side, one for the nerve and one for the sinus. To these foramina we may add another very small one on each side, through which pass the portiones duræ of the auditory nerves; and sometimes there is another for the passage of an artery.

7. The *os occipitis* forms all the back part of the scull. It is bounded by the sphenoidal, temporal, petrosal, and parietal bones. It has two small apophyses, by which it is articulated to the spine. Near those apophyses are two small foramina, which are the ninth of the scull; and through them pass the ninth pair of nerves. Between these is the great or tenth foramen, through which the medulla oblongata descends into the spine, the cervical arteries enter, and the cervical veins pass out. In the inside of this bone is a crucial spine impressed by the longitudinal and lateral sinuses; and on the outside, opposite to the middle of this spine, in some bodies, is an apophysis, and from that down to the great foramen a small thin spine. The spines in this bone are of the same use with those in the os frontis and other bones, viz. to strengthen it. The thinner parts of this bone are also defended by the muscles that cover them; a kind of provision which is very necessary, since we can least defend this part, and blows here are often attended with the most fatal consequences. There exists in most sculls a foramen behind each apophysis of the occipital bone. Through these pass sinuses from the lateral sinuses to the external cervical veins; and by means of these passages, as in all other communications of the same sort, the blood passes from those that happen to be surcharged by any posture of the head, into those that from the same posture would have been almost empty. Such sculls as want these foramina have two sinuses which answer the same purpose.

Whoever is acquainted with each bone of the cranium, can, without difficulty, examine them as they stand united, so as to know the shapes, sizes, distances, &c. of their several parts, and the forms, capacities, &c. of the cavities formed by them. This is of great use towards understanding the anatomy of the parts contiguous to, contained within, or connected to them.

Sect. III. *Of the Bones of the Face.*

The face is that irregular pile of bones which compose the fore and under part of the head. These are divided by authors into the *upper* and *lower maxillæ* or jaws, and the several parts of which they consist we shall now proceed to describe.

1. *Ossa nasi* make the upper part of the nose, and form that kind of arch which is fittest to sustain such injuries as the nose is most exposed to, as blows, bruises, &c.

2. The *ossa malarum* compose the anterior, lower, and outer parts of the orbits of the eyes. They have each a short process, which proceeds joins the proceſſus jugales of the temporal bones, and form arches which have been called ossa jugalia.

3. *Ossa ungues* are situated immediately below the os frontis towards the nose, and within the orbits of the eyes, whose anterior and inner parts they help to compose. Between each of these and the upper jaw is a foramen as large as a goose quill, for the passage of the lachrymal duct into the nose. Through this the puncta lachrymalia carry off any superfluous moisture from the eyes.

4. *Ossa plana* are seated immediately beyond the foregoing bones, in the orbits of the eyes, and are near thrice as big. They are rather smooth surfaces of the os spongiosum, than distinct bones, and are very often imperfect.

5. *Maxilla superior* is always described single, though it is manifestly divided by a suture which is scarce ever obliterated. It has two processes, which join the os frontis, and make part of the nose; and a third, which joins to the cartilage of the septum nasi. Its upper and outer parts compose the lower portions of the orbits of the eyes; its lower side, all that part of the face under the cheeks, eyes, and nose to the mouth, and two-thirds of the roof of the mouth. A little below the orbits of the eyes, in this bone, are two holes, and behind the dentes incisores one more, which divides into two, as it opens into the nose, on each side of the septum nasi. Between the posterior grinding-teeth and the orbits of the eyes are two great sinuses, called antra maxillæ superioris, which open in the upper part of the nose. In the lower edge of this jaw are the alveoli, or sockets for the teeth. All the body of the maxillary bone is hollow, and leaves a large sinus, which is commonly called antrum highmorianum. When the os maxillare is separated from all the other bones of the skeleton, its antrum appears to have a large aperture into the nostrils; but, in a recent subject, it is so covered at its back-part by the palate-bone, in the middle by the os spongiosum inferius, and before by a strong membrane, that one or sometimes two holes, scarcely so large as a crow-quill, are only left at the upper part; which, after a short winding process, open into the nostrils between the two ossa spongiosa. At the bottom of this cavity, we may often observe some protuberances, in which the small points of the roots of the teeth are contained. This cavern and the sockets of the teeth are often divided by the interposition only of a very thin bony plate, which is liable to be eroded by matter, or to be broke in drawing a tooth.

6. The *ossa palati* are two small bones that form the back-part of the roof of the mouth, and a small part of the bottom of each orbit. Between the ossa palati and os maxillare near the pterygoid processes of the sphenoidal bone, are two small foramina, through which arteries and nerves pass to the palate.

7. The *vomer*, so called from its resemblance to a *plow-share*, is seated between the bones of the palate, and the sphenoidal bone. It is also joined to the process of the ethmoides, and part of the lower jaw. Its fore-part is spongy, and is continued to the middle cartilage of the nose. This bone and cartilage form the septum nasi.

8. *Os spongiosum* is usually treated as a distinct bone, though it is only the spongy laminæ in the nose, of the os ethmoides and ossa plana, but chiefly of the os ethmoides, to which it always adheres.

9. The *ossa turbinata*, or *spongiosa inferiora*, resemble the superior ossa spongiosa in shape and substance, but have their anterior and upper edges contiguous to the transverse ridges of the nasal processes of the maxillary and palate-bones. From their upper straight edge, two small processes stand out: the posterior, which is the broadest, descends to cover some of the antrum highmorianum; the anterior rises up to join the os unguis, and to make part of the lachrymal duct.

10. *Maxilla inferior* is articulated with loose cartilages to the temporal bones, by two processes, named condyloides. Near these arise two more, called coronales, and at the inside

of the chin a small rough processus innominatus. In the inside of this bone, under each processus coronalis, is a large foramen, which runs under the teeth, and passes out near the chin. Through this foramen, the vessels pass that belong to the teeth; and in the upper edge of this jaw are the alveoli or sockets for the teeth, which seldom exceed sixteen in each jaw. The four first in each are called incisores, the two next canini, the rest molares. The four last of these are named dentes sapientiæ, because they do not appear till men arrive at years of discretion. The incisores and canini have only one single root, but the molares more; the eight first, two; and the rest, some three, some four, especially in the upper jaw; where also they are spread wider, because that jaw being more spongy than the other, the teeth need more space to fix them. Each of these roots has a foramen, through which pass an artery, vein, and nerve, which are expanded in a fine membrane that lines the cavity in each tooth. These vessels and membrane are the seat of the tooth-ach. The teeth of children cast off in consequence of the pressure of the new teeth, which causes the roots of the first teeth to be absorbed. When teeth are drawn from the jaws of adult persons, the sockets are absorbed, and new teeth very rarely, if ever, supply the place of those that have been extracted.

Sect. IV. *Of the Bones of the Trunk.*

The trunk consists of the *spine*, *pelvis*, and *thorax*.

1. The *spine* is composed of twenty-four vertebræ, besides those of the os sacrum and coccygis. Seven of these belong to the neck, and the first of them is called *atlas*, because it immediately supports the head. Its upper side has two cavities, into which the apophyses of the os occipitis are received; but these two cavities together, unlike all other joints, are laterally portions of concentric circles, by which means they are but as one joint, and so suffer the head to move easily side-ways, which otherwise it could no more do than the knee, which also has two heads and two cavities. The under side of this bone has a very flat articulation with the next; by which means it is fitted for a rotatory motion. The second vertebra is called *dentata*, or axis, from a process which passes through the former bone, and is the axis upon which it turns; nevertheless all the vertebræ of the neck contribute something to the rotatory motion of the head. The *processus dentatus* is strongly tied to the os occipitis, and to the atlas by ligaments, to prevent its hurting the spinal marrow. Twelve vertebræ belong to the back, and five to the loins. The os sacrum consists sometimes of five, sometimes six bones, and the os coccygis of four. If the spine had been composed of fewer bones, they must have either not been capable of bending so much and so variously as they do, or have bent more in each joint, which would have endangered the spinal marrow.

The superior vertebræ of the neck being fixed behind the head's centre of gravity, the neck is so far bent forward, as that the last of these vertebræ, which has a firm bearing upon those of the thorax, falls exactly under the centre of gravity. Those of the thorax are bent backwards, behind the centre of motion, to make room for the parts contained in the thorax; and that they might not be made too weak by this structure, they are formed for less motion than other vertebræ. Those in particular which are bent farthest from the centre of gravity have the least motion. The middle vertebræ of the loins are again bent forwards under the centre of gravity, or near it; and from thence they go backwards to the os sacrum, where being fixed to the ossa innominata behind the centre of gravity, the articulation is therefore firm and without motion; and from thence the ossa innominata are so formed, as that their sockets, into which the thigh bones are admitted and enjoy a free motion, are exactly under the centre of gravity.

There is in all these vertebræ, except the first, a middle anterior spongy body, by which they are firmly articulated with a very strong intervening ligament; and from the middle of the hind part of each, except the first, stands a process named *spinalis*, and from every one a process on each side, called *transversalis*, and two superior, and two inferior short ones, by which the back parts of the vertebræ are articulated, named *obliqui superiores*, and *inferiores*.

The fore-part of the seven vertebræ of the neck, and two upper of the back, are flat forwards, to make room for the trachea. The third and fourth of the back are acute, to give way to the vessels of the lungs and heart, and they are directed to the right side for the better situation of the heart, which makes that side of the breast more convex than the other.

The spinal processes of the second, third, fourth, and fifth vertebræ of the neck are forked, the two last long and horizontal, the three or four upper ones of the back like them, only a little declining. The middle ones of the back run obliquely downwards, and the processes of the remaining vertebræ become successively thicker, stronger, and less declining; those of the loins being horizontal, like the last of the neck. The muscles, that are inserted into the spinal processes of the vertebræ of the neck and loins will act with more strength than those of the back, because their processes being perpendicular to the spine, they are longer levers. Besides, those of the back almost touch one another, to prevent much motion, because it would interrupt respiration; but more motion being necessary in the neck and loins, their processes are contrived accordingly.

The transverse processes of the vertebræ of the neck are perforated, for the admission of the cervical blood vessels, and bowed downwards, and hollowed, for the passage of the cervical nerves. The eight or nine upper ones of the back receive the upper ribs; and the rest, with those of the loins, serve only for the origin and insertion of muscles.

2. *Os sacrum* has two upper oblique processes, some small spinal processes, and two foramina in each interstice of the bones which compose it, both before and behind.

3. *Os coccygis* or *rump-bone*, is that triangular chain of bones depending from the os sacrum; each bone becoming smaller as they descend, till the last ends almost in a point. The os coccygis is convex behind, and concave before; from which crooked pyramidal figure, which was thought to resemble a cuckow's beak, it has got its name. This bone consists of four pieces in people of middle age. In children, almost the whole of it is cartilage. In old subjects, all the bones are united, and become frequently one continued bone with the os sacrum.

Through every bone of the spine, the ossa coccygis excepted, is a large foramen, which together make a channel through the spine, designed to contain the medulla spinalis; and in each space between the vertebræ are two large holes for the nerves to pass out. Nothing can be more worthy of admiration, than the provision which nature has made to prevent luxations in this chain of bones, such luxations being worse than any other, because of the spinal marrow that is contained within. The bodies of the vertebræ are all in the same manner connected by strong intervening ligaments or cartilages. In the neck the oblique processes of the received bone are wrapped over those of the receiving bone, which forbids their luxating forwards. The transverse processes, with a small apophysis of the body of the same bone, in like manner, secure them from slipping backwards; and an apophysis on each side of the body of the receiving bone, hinders them from slipping to either side. The vertebræ of the back are hindered from dislocating forwards by

the ſame proviſion with thoſe of the neck; and from luxating backwards, by the ribs which are faſtened to the tranſverſe proceſſes of the inferior vertebræ, and againſt the back part of the body of the next ſuperior. They alſo hinder them from diſlocating to either ſide; but the laſt ribs are not fixed to the tranſverſe proceſſes of the vertebræ of the back, and therefore it is that luxations are moſt frequently ſeen in this part. The vertebræ of the loins however are received into deep cavities, and are tied with much ſtronger ligaments for their ſecurity. Each joint of the vertebræ, except the two uppermoſt, has two centres of motion, one upon the bodies of the vertebræ, when the trunk is bowed forward; and the other at the articulations of the oblique proceſſes, when the body is inclined backwards. From this ſtructure the extenſor muſcles will have about twice the leaver to act with, and conſequently twice the power to raiſe the trunk into an erect poſture, that they have to carry it beyond that poſture; for then the oblique proceſſes begin to be the centre of motion, and give a like advantage to the flexors. Without this contrivance it would be difficult to keep the body erect, or to recover an erect poſture after the body has been bent forwards.

4. The *ribs* are twelve in number on each ſide. The ſeven uppermoſt are called *true* ribs, becauſe their cartilages reach the ſternum; and the five loweſt are named *falſe* ribs. They are articulated to the bodies of the twelve vertebræ of the back, and all, except the two or three laſt, are articulated to their tranſverſe proceſſes, and the under ſide of the middle ribs are hollowed for the paſſage of the intercoſtal veſſels. They defend the parts contained in the breaſt, and when they are drawn upwards, the cavity of the breaſt is enlarged for inſpiration, and vice verſa.

The ſubſtance of the ribs is ſpongy, cellular, and only covered with a very thin external lamellated ſurface, which increaſes in thickneſs and ſtrength as it approaches the vertebræ. To the fore-end of each rib a long, broad, and ſtrong cartilage is fixed, and reaches thence to the ſternum, or is joined to the cartilage of the next rib. This courſe, however, is not in a ſtraight line with the rib; for the cartilages generally make a conſiderable curve, the concave part of which is upwards; therefore, at their inſertion into the ſternum, they make an obtuſe angle above, and an acute one below. Theſe cartilages are of ſuch a length as never to allow the ribs to come to a right angle with the ſpine; but they keep them ſituated ſo obliquely as to make the angle very conſiderably obtuſe, above, till a force exceeding the elaſticity of the cartilage is applied. Theſe cartilages, like all others, are firmer and harder internally than they are on their external ſurface; and ſometimes in old people, all their middle ſubſtance becomes bony, while a thin cartilaginous lamella appears externally. The oſſification, however, begins frequently at the external ſurface.

5. The *ſternum*, or *breaſt-bone*, is generally made up of three ſpongy bones, ſometimes more. To this the two ribs are articulated by their cartilages, which ſometimes in robuſt men have moveable joints, ſuch as are ſeen in oxen and other quadrupeds. At the end of the ſternum is the *cartilago enſiformis*, ſo called from its ſhape, but it very often is double. There is alſo frequently a variety in the form of the cartilages which join the ribs and ſternum; ſometimes one cartilage ſerving two ribs, and ſometimes a cartilage not being joined to any rib.

It is ſeldom that we find fewer than twenty-four vertebræ in the ſpine, beſides the os ſacrum, but often more. Sometimes there are thirteen of the back, with as many ribs of a ſide: ſometimes there exiſt ſix in the loins, and in ſome bodies two ribs from the firſt vertebræ of the loins; but then the tranſverſe proceſſes are generally wanting.

6. The bone called *os innominatum* in the adult ſubject, is in young perſons compoſed of three bones; the upper named *os ilium*, the lower and poſterior *os iſchii*, and the anterior *os pubis*. The upper edge of the ilium is called its ſpine, the anterior part of the ſpine its apex, and a little lower is the *proceſſus innominatus*. The os ilium has two proceſſes, the one named the obtuſe proceſs, and the other the acute. In the centre of theſe bones is the acetabulum or ſocket in which the motions of the thigh bone are performed. In the bottom of this ſocket is another cavity, in which lies the lubricating gland which ſupplies this joint with *ſynovia*. Between the os iſchium and pubis a very large irregular hole is left, which, from its reſemblance to a door or ſhield, has been called *thyroides*. This hole is all, except the niche for the poſterior crural nerve, filled up, in a recent ſubject, with a ſtrong ligamentous membrane, that adheres very firmly to its circumference. From this membrane chiefly the two obturator muſcles, external and internal, take their riſe. The great deſign of this hole, beſides rendering the bone lighter, is to allow a ſtrong enough origin to the obturator muſcles, and ſufficient ſpace for lodging their bellies, that there may be no danger of diſturbing the functions of the contained viſcera of the pelvis by the actions of the internal, nor of the external being bruiſed by the thigh bone, eſpecially by its leſſer trochanter.

SECT. V. *Of the bones of the upper extremity.*

1. In ſpeaking of theſe we ſhall begin with the *clavicula* or *collar-bone*, which is connected at one end to the ſternum by a looſe cartilage, and at the other to the proceſſus acromion of the ſcapula. Its chief uſe is to keep the ſcapula a ſufficient diſtance from the breaſt, and by that means to prevent the ſhoulders from coming too near together.

2. The *ſcapula* is united to the ſternum by the clavicle. Its chief connection however is to the ribs and ſpine, by means of the ſame muſcles that direct its motions. In ſuch quadrupeds as have no clavicles it is fixed only by muſcles, whoſe actions give to this bone a great deal of that motion which ſeems to belong to the joint of the ſhoulder. The under ſide of this bone is a little concave, partly to fit the outer ſurface of the ribs on which it moves, and partly to give room for the ſubſcapularis muſcle. On the outſide of the ſcapula riſes a large ſpine, the fore part of which is called the *proceſſus acromion*, and to which the clavicle is fixed. In men and ſuch quadrupeds as have clavicles, and uſe their fore limbs like arms, this proceſs and ſpine are much larger and more prominent. By this the muſcles are placed farther from the centre of motion, and are thereby able to act with greater effect. Near this proceſs is another called *coracoides*, from whoſe extremity, and with ſimilar advantages, ariſe two muſcles of the arm. This proceſs with the former and a flat ligament between them both, hinder the os humeri from being diſlocated upwards. The ſide oppoſite to the ſocket is called the baſis of the ſcapula, and the lower edge *coſta inferior* from its figure, which is thick, and like a rib to the ſcapula; but its upper edge being very thin, is improperly ſo called in the human ſubject although it may be otherwiſe in many quadrupeds. At the fore part of this edge, cloſe to the coracoid proceſs, is a ſemicircular nich or groove for the paſſage of blood-veſſels, which nich is cloſed above with a ligament and ſometimes with bone. The ſcapula and clavicle are joined by plain ſurfaces tipped with cartilage.

The ſcapula is connected to the head, os hyoides, vertebræ, ribs, and arm-bone, by muſcles, that have one end faſtened to theſe bones, and the other to the ſcapula, ſo as to move it upwards, downwards, backwards, or forwards; by the quick ſucceſſion of theſe motions, its whole body is car-

ricd in a circle. But being alſo often moved as upon an axis perpendicular to its plane, its circumference turns in a circle whoſe centre this axis is. Whichever of theſe motions it performs, it always carries the outer end of the clavicle and the arm along with it.

3. The *os humeri*, at its upper end or head, where it is joined to the ſcapula, is ſomewhat flat, and much larger than the ſocket which receives it. At its ſuperior part are two proceſſes for the inſertion of the muſcles of the arms, and between theſe proceſſes is a long channel, in which lies the tendon of the biceps cubiti. At its lower end are two conſiderable proceſſes, both formed to give origin to muſcles which move the wriſt and fingers; and the flexors in theſe parts being much more conſiderable than the extenſors, the inner proceſs from which the flexors ariſe is formed much larger than the outer, from which the extenſors take their origin: between theſe proceſſes is the elbow joint. That part to which is attached the upper end of the radius, is fitted not only for the motion of the elbow, but alſo for the rotatory motion of the radius. The reſt of this joint is made of portions of unequal, but concentric, circles, like the ſhanks of quadrupeds; and this inequality prevents the ulna from diſlocating ſideways, which ſo ſmall a joint with ſo conſiderable a ſhare of motion would otherwiſe be very liable to. Of a like uſe is the little ſinus on the fore part of the humerus, and the large one behind; the firſt receiving a proceſs of the ulna when the arm is bent, and the other, the olecranon, when the arm is in a ſtate of extenſion.

4. The *ulna*, at its upper end, has one large proceſs called *olecranon*, and a ſmall proceſs on the fore part; and on one ſide between theſe is alſo a ſmall cavity, which receives the upper end of the radius for its rotatory motion. Down the ſide of this bone, next the radius, is a ſharp edge, from which the ligament ariſes, and which connects both together. At the lower end is a proceſs, called ſtyliformis, and a round head, which is received into the radius and adapted for the rotatory motion of the elbow.

5. *Radius:* The upper end of this bone is received into the ulna, and joined to the humerus, in a manner chiefly favourable to its rotatory motion; for the ſtrength of the elbow joint receives but little advantage from the union of theſe two bones. A little below its head is a large tubercle, into which the biceps muſcle is inſerted, and which, in conſequence of this arrangement, turns the cubit in a ſupine poſture, and alſo bends it. At the lower end, which is thicker, is a ſocket to receive the carpus, and at the ſide next the ulna a ſmall one to receive that bone. There is likewiſe a thin edge, into which the tranſverſe ligament, which ariſes from the ulna, is inſerted. By this ligament theſe bones are tied conveniently and firmly together; for the ulna being chiefly articulated to the os humeri, and the radius to the carpus, a weight at the end would be liable to pull theſe bones aſunder were it not prevented by this ligament.

Bones of the hand.

1. The *carpus* or *wriſt* is compoſed of eight bones of very irregular forms, undoubtedly the propereſt that can be; yet why in theſe forms, rather than any other, no anatomiſt has been able to ſhew. They have all obſcure motions one with another, and with thoſe of the *metacarpus*; but the motion of thoſe of the firſt rank, or order, with thoſe of the ſecond, is more conſiderable, and is directed by the ſame muſcles which move the carpus on the radius.

2. The *metacarpus* conſiſts of four bones which ſuſtain the fingers; that of the fore-finger having the leaſt motion, and that of the little one the moſt. The other ends of theſe bones have round heads for the articulations of the fingers; but the other joints of the fingers have double heads and ſockets. The thumb is ſhorter and ſtronger than any of the fingers, becauſe in its actions it is to reſiſt them all. The firſt joint is very ſingular, each bone receiving and being equally received.

3. The orderly diſpoſition of the bones of the *fingers* into three rows, has made them generally obtain the name of three *phalanges*. All of them have half-round convex ſurfaces, covered with an aponeuroſis, formed by the tendons of the extenſors, lumbricales, and interoſſei, and placed directly backwards, for their greater ſtrength; and their flat concave part is forwards, for taking hold more ſurely, and for lodging the tendons of the flexor muſcles. The ligaments for keeping down theſe tendons are fixed to the angles that are between the convex and concave ſides.

Sect. VI. *Bones of the lower extremity.*

1. Of the bones of the lower limb, the principal is the *os femoris*, which, at its upper end has a round head that is received into the ſocket of the os innominatum. In moſt quadrupeds this head is oblong, and makes a firmer articulation; but that ſhape not allowing of ſo much motion as a rounder head, could not be well adapted to the human ſubject. The two proceſſes near the head of this bone, are called the *greater* and *leſſer trochanters*. Theſe are as evidently formed for the inſertion of muſcles, as the neck which lies between them and the head, is formed to make room for thoſe numerous and powerful muſcles which are diſpoſed on the inſide of the thigh; beſides that by projecting outwards, longer levers are ſupplied for thoſe muſcles that are inſerted into its upper and external parts. Between the great trochanter and the neck of this bone, is a large ſinus, into which muſcles are inſerted; and between the two trochanters is a remarkable roughneſs which begins the linea aſpera, and is deſigned for the ſame uſe. The middle of this bone, for the convenience of the muſcles, is bent forwards; and this would make it ſubject to break backwards, if there were not a ſtrong ridge on the back ſide, which ſtrengthens it conſiderably, and ſerves alſo for the advantageous inſertion of ſeveral muſcles: this ridge is called the *linea aſpera*. At the lower end of the femur are two large heads, called the outer and inner apophyſes. Theſe are ſo contrived, partly from being projected backwards, and partly from their ſhape, as to remove the centre of motion very far behind the axis of the bone, ſo as to give great power to the muſcles that extend this joint to raiſe the whole weight of the body, though it leſſens the power of the flexors that move the leg only. It is between theſe proceſſes that the large blood-veſſels deſcend ſecurely to the leg.

2. The *rotula*, or *knee-pan*, is ſeated on the fore-part of the knee. It has the appearance of being buried as it were, in the centre of the tendon, through which however it ſoon extends, until the tendinous fibres are loſt, and appear to be converted into bone. When this bone is broken, the original tendinous diſpoſition ſeems to prevail in the part, ſince its broken extremities, unlike thoſe of all other fractured bones, unite with a tendon-like ſubſtance, which is rarely converted into bone, and eſpecially in thoſe caſes where the joint moſt perfectly recovers its motions. The uſe of the rotula is to ſecure the extenſors of the tibia, leſt, paſſing over the joint, they might be too much expoſed to external injuries; it alſo poſſeſſes the advantage mentioned above, of removing the common axis of the extenſors of the tibia farther from the centre of motion, and thus becomes a moſt convenient medium for thoſe muſcles to unite in, to perform one common action.

3. The *tibia*, ſo called from its reſemblance to an old muſical pipe or flute, is the long thick triangular bone, ſituated at the internal part of the leg, and continued in almoſt a ſtraight

line from the thigh bone. At its upper end, are two ſhallow ſockets which receive the thigh bone, and between theſe, a rough proceſs, to which the crucial ligaments of the knee-joint are connected. Near the upper end is a proceſs, into which the ligament or tendon of the patella is inſerted, and at the lower is the proceſs, which forms the inner ancle, and ſecures this bone from diſlocating outwards. Towards its upper end, the tibia is triangular, and even concave on the ſide next the muſcles; but lower, as the muſcles grow leſs and become tendinous, the bone grows rounder; that being upon the whole a ſtronger form. Yet it is by no means ſo ſtrong a bone as that of the thigh, though it bears a greater weight. It is perhaps ſomewhat the more able to do this by being ſtraighter and ſhorter, and bearing the weight of the body in a more perpendicular direction.

4. *Fibula* is the ſmall long bone, placed on the outſide of the leg, oppoſite to the external angle of the tibia; the ſhape of it is irregularly triangular. The head of the fibula has a ſuperficial circular cavity formed on its inſide, which, in a recent ſubject, is covered with a cartilage; and it is ſo cloſely connected to the tibia by ligaments, as to allow only a ſmall motion backwards and forwards. This head is protuberant and rough on its outſide, where a ſtrong round ligament and the muſculus biceps are inſerted; and, below the back-part of its internal ſide, a tubercle may be remarked, that gives riſe to the ſtrong tendinous part of the ſolæus muſcle. Its upper end is joined to that bone below the joint of the knee, and its lower end ſinks into a ſhallow ſinus of the ſame bone, forming lower down the external ancle. This proceſs, with that of the tibia, ſtrengthens the ancle joint. It is a doubtful point, whether or not this bone contributes to the ſupport of the body; but, as affording a convenient ſurface for the attachment of muſcles, it is a part of conſiderable importance.

Bones of the Foot.

1. The *tarſus* is compoſed of ſeven bones, the firſt of which, called *aſtragalus*, ſupports the tibia, and is ſupported by the os calcis, which being projected backwards, makes a long lever for the muſcles to act with, that extend the ancle and raiſe the body upon the toes. Theſe two bones have a conſiderable motion between themſelves, and the aſtragalus alſo with the os naviculare. All the reſt have an obſcure motion one with another, and with the bones of the *metatarſus*: the principal ſhare of theſe motions falling towards the great toe, where lies the greateſt ſtreſs of action. Theſe bones, by yielding in this manner, are leſs liable to be broken; and acting as a kind of ſpring under the leg, render the motions of the body in walking more eaſy and graceful, and the bones to which they give ſupport, leſs ſubject to be fractured in any violent exertion.

2. To theſe bones are joined five others, called *metatarſal* bones. That which ſupports the great toe is much the largeſt, becauſe of there being the greateſt ſtreſs laid on it in walking. Under its end lie the two *ſeſamoid* bones, which are of the ſame uſe as the rotula. The great toe has two bones; the leſſer three each. The little toe, and frequently that next to it, have the ſecond and third bones intimately united into one; which may be owing to their little motion, and the great preſſure they are ſubject to from the weight of the body.

SECT. VII. *Of the Cartilages, Ligaments, &c.*

If the moveable bones were not connected and kept firm by ſome ſtrong ſubſtance, they would be luxated at every motion of the joints; and if their hard rough unequal ſurfaces were to play on each other, their motion would not only be difficult, but the loſs of ſubſtance from attrition would be great. Therefore ligaments are made to obviate the firſt, and cartilages t prevent the other inconveniency. But becauſe ligaments an cartilages turn rigid, inflexible, and rough, unleſs they are kep moiſt, a ſufficient quantity of a proper liquor termed *ſynovia* is ſupplied for their lubrication. Thoſe parts of a bone therefore, which is articulated to another bone for motion are covered or lined with a *cartilage*, as far as it move upon, or is itſelf moved upon by another bone in any ac tion; for cartilage being ſmoother and ſofter than bone renders motion more eaſy than it would otherwiſe be, and pre vents the bones from injuring each other by the friction of th joint.

In each articulation of the lower jaw, there is a looſe cart lage, upon which the condyloid proceſs moves on one ſide while the jaw is moved to the other; and the two proceſſe being thus raiſed at once, the jaw is thruſt forward. Thi ſtructure renders the motions of the jaw more firm, as tha with intervening cartilages makes it more looſe and volubl There are alſo cartilages of this kind between the clavicles an the ſternum.

In the joint of the knee are two looſe, almoſt annular cart lages, which being thick at their outer edges, and thin at thei inner ones, make the greateſt parts of the two ſockets in thi joint. The uſe of theſe cartilages is to make variable ſocket to ſuit the different parts of the lower end of the os femoris for none but a round head and a round cavity can ſuit in mo tion, unleſs the ſhape of one or the other alters; and it i plainly neceſſary, that this lower end of the os femoris ſhoul be flattiſh, and projected backward, to give advantage to th muſcles that extend the tibia, by ſetting the centre of motio backward: which mechaniſm, though it equally leſſens th power of thoſe muſcles which bend this joint, is yet of grea ſervice, becauſe the extending muſcles move this joint unde the weight of the whole body, but the flexors only raiſe th legs; and as no head or ſocket moves ſo eaſily as round ones here ſeems to be ſome proviſion made againſt the inconvenienc of a flattiſh head and cavity, by having the friction made upo two ſurfaces, the os femoris upon the looſe cartilages, and th looſe cartilages upon the tibia. This contrivance is practiſe by mechanics, where the friction of the joints of any of thei machines is great, as between the parts of hook-hinges o heavy gates, and between the male and female ſcrews of larg vices, where they uſually place a looſe ring.

There are other cartilages which ſerve to give ſhape to parts Of this ſort are the ciliary cartilages at the edge of the eye lids, the cartilages of the outer ears, and thoſe which compoſ the noſtrils, which have this particular advantage in theſ places, that they ſupport and ſhape the parts as well as bone do, and without being liable to be broke.

Such of the bones as are articulated for motion are tied to gether by very ſtrong ligaments, to prevent their diſlocating and theſe ligaments alſo ſurround the joints, and preſerve thei lubricating mucus. The thickneſs and ſtrength of theſe liga ments are proportioned to the actions of the ſeveral joints, an their lengths are no more than ſufficient to allow a proper de gree of motion; but the forms of them are different according as the actions of the ſeveral joints are to be performed.

To the bones of thoſe limbs that move in every direction, ar attached *ligaments* like purſes, which ariſe from or near the edge of the ſockets of the receiving bones, and are inſerted al round the received bones a little below their heads. The begin nings of theſe ligaments, from the edges of the ſockets of th ſcapula and os innominatum, are of a nature almoſt cartilagi nous, which ſerves in the ſcapula to make a larger ſocket, an ſuch a one as will alter the figure as the bone moves, for the rea ſon given with regard to the looſe cartilage of the knee. In deed the head of the os humeri not being an exact portion of

ſphere, requires ſuch a ſocket, and the hard part of this ligament in the acetabulum of the os innominatum makes that cavity deeper than the ſemidiameter of the ſocket, by which means the articulation is made ſtronger without any hindrance to motion. It will give way to the neck of the os femoris when it preſſes againſt it; and the thigh bone being more diſpoſed to be diſlocated upwards than any other way, the upper ſide of this burſal ligament is made exceedingly ſtrong to prevent ſuch an accident. From the lower edge of the acetabulum or ſocket of the os innominatum ariſes a ligament about an inch long, called *teres*, or *rotundum*, which length is neceſſary for that quantity of motion which this joint has in human bodies. It alſo hinders the os femoris from diſlocating upwards, though downwards it will ſuffer it to go far out of the ſocket. This ligament is alſo thought to aſſiſt in preſſing the gland in the bottom of the acetabulum, ſo as compel it to yield its ſecretions.

In thoſe joints which admit only of flexion and extenſion, the ligaments differ from the foregoing in this, that they are much ſhorter and ſtronger at the ſides of the joints, and thinner backward and forward. Beſides theſe ligaments, in the middle and back-part of the joint of the knee, are two very ſtrong ligaments, which ariſe from a proceſs at the end of the tibia. They croſs each other in ſuch a manner, as is beſt calculated to ſecure the joint from being diſplaced in any direction. They alſo hinder the extenſors of the tibia from pulling that bone too far forwards, and are ſo connected to the ſemilunar cartilages, as to move them as the joint moves. But beſides theſe, there exiſts in this joint another ſmall ligament, which ariſes from the os femoris, and ends in the fatty membrane that it ſupports. From this arrangement of parts, it ſeems evident that the knee cannot be completely diſlocated without breaking the croſs ligaments.

The bones of the carpus and tarſus are connected together by ligaments running promiſcuouſly upon their ſurfaces from one to another. At the under-ſide of the tarſus theſe are exceedingly ſtrong, becauſe they ſupport the whole body. There is alſo to the carpus a ſtrong ligament, which runs from the fifth bone to the eighth, and the proceſs of the fourth bone. The proper uſe of this is, to bind down the tendons of thoſe muſcles that bring the fingers into a ſtate of flexion.

The proceſſus dentatus of the ſecond vertebra is tied to the ſcull by a ligament, and kept cloſe to the fore-part of the firſt vertebra by another in that vertebra, that it may not bruiſe the ſpinal marrow; and when either this ligament or proceſs is broke, it occaſions that ſort of broken neck which is attended with ſudden death. All the bones of the vertebræ, and every joint that is without motion, and not joined by a ſuture, as the oſſa innominata with each other, and the os ſacrum with the oſſa innominata, are joined by intervening ligaments, or, as they are commonly called, cartilages. The oſſa innominata are alſo tied by very ſtrong ligaments which run from the back of the ſpines of the oſſa ilia to the os ſacrum, and other ligaments which go from the os ſacrum and os coccygis to the acute and obtuſe proceſſes of the oſſa iſchia: theſe ligaments ſerve alſo for origins of muſcles. Towards the great foramen of the oſſa innominata the acetabulum has a deep notch, acroſs which runs a ligament that completes the ſocket. A ligament ſomewhat like this exiſts alſo between the proceſſes of the ſcapula. From the edge of the ilium to that of the os pubis, runs a ligament which is contiguous to, and appears to be a part of, the tendons of the muſcles of the abdomen. The uſe of this is to cover the iliac veſſels as they deſcend to the thigh.

Ligaments alſo ſupply the place of bones in ſeveral caſes. Thus the parts in the pelvis are more ſafely ſupported below by ligaments than they could have been by bone. The ligaments placed in the great holes of the oſſa innominata and between the bones of the fore-arm and leg, afford convenient origin to muſcles. Immoveable bones are firmly connected by them; of which the conjunction of the os ſacrum and innominatum is an example. They afford a ſocket for moveable bones to play in, as we ſee part of the aſtragalus does on the ligament ſtretched from the heel-bone to the ſcaphoid.

In every joint, where the bones are faced with a cartilage to favour a ſliding kind of motion, there are ſmall glands, which ſeparate a mucilaginous fluid, called *ſynovia*. Theſe are commonly ſituated in the joint, after ſuch a manner as to be gently preſſed, but not deſtroyed by its motion. By this means, when there is the greateſt neceſſity for this liquor, that is, when the moſt frequent motions are performed, the greateſt quantity of it muſt be ſeparated. Theſe glands are ſoft and pappy, but not friable: in ſome of the large joints they are of the conglomerate kind, or a great number of ſmall glandules are wrapt up in one common membrane. Their excretory ducts are long, and hang looſe, like ſo many fringes, within the articulation; which, by its motion and preſſure, prevents obſtructions in the body of the gland or its excretories, and promotes the return of this liquor, when fit to be taken up by the abſorbent veſſels, which muſt be in the joints, as well as in the other cavities in the body; and, at the ſame time, the preſſure on the excretory ducts hinders a ſuperfluous unneceſſary ſecretion, while the fimbriated diſpoſition of theſe excretories does not allow any of the ſecreted liquor to be puſhed back again by theſe canals towards the glands. Very often theſe fountains of ſlimy liquor appear only as a net-work of veſſels. Frequently they are almoſt concealed by cellular membranes containing the fat, and ſometimes ſmall ſimple mucous folliculi may be ſeen. The different joints have theſe organs in different numbers and ſizes. The conglomerate ones do not vary much, eſpecially as to ſituation, in the ſimilar joints of different bodies; but the others are more uncertain.

EXPLANATION OF PLATE X.

Bones of the Skeleton.

1 Os frontis. 2 Os bregmatis. 3 Os temporis. 4 Os occipitis. 5 Os malæ. 6 Os maxillæ ſuperioris. 7 Os naſi. 8 Dentes. 9 Os maxillæ inferioris. 10 Tranſverſe proceſſes of the vertebræ of the neck. 11 Clavicula. 12 Proceſſus acromion of the ſcapula. 13 Scapula. 14 Os humeri. 15 Radius. 16 Ulna. 17 Carpus. 18 Metacarpus. 19 Bones of the fingers. 20 Sternum. 21 Cartilago enſiformis. 22 Ribs. 23 Vertebræ of the loins with their tranſverſe proceſſes. 24 Os ileum. 25 Os ſacrum. 26 Os coccygis. 27 Os femoris. 28 Rotula. 29 Fibula. 30 Tibia. 31 Os calcis. 32 Tarſus. 33 Metatarſus. 34 Bones of the toes.

Explanation of the Anatomical Figure, which exhibits a View of the external Muſcles.

1 Muſculus triceps extenſor cubiti. 2 Deltoides. 3 Teres major. 4 Latiſſimus dorſi. 5 Pectoralis. 6 Obliquus deſcendens abdominis. 7 Rectus abdominis. 8 Sartorius. 9 Rectus femoris. 10 Vaſtus externus. 11 Vaſtus internus. 12 Gaſtrocnemius. 13 Solæus. 14 Tibialis anticus.

PART II.

Sect. I. *Of the Muſcles.*

BY the name of *muſcular* or *moving fibres* in the human body, we call bundles of reddiſh coloured threads, which perform all the motions viſible in the human body. When many of theſe fibres are collected together, and appear more evidently red, they are called *a muſcle.*

In every muſcle we meet with long ſoft threads of *fibres*, ſomewhat elaſtic, or extenſible, and almoſt conſtantly diſpoſed parallel with each other; and theſe, being ſurrounded with a good deal of cellular ſubſtance, are by that faſtened together into little bundles, called *lacertuli*; which are again tied together into larger bundles, by a more looſe cellular net-work, that contains ſome fat; and between theſe we conſtantly perceive membranous partitions and ſtripes of the cellular ſubſtance removing them farther from each other, till at laſt a number of them combined together, either parallel or inclined, are ſurrounded with a more thin and denſe cellular membrane, continuous with that of their partitions; and this being again ſurrounded by a thicker plate of the cellular ſubſtance, parts the whole bundle from the adjacent fleſh, and gives it the denomination of a *ſingle* or *entire muſcle.* In every one of theſe threads there appears a leſſer ſeries of filaments, which, by oblique extremities, are cemented to others of the ſame kind, forming together a large fibre.

The generality of the muſcles, but more eſpecially thoſe which are inſerted into the bones, have other fibres fixed to them; but theſe are condenſed into a more ſlender, hard, and ſhining ſubſtance, of a ſilver colour, which has the name of *tendon.* When the tendinous fibres expand into a broad flat ſurface, they form what is called an *aponeuroſis.*

Borelli and other anatomiſts have deſcribed the muſcular fibres to be ſtrings of bladders, and have endeavoured to account for muſcular motion by an expanſion made from an influx of blood and animal ſpirits into theſe bladders; but as the muſcles do not increaſe their bulk ſenſibly in contracting, this hypotheſis cannot be correct. Another great anatomiſt thought that in this way the muſcles might be contracted by a ſwelling, ſcarce ſenſible, if the bladders were but very ſmall; for, ſays he, ſuppoſing a bladder of any determined bigneſs can raiſe a weight a foot, a hundred bladders, whoſe diameters are each a hundredth part of the former, will raiſe the weight to the ſame height. But the force of inflation and the ſwelling of all together will be ten thouſand times leſs, and it will alſo raiſe ten thouſand times leſs weight, which he has not obſerved. Therefore not one ſuch ſtring of bladders, but ten thouſand, muſt be applied to do the ſame thing that the one bladder will do; and they will have the ſame ſwelling; otherwiſe it would be eaſy to ſhew how to make a perpetuum mobile of almoſt any force.

1. Muscles are of two ſorts, *rectilinear* and *penniform.* The former have their fibres almoſt parallel, in the ſame or near the ſame direction with the axis of the muſcle. The latter have their fibres joined, in an oblique direction, to a tendon paſſing in or near the axis, or elſe on their outſide. Rectilineal muſcles, if their origins and inſertions lie in little compaſs, are never of any conſiderable thickneſs, unleſs they are very long, becauſe the outer fibres would compreſs the inner ones, and render them almoſt uſeleſs. Every rectilineal muſcle, therefore, whoſe inner fibres are compreſſed by the outer, has its inner fibres longer than its external fibres, in order that they may be capable of an equal quantity of contraction.

2. The *penniform* muſcles, though in a manner free from the inconvenience of one fibre compreſſing another, and though by the obliquity of their fibres nothing is abated of their moment, (for in all caſes, juſt ſo much more weight as rectilineal fibres will raiſe than oblique ones, the oblique will move their weight with ſo much greater velocity than the rectilineal; which is making their moments equal: ſo that in the ſtructure of an animal, like all mechanic engines, whatever is gained in ſtrength is loſt in velocity, and whatever is gained in velocity is loſt in ſtrength) yet the fibres of the penniform muſcles becoming more and more oblique as they contract, their ſtrength decreaſes, and their velocity increaſes, which makes them leſs uniform in their actions than the rectilineal muſcles. Wherefore it ſeems, that nature never uſes a penniform muſcle where a rectilineal muſcle can be uſed; and the caſes in which a rectilineal muſcle cannot be uſed, are where the ſhape of a muſcle is ſuch as that the inward fibres would be too much compreſſed, or where rectilineal fibres could not have a lever to act with, ſuitable to their quantity of contraction, which is the caſe with all the long muſcles of the fingers and toes. Every muſcle muſt be inſerted or paſs over the centre of motion of the joint it moves, at a diſtance ſuitable to its quantity of contraction, and the quantity of motion in the joint moved; for if it were to be inſerted too near, then the motion of the joint would be performed before the muſcle became completely contracted; if too far off, the muſcle would ceaſe to contract before the whole motion of the joint was performed. And though the quickneſs and quantity of motion in a muſcle will be cæteris paribus as the length of its fibres; (for if a fibre four inches long will contract one inch in a given time, a fibre eight inches long will contract two inches in the ſame time; and the ſtrength of a muſcle or power to raiſe a weight, cæteris paribus, will be as the number of its fibres; for if one fibre will raiſe a grain weight, twenty fibres will raiſe twenty grains:) yet two muſcles of equal magnitude, one long, and the other ſhort, will both move the ſame weight with the ſame velocity when applied to a bone; becauſe the levers they act with muſt be as their lengths, and therefore the penniform and ſhort thick muſcles are never applied to a bone for the ſake of ſtrength, nor long fibred muſcles for quickneſs; for whatever is gained by the form of the muſcle, whether ſtrength or quickneſs, muſt be loſt by their inſertions into the bone. Either the muſcles muſt not act all they can, or the bones muſt have leſs motion than they are capable of.

In the limbs ſeveral muſcles paſs over two joints, both of which are liable to move at once, with force proportionable to the levers they act with upon each joint; but either joint being fixed by an antagoniſt muſcle, the whole force of ſuch muſcles will be exerted upon the other joint; which in that caſe may be moved with a velocity equal to what is in both joints, when theſe muſcles act upon both at once. This mechaniſm is of the utmoſt importance.

That only we call the proper uſe and action of any muſcle which it has without the neceſſary aſſiſtance of any other muſcle, and what that is in a muſcle moving a joint we may always know in any ſituation, and with what force it acts, cæteris paribus, by dropping a line, from the centre of motion of the joint it moves, perpendicular into the axis of the muſcle. But in a joint which admits only of flexion and extenſion, this line muſt alſo be perpendicular to the axis of motion in that joint, and the action of the muſcles will be in the direction of that perpendicular line, and the force with which it acts in any ſituation will be, cæteris paribus, as the length of that perpendicular line.

Each muſcle, ſo far as it is diſtinct, and is moved againſt any part, is covered with a ſmooth cellular membrane to make the friction eaſy; but where the muſcles are externally tendinous, their ſurfaces are generally ſmooth enough to make ſuch a covering unneceſſary. Beſides this membrane there is another, known by the name of *faſcia tendinoſa*, which deſerves to be particularly conſidered. The ſtrong one on the outſide of the thigh, which belongs to the faſcialis and glutæus muſcles, is of great uſe in raiſing the gluteus farther from the center of motion of the joint it moves, to increaſe its force. In like manner the faſcia detached from the tendon of the biceps cubiti alters its direction for the ſame purpoſe, but thoſe on the outſide of the tibia and cubit, &c. are only flat tendons from which the fibres of the muſcles ariſe as from the bones. There exiſt alſo in many places tendons between the muſcles, from which each muſcle ariſes in like manner; for the bones themſelves are not ſufficient to give origin to half the fibres of the muſcles that belong to them.

Sect. II. *Of the particular Muſcles.*

The enumeration and deſcription of the particular muſcles, though dry and unentertaining, could not be altogether omitted in this place. We have therefore thrown this part of the ſubject into the form of a table; in which the name, origin, inſertion, and principal uſe of each muſcle, will be found deſcribed in a few words. It is however to be underſtood, that this does not include *all* the muſcles of the body; ſince thoſe belonging to the eyes, internal ear, inteſtinum rectum, &c. are mentioned in other parts of the work. We muſt alſo remark, that though almoſt all the muſcles are in *pairs*, mention is here made only of the muſcles of one ſide.

A TABLE of the MUSCLES.

Muscles *ſituated under the Integuments of the Cranium.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
Occipito frontalis.	From the tranſverſe ridge of the os occipitis.	Into the ſkin of the eye-brows.	To pull the ſkin of the head backwards, and to raiſe the eye-brows and ſkin of the fore-head.
Corrugator ſupercilii.	From above the joining of the os frontis, os naſi, and os maxillare.	Into the inner part of the occipito frontalis.	To draw the eye-brows towards each other, and to wrinkle the forehead.

Muscles *of the Eye-lids.*

Orbicularis palpebrarum.	From around the edge of the orbit.	Into the naſal proceſs of the os maxillare.	To ſhut the eye.
Levator palpebræ ſuperioris.	From the bottom of the orbit, near the optic foramen.	Into the cartilage of the upper eye lid.	To open the eye.

Muscles *of the external Ear.*

Attollens auriculam.	From the tendon of the occipito frontalis near the os temporis.	Into the upper part of the ear.	To raiſe the ear.
Anterior auriculæ.	From near the back part of the zygoma.	Into an eminence behind the helix.	To raiſe this eminence, and to pull it forwards.
Retrahentes (A) auriculæ.	From the outer and back part of the root of the maſtoid proceſs.	Into the convex part of the concha.	To ſtretch the concha, and pull the ear backwards.

Muscles *of the Cartilages of the Ear.*

Tragicus.	From the outer and middle part of the concha, near the tragus.	Into the upper part of the tragus.	To depreſs the concha, and pull the point of the tragus a little outwards.
Anti-tragicus.	From the root of the inner part of the helix.	Into the upper part of the anti-tragus.	To dilate the mouth of the concha.
Tranſverſus-auriculæ.	From the upper part of the concha.	Into the inner part of the helix.	To ſtretch the concha and ſcapha, and likewiſe to pull the parts it is connected with towards each other.
Helicis major.	From the upper, anterior, and acute part of the helix.	Into the cartilage of the helix, a little above the tragus.	To depreſs the upper part of the helix.
Helicis minor.	From the lower and fore part of the helix.	Into the helix, near the fiſſure in its cartilage.	To contract the fiſſure.

Muscles *of the Noſe.*

Compreſſor (B) naris.	From the outer part of the root of the ala naſi.	Into the naſal proceſs of the os maxillare, and anterior extremity of the os naſi.	To ſtraighten the noſtrils, and likewiſe to corrugate the ſkin of the noſe.

Muscles *of the Mouth and Lips.*

Name.	*Origin.*	*Insertion.*	*Use.*
1. Levator labii ſuperioris, alæque naſi.	From the outer part of the orbitar proceſs of the os maxillare, and from the naſal proceſs of that bone, where it joins the os frontis.	Into the upper lip and ala of the noſe.	To draw the upper lip and ſkin of the noſe upwards and outwards.
2. Levator anguli oris.	From the os maxillare ſuperius, between the orbitar foramen and the firſt dens molaris.	Into the orbicularis oris at the angle of the mouth.	To raiſe the corner of the mouth.
3. Zygomaticus major.	From the os malæ, near the zygomatic ſuture.	Into the angle of the mouth.	To raiſe the angle of the mouth, and make the cheek prominent as in laughing.
4. Zygomaticus minor.	Immediately above the origin of the zyg. major.	Into the angle of the mouth.	To raiſe the angle of the mouth obliquely outwards.
5. Buccinator.	From the alveoli of the dentes molares in the upper and lower jaws.	Into the angle of the mouth.	To contract the mouth and draw the angle of it outwards and backwards.
6. Depreſſor labii ſuperioris, alæque naſi.	From the os maxill. ſuper. immediately above the gums of the dentes inciſores.	Into the root of the ala naſi and upper lip.	To draw the ala naſi and upper lip downwards.
7. Depreſſor anguli oris.	At the ſide of the chin from the lower edge of the maxilla inferior.	Into the angle of the mouth.	To draw the corner of the mouth downwards.
8. Depreſſor labii inferioris.	From the lower and anterior part of the maxilla inferior.	Into the under lip.	To draw the under lip downwards and ſomewhat outwards.
9. Levator labii inferioris.	From near the gums of the inciſores and caninus of the maxilla inferior.	Into the under lip and ſkin of the chin.	To raiſe the under lip and ſkin of the chin.
10. Orbicularis oris (C)			To ſhut the mouth by conſtringing the lips.

Muscles *of the Lower Jaw.*

1. Temporalis.	From part of the os bregmatis and os frontis; ſquamous part of the os temporis; back part of the os malæ, and the temporal proceſs of the os ſphenoides (D).	Into the coronoid proceſs of the lower jaw.	To move the lower jaw upwards.
2. Maſſeter (E).	From the malar proceſs of the os maxillare, and the lower edges of the os malæ, and of the zygomatic proceſs of the os temporis.	Into the baſis of the coronoid proceſs, and that part of the jaw which ſupports that and the condyloid proceſs.	To raiſe and likewiſe to move the jaw a little forwards and backwards.
3. Pterygoideus internus.	From the inner ſurface of the outer wing of the pterygoid proceſs of the os ſphenoides, and from the proceſs of the os palati that helps to form the pterygoid foſſa.	Into the lower jaw on its inner ſide and near its angle.	To raiſe the lower jaw, and draw it a little to one ſide.
4. Pterygoideus externus.	From the external ala of the pterygoid proceſs, a ſmall part of the adjacent os maxillare, and a ridge in the temporal proceſs of the os ſphenoides.	Into the fore part of the condyloid proceſs of the lower jaw, and likewiſe of the capſular ligament.	To move the jaw forwards and to the oppoſite ſide (F); and at the ſame time to prevent the ligament of the joint from being pinched.

Muscles *ſituated at the Fore Part of the Neck.*

1. Latiſſimus colli (G).	From the cellular membrane covering the pectoral, deltoid, and trapezius muſcles.	Into the ſide of the chin and integuments of the cheek.	To draw the cheeks and ſkin of the face downwards; and when the mouth is ſhut, to draw all that part of the ſkin to which it is connected below the lower jaw upwards.
2. Maſtoideus (H).	From the upper part of the ſternum, and from the upper and fore part of the clavicle.	Into the maſtoid proceſs, and as far back as the lambdoidal ſuture.	To move the head to one ſide, or when both muſcles act, to bend it forwards.

Muscles *ſituated between the Trunk and the Os Hyoides.*

1. Omo-hyoideus (I).	From the upper coſta of the ſcapula near its niche; from part of a ligament that extends acroſs this niche, and ſometimes by a few fibres, from the coracoid proceſs.	Into the baſis of the os hyoides.	To draw the os hyoides in an oblique direction downwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
2. Sterno-hyoideus.	From the cartilage of the firſt rib, the inner and upper part of the ſternum, and a ſmall part of the clavicle.	Into the baſis of the os hyoides.	To draw the os hyoides downwards.
3. Hyo-thyroideus.	From part of the baſis and horn of the os hyoides.	Into a rough oblique line at the ſide of the thyroid cartilage.	To raiſe the thyroid cartilage, or depreſs the os hyoides.
4. Sterno-thyroideus.	From between the cartilages of the 1ſt and 2d ribs, at the upper and inner part of the ſternum.	Immediately under the hyo-thyroideus.	To pull the thyroid cartilage downwards.
5. Crico-thyroideus.	From the anterior part and ſide of the cricoid cartilage.	Into the lower part and inferior horn of the thyroid cartilage.	To pull the cricoid cartilage upwards and backwards, or the thyroid forwards and downwards.

Muscles *ſituated between the Os Hyoides and the Lower Jaw.*

1. Diagaſtricus (K).	From a foſſa at the root of the maſtoid proceſs, and likewiſe from the os hyoides.	Into the lower and anterior part of the chin.	To draw the lower jaw downwards.
2. Stylo-hyoideus (L).	From the baſis of the ſtyloid proceſs.	Into the ſide and fore part of the os hyoides near its baſe.	To draw the os hyoides obliquely upwards.
3. Mylo-hyoideus (M).	From the inſide of the lower jaw, between the laſt dens molaris and the chin.	Into the baſis of the os hyoides.	To move the os hyoides to either ſide, forwards or upwards.
4. (N) Genio-hyoideus.	From the inſide of the chin.	Into the baſe of the os hyoides.	To move the os hyoides forwards or upwards.
5. Genio-gloſſus.	From the inſide of the chin.	Into the tongue and baſis of the os hyoides.	To move the tongue in various directions.
6. Hyo-gloſſus (O).	From the horn, baſis, and appendix of the os hyoides.	Into the tongue laterally.	To draw the tongue downwards and inwards.
7. Lingualis.	Laterally from the root of the tongue.	Into the extremity of the tongue.	To ſhorten the tongue and draw it backwards.
8. Stylo-gloſſus.	From the ſtyloid proceſs, and ſometimes alſo from a ligament that extends from thence to the angle of the lower jaw.	Into the ſide of the tongue from the root to near its tip.	To move the tongue backwards and to one ſide.
9. Stylo-pharyngæus.	From the baſis of the ſtyloid proceſs.	Into the ſide of the pharynx and poſterior part of the thyroid cartilage.	To raiſe the thyroid cartilage and pharynx, and likewiſe to dilate the latter.
10. Circumflexus palati.	From near the bony part of the Euſtachian tube, and from the ſpinous proceſs of the os ſphenoides.	Into the ſemilunar edge of the os palati and the velum pendulum palati (P).	To dilate and draw the velum obliquely downwards.
11. Levator palati.	From the membranous part of the Euſtachian tube, and the extremity of the os petroſum.	Into the velum pendulum palati.	To pull the velum backwards.

Muscles *ſituated about the Fauces.*

1. Palato-pharyngæus.	From the lower and anterior part of the cartilaginous extremity of the Euſtachian tube (Q); the tendinous expanſion of the circumflexus palati; and the velum pendulum palati near the baſis and back part of the uvula.	Into the upper and poſterior part of the thyroid cartilage.	To raiſe the pharynx and thyroid cartilage, or to pull the velum and uvula backwards and downwards.
2. Conſtrictor iſthmi faucium.	From near the baſis of the tongue laterally.	Into the velum pendulum palati, near the baſis and fore part of the uvula.	To raiſe the tongue and draw the velum towards it (R).
3. Azygos uvulæ.	From the end of the ſuture that unites the oſſa palati.	Into the extremity of the uvula.	To ſhorten the uvula, and bring it forwards and upwards.

Muscles *at the Back Part of the Pharynx.*

1. Conſtrictor pharyngis ſuperior.	From the cuneiform proceſs of the occipital bone; the pterygoid proceſs of the os ſphenoides, and from each jaw near the laſt dens molaris (S).	Into the middle of the pharynx.	To move the pharynx upwards and forwards, and to compreſs its upper part.

Names.	*Origin.*	*Inſertion.*	*Uſe.*
2. Conſtrictor pharyngis medius (r).	From the horn and appendix of the os hyoides, and from the ligament that unites it with the thyroid cartilage.	Into the middle of the proceſſus cuneiformis of the occipital bone, about its middle and before the great foramen.	To draw the os hyoides and pharynx upwards, and to compreſs the latter.
3. Conſtrictor pharyngis inferior (s).	From the cricoid and thyroid cartilage.	Into the middle of the pharynx.	To compreſs part of the pharynx.
	Muscles *about the Glottis.*		
1. Crico-arytænoideus lateralis.	From the ſide of the cricoid cartilage.	Into the baſis of the arytænoid cartilage laterally.	To open the glottis.
2. Crico-arytænoideus poſticus.	From the cricoid cartilage poſteriorly.	Into the baſis of the arytænoid cartilage poſteriorly.	To open the glottis.
3. Arytænoideus obliquus.	From the baſis of one of the arytænoid cartilages.	Near the extremity of the other arytænoid cartilage.	To draw the parts it is connected with towards each other.
4. Arytænoideus tranſverſus.	From one of the arytænoid cartilages laterally.	Into the other arytænoid cartilage laterally.	To ſhut the glottis.
5. Thyreo-arytænoideus.	From the poſterior and under part of the thyroid cartilage.	Into the arytænoid cartilage.	To draw the arytænoid cartilage forwards.
6. Arytæno-epiglottideus.	From the upper part of the arytænoid cartilage laterally.	Into the ſide of the epiglottis.	To move the epiglottis outwards.
7. Thyreo-epiglottideus.	From the thyroid cartilage.	Into the ſide of the epiglottis.	To pull the epiglottis obliquely downwards (w).
	Muscles *at the Fore Part of the Neck, cloſe to the Vertebræ.*		
1. Rectus capitis internus major.	From the anterior extremities of the tranſverſe proceſſes of the five lowermoſt cervical vertebræ.	Into the fore part of the cuneiform proceſs of the os occipitis.	To bend the head forwards.
2. Rectus capitis internus minor.	From the anterior and upper part of the firſt cervical vertebræ.	Near the baſis of the condyloid proceſs of the os occipitis.	To aſſiſt the laſt deſcribed muſcle.
3. Rectus capitis lateralis.	From the anterior and upper part of the tranſverſe proceſs of the firſt cervical vertebra.	Into the os occipitis, oppoſite to the ſtylo-maſtoid foramen.	To move the head to one ſide.
4. Longus colli.	Within the thorax, laterally from the bodies of the three uppermoſt dorſal vertebræ; from the baſis and fore part of the tranſverſe proceſſes of the firſt and ſecond dorſal vertebræ, and of the laſt cervical vertebra; and laſtly, from the anterior extremities of the tranſverſe proceſſes of the 6th, 5th, 4th, and 3d cervical vertebræ.	Into the ſecond cervical vertebra anteriorly.	To pull the neck to one ſide (x).
	Muscles *at the Fore Part of the Abdomen.*		
1. Obliquus externus.	From the lower edges of the eight inferior ribs, near their cartilages.	Into the linea alba (y), oſſa pubis (z), and ſpine of the ilium (a).	To compreſs and ſupport the viſcera, aſſiſt in evacuating the fæces and urine, draw down the ribs, and bend the trunk forwards, or obliquely to one ſide.
2. Obliquus internus.	From the ſpinous proceſs of the three lowermoſt lumbar vertebræ, the back part of the os ſacrum, the ſpine of the ilium, and back part of Fallopius's ligament (c).	Into the cartilages of all the falſe ribs, linea alba (b), and fore part of the pubis.	To aſſiſt the obliquus externus.
3. Tranſverſalis.	From the cartilages of the ſeven inferior ribs; the tranſverſe proceſſes of the laſt dorſal, and four upper lumbar vertebræ; the inner part of Fallopius's ligament, and the ſpine of the ilium.	Into the linea alba and cartilago enſiformis.	To compreſs the abdominal viſcera.
4. Rectus abdominis.	From the upper edge of the pubis and the ſymphyſis pubis.	Into the cartilages of the 5th, 6th, and 7th ribs, and the edge of the cartilago enſiformis (d).	To compreſs the fore part of the abdomen, and to bend the trunk forwards.

Names.	*Origin.*	*Inſertion.*	*Uſe.*
5. Pyramidalis (e).	From the anterior and upper part of the pubis.	Into the linea alba and inner edge of the rectus, commonly about two inches above the pubis.	To aſſiſt the lower portion of the rectus.
	MUSCLES *at the Fore Part of the Thorax.*		
1. Pectoralis major.	From the cartilaginous ends of the 5th and 6th ribs; the ſternum, and anterior part of the clavicle.	Into the upper and inner part of the os humeri (f)	To draw the arm forwards, or obliquely forwards.
2. Subclavius.	From the cartilage of the firſt rib.	Into the under ſurface of the clavicle.	To move the clavicle forwards and downwards, and to aſſiſt in raiſing the firſt rib.
3. Pectoralis minor (g).	From the upper edges of the 3d, 4th, and 5th ribs.	Into the coracoid proceſs of the ſcapula.	To move the ſcapula forwards and downwards, or to elevate the ribs.
4. Serratus magnus.	From the eight ſuperior ribs.	Into the baſis of the ſcapula.	To bring the ſcapula forwards.
	MUSCLES *that concur in forming the Thorax.*		
1. Diaphragma (h).			
2. Levatores coſtarum.	From the tranſverſe proceſſes of the laſt cervical, and the eleven upper dorſal vertebræ.	Into the upper ſide of each rib near its tuberoſity.	To move the ribs upwards and outwards.
3. Intercoſtales externi.	From the lower edge of each upper rib.	Into the ſuperior edge of each lower rib.	To elevate the ribs.
4. Intercoſtales interni (i).			
5. Sterno coſtales (k).	From the cartilago enſiformis, and lower and middle part of the ſternum.	Into the cartilages of the 2d, 3d, 4th, 5th, and 6th ribs.	To depreſs the cartilages of the ribs.
	MUSCLES *at the Back Part of the Neck and Trunk.*		
1. Trapezius (l), or cucullaris.	From the middle of the os occipitis, and the ſpinous proceſſes of the two inferior cervical, and of all the dorſal vertebræ (m).	Into the poſterior half of the clavicle part of the acromion, and the ſpine of the ſcapula.	To move the ſcapula.
2. Rhomboideus (n).	From the ſpinous proceſſes of the three lowermoſt cervical, and of all the dorſal vertebræ.	Into the baſis of the ſcapula.	To move the ſcapula upwards and backwards.
3. Latiſſimus dorſi.	From part of the ſpine of the os ilium, the ſpinous proceſſes of the os ſacrum and lumbar vertebræ, and of ſix or eight of the dorſal vertebræ; alſo from the four inferior falſe ribs near their cartilages.	Into the os humeri, at the inner edge of the groove for lodging the long head of the biceps muſcle.	To draw the os humeri downwards and backwards, and to roll it upon its axis.
4. Serratus inferior poſticus.	From the ſpinous proceſſes of the two lowermoſt dorſal, and of three of the lumbar vertebræ.	Into the lower edges of the three or four lowermoſt ribs near their cartilages.	To draw the ribs outwards, downwards, and backwards.
5. Levator ſcapulæ.	From the tranſverſe proceſſes of the four uppermoſt vertebræ colli.	Into the upper angle of the ſcapula.	To move the ſcapula forwards and upwards.
6. Serratus ſuperior poſticus.	From the lower part of the ligamentum colli, the ſpinous proceſs of the lowermoſt cervical vertebra, and of the two ſuperior dorſal vertebræ.	Into the 2d, 3d, and 4th ribs.	To expand the thorax.
7. Splenius (o).	From the ſpinous proceſſes of the four or five uppermoſt vertebræ of the back, and of the lowermoſt cervical vertebra.	Into the tranſverſe proceſſes of the two firſt cervical vertebræ, the upper and back part of the maſtoid proceſs, and a ridge on the os occipitis.	To move the head backwards.
8. Complexus (p).	From the tranſverſe proceſſes of the four or five uppermoſt dorſal, and of the ſix lowermoſt cervical vertebræ.	Into the os occipitis.	To draw the head backwards.
9. Trachelo-maſtoideus (q).	From the tranſverſe proceſſes of the firſt dorſal vertebra, and four or five of the lowermoſt cervical vertebræ.	Into the maſtoid proceſs.	To draw the head backwards.
10. Rectus capitis poſticus major	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the os occipitis.	To extend the head and draw it backwards.

Names.	*Origin.*	*Inſertion.*	*Uſe.*
11. Rectus capitis poſticus minor.	From the firſt vertebra of the neck.	Into the os occipitis.	To aſſiſt the rectus major.
12. Obliquus ſuperior capitis.	From the tranſverſe proceſs of the firſt cervical vertebra.	Into the os occipitis.	To draw the head backwards.
13. Obliquus inferior capitis.	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the tranſverſe proceſs of the firſt cervical vertebra.	To draw the face towards the ſhoulder, and to move the firſt vertebra upon the ſecond.
14. Sacro-lumbalis (r).	From the back part of the os ſacrum, ſpine of the ilium, ſpinous proceſſes, and roots of the tranſverſe proceſſes of the vertebræ of the loins.	Into the lower edge of each rib.	To draw the ribs downwards, move the body upon its axis, aſſiſt in erecting the trunk, and turn the neck backwards, or to one ſide.
15. Longiſſimus dorſi (s).	The ſame as that of the ſacro-lumbalis.	Into the tranſverſe proceſſes of the dorſal vertebræ.	To ſtretch the vertebræ of the back, and keep the trunk erect.
16. Spinalis dorſi.	From the ſpinous proceſſes of the uppermoſt lumbar and lowermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the nine ſuperior dorſal vertebræ.	To extend the vertebræ.
17. Semi-ſpinalis dorſi.	From the tranſverſe proceſſes of the 7th, 8th, 9th, and 10th vertebræ of the back.	Into the ſpinous proceſſes of the four uppermoſt dorſal, and lowermoſt of the cervical vertebræ.	To extend the ſpine obliquely backwards.
18. Multifidus ſpinæ (t).	From the os ſacrum, ilium, oblique and tranſverſe proceſſes of the lumbar vertebræ, tranſverſe proceſſes of the dorſal, and four of the cervical vertebræ.	Into the ſpinous proceſſes of the lumbar, dorſal, and ſix of the cervical vertebræ.	To extend the back and draw it backwards, or to one ſide.
19. Semi-ſpinalis colli.	From the tranſverſe proceſſes of the five or ſix uppermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the 2d, 3d, 4th, 5th, and 6th cervical vertebræ.	To ſtretch the neck obliquely backwards.
20. Scalenus (u).	From the tranſverſe proceſſes of the five inferior cervical vertebræ.	Into the upper and outer part of the firſt and ſecond ribs.	To move the neck forwards, or to one ſide.
21. Inter-ſpinales (x).	From the upper part of each of the ſpinous proceſſes of the ſix inferior cervical vertebræ.	Into the under part of each of the ſpinous proceſſes of the vertebræ above.	To draw the ſpinous proceſſes towards each other.
22. Inter-tranſverſales (y)	From the upper part of each of the tranſverſe proceſſes of the vertebræ.	Into the under part of each of the tranſverſe proceſſes of the vertebræ above.	To draw the tranſverſe proceſſes towards each other.

MUSCLES *within the Cavity of the Abdomen, on the Anterior and Lateral Parts of the Spine.*

1. Pſoas parvus (z).	From the ſides and tranſverſe proceſſes of the uppermoſt lumbar vertebra, and ſometimes of the lowermoſt dorſal vertebra.	Into the brim of the pelvis, at the junction of the os pubis with the ilium.	To bend the loins forwards.
2. Pſoas magnus.	From the bodies and tranſverſe proceſſes of the laſt dorſal, and all the lumbar vertebræ.	Into the os femoris, a little below the trochanter minor.	To bend the thigh forwards.
3. Iliacus internus.	From the inner lip, hollow part, and edge of the os ilium.	In common with the pſoas magnus.	To aſſiſt the pſoas magnus.
4. Quadratus lumborum (a).	From the poſterior part of the ſpine of the ilium.	Into the tranſverſe proceſſes of the four uppermoſt lumbar vertebræ, the inferior edge of the laſt rib, and the ſide of the lowermoſt dorſal vertebra.	To ſupport the ſpine, or to draw it to one ſide.
5. Coccygæus.	From the poſterior and inner edge of the ſpine of the iſchium.	Into the lower part of the os ſacrum, and almoſt the whole length of the os coccygis laterally.	To draw the os coccygis forwards and inwards (b)

MUSCLES *on the Scapula and Upper Part of the Os Humeri.*

1. Deltoides (c).	From the clavicle, proceſſus acromion, and ſpine of the ſcapula.	Into the anterior and middle part of the os humeri.	To raiſe the arm.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
2. Supra-ſpinatus.	From the baſis, ſpine, and upper coſta of the ſcapula.	Into a large tuberoſity at the head of the os humeri.	To raiſe the arm.
3. Infra-ſpinatus.	From the baſis and ſpine of the ſcapula.	Into the upper and middle part of the tuberoſity.	To roll the os humeri outwards.
4. Teres minor (*d*).	From the inferior coſta of the ſcapula.	Into the lower part of the tuberoſity.	To aſſiſt the infra ſpinatus.
5. Teres major.	From the inferior angle, and inferior coſta of the ſcapula.	Into the ridge at the inner ſide of the groove formed for the long head of the biceps.	To aſſiſt in the rotatory motion of the arm.
6. Subſcapularis.	From the baſis, ſuperior and inferior coſtæ of the ſcapula.	Into the upper part of a ſmall tuberoſity at the head of the os humeri.	To roll the arm inwards.
7. Coraco-brachialis (*e*).	From the coracoid proceſs of the ſcapula.	Into the middle and inner ſide of the os humeri.	To roll the arm forwards and upwards.
	Muscles *on the Os Humeri.*		
1. Biceps flexor cubiti.	By two heads, one from the coracoid proceſs, and the other, or long head, from the upper and outer edge of the glenoid cavity of the ſcapula.	Into the tuberoſity at the upper end of the radius.	To bend the fore-arm.
2. Brachialis internus.	From the os humeri, below, and at each ſide of the tendon of the deltoids.	Into a ſmall tuberoſity at the fore part of the coronoid proceſs of the ulna.	To aſſiſt in bending the fore-arm.
3. Triceps extenſor cubiti.	By three heads: the firſt from the inferior coſta of the ſcapula; the ſecond, from the upper and outer part of the os humeri; and the third, from the back part of that bone.	Into the upper and outer part of the olecranon.	To extend the fore-arm.
	Muscles *on the Fore-arm.*		
1. Supinator longus.	From the outer ridge and anterior ſurface of the os humeri, a little above its outer condyle.	Into the radius near its ſtyloid proceſs.	To aſſiſt in turning the palm of the hand upwards.
2. Extenſor carpi radialis longus.	Immediately below the origin of the ſupinator longus.	Into the upper part of the metacarpal bone of the middle finger.	To extend the wriſt.
3. Extenſor carpi radialis brevis.	From the outer and lower part of the outer condyle of the os humeri, and the upper part of the radius.	Into the upper part of the metacarpal bone of the middle finger.	To aſſiſt the extenſor longus.
4. Extenſor digitorum communis.	From the outer condyle of the os humeri.	Into the back part of all the bones of the four fingers.	To extend the fingers.
5. Extenſor minimi digiti.	From the outer condyle of the os humeri.	Into the bones of the little finger.	To extend the little finger.
6. Extenſor carpi ulnaris.	From the outer condyle of the os humeri.	Into the metacarpal bone of the little finger.	To aſſiſt in extending the wriſt.
7. Anconæus (*f*).	From the outer condyle of the os humeri.	Into the outer edge of the ulna.	To extend the fore-arm.
8. Flexor carpi ulnaris.	From the inner condyle of the os humeri, and anterior edge of the olecranon (*g*).	Into the os piſiforme.	To aſſiſt in bending the hand.
9. Palmaris longus.	From the inner condyle of the os humeri.	Into the internal annular ligament, and aponeuroſis palmaris (*b*).	To bend the hand.
10. Flexor carpi radialis.	From the inner condyle of the os humeri.	Into the metacarpal bone of the fore finger.	To bend the hand.
11. Pronator radii teres.	From the outer condyle of the os humeri, and coronoid proceſs of the ulna.	Into the anterior and convex edge of the radius, near its middle.	To roll the hand inwards.
12. Flexor ſublimis perforatus (*i*).	From the inner condyle of the os humeri, inner edge of the coronoid proceſs of the ulna, and upper and anterior part of the radius.	Into the ſecond bone of each finger.	To bend the ſecond joint of the fingers.
13. Supinator radii brevis.	From the outer condyle of the os humeri, and poſterior ſurface and outer edge of the ulna.	Into the anterior, inner, and upper part of the radius.	To roll the radius outwards.
14. Abductor pollicis longus.	From the middle and back part of the ulna, interoſſeous ligament, and radius.	By two tendons into the os trapezium, and firſt bone of the thumb.	To ſtretch the firſt bone of the thumb outwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
15. Extenſor minor pollicis.	From the back part of the ulna, and interoſſeous ligament and radius.	Into the convex part of the ſecond bone of the thumb.	To extend the ſecond bone of the thumb obliquely outwards.
16. Extenſor major pollicis.	From the back of the ulna and interoſſeous ligament.	Into the third and laſt bone of the thumb.	To ſtretch the thumb obliquely backwards.
17. Indicator.	From the middle of the ulna.	Into the metacarpal bone of the fore-finger.	To extend the fore-finger.
18. Flexor profundus perforans.	From the upper and fore part of the ulna, and interoſſeous ligament.	Into the fore part of the laſt bone of each of the fingers.	To bend the laſt joint of the fingers.
19. Flexor longus pollicis.	From the upper and fore part of the radius.	Into the laſt joint of the thumb.	To bend the laſt joint of the thumb.
20. Pronator radii quadratus.	From the inner and lower part of the ulna.	Into the radius, oppoſite to its origin.	To roll the radius inwards, and of courſe to aſſiſt in the pronation of the hand.
	Muscles *on the Hand.*		
1. Lumbricales (*k*).	From the tendons of the perforans.	Into the tendons of the extenſor digitorum communis.	To bend the firſt, and to extend the two laſt joints of the fingers (*l*).
2. Abductor brevis pollicis.	From the fore part of the internal annular ligament, os ſcaphoides, and one of the tendons of the abductor longus pollicis.	Into the outer ſide of the 2d bone of the thumb, near its root.	To move the thumb from the fingers.
3. Opponens pollicis.	From the inner and anterior part of the internal annular ligament, and from the os ſcaphoides.	Into the firſt bone of the thumb.	To move the thumb inwards, and to turn it upon its axis.
4. Flexor brevis pollicis.	From the os trapezoides, internal annular ligament, os magnum, and os unciforme.	Into the oſſa ſeſamoidea and ſecond bone of the thumb.	To bend the ſecond joint of the thumb.
5. Abductor pollicis.	From the metacarpal bone of the middle finger.	Into the baſis of the ſecond bone of the thumb.	To move the thumb towards the fingers.
6. Abductor indicis.	From the inner ſide of the firſt bone of the thumb, and from the os trapezium.	Into the firſt bone of the fore finger poſteriorly.	To move the fore finger towards the thumb.
7. Palmaris brevis.	From the internal annular ligament, and aponeuroſis palmaris.	Into the os piſiforme, and the ſkin covering the abductor minimi digiti.	To contract the palm of the hand.
8. Abductor minimi digiti.	From the internal annular ligament and os piſiforme.	Into the ſide of the firſt bone of the little finger.	To draw the little finger from the reſt.
9. Flexor parvus minimi digiti.	From the os unciforme and internal annular ligament.	Into the firſt bone of the little finger.	To bend the little finger.
10. Abductor metacarpi minimi digiti.	From the os unciforme and internal annular ligament.	Into the metacarpal bone of the little finger.	To move that bone towards the reſt.
11. Interoſſei interni.	Situated between the metacarpal bones.	Into the roots of the fingers.	To extend the fingers and move them towards the thumb (*m*).
12. Interoſſei externi.	Situated between the metacarpal bones on the back of the hand.	Into the roots of the fingers.	To extend the fingers; but the firſt draws the middle finger inwards, the ſecond draws it outwards, and the third draws the ring finger inwards.
	Muscles *at the Back Part of the Pelvis, and Upper Part of the Thigh.*		
1. Glutæus (*n*) maximus.	From the ſpine of the ilium, poſterior ſacro-iſchiatic ligaments, os ſacrum, and os coccygis.	Into the upper part of the *linea aſpera* of the os femoris.	To extend the thigh and draw it outwards.
2. Glutæus medius.	From the ſpine and ſuperior ſurface of the ilium.	Into the outer and back part of the great trochanter of the os femoris.	To draw the thigh outwards and a little backwards, and when it is bended, to roll it.
3. Glutæus minimus.	From the outer ſurface of the ilium, and the border of its great nich.	Into the upper and anterior part of the great trochanter.	To aſſiſt the former.
4. Pyriformis (*o*).	From the anterior part of the os ſacrum.	Into a cavity at the root of the trochanter major.	To roll the thigh outwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
5. Gemini (*p*).	By two portions, one from the outer ſurface of the ſpine of the iſchium; the other from the tuberoſity of the iſchium and poſterior ſacro-iſchiatic ligament.	Into the ſame cavity as the pyriformis.	To roll the thigh outwards, and likewiſe to confine the tendon of the obturator internus, when the latter is in action.
6. Obturator internus.	From the ſuperior half of the inner border of the foramen thyroideum.	Into the ſame cavity with the former.	To roll the thigh outwards.
7. Quadratus (*q*) femoris.	From the tuberoſity of the iſchium.	Into a ridge between the trochanter major and trochanter minor.	To move the thigh outwards.
	Muscles *on the Thigh* (*r*).		
1. Biceps flexor cruris.	By two heads; one from the tuberoſity of the iſchium, the other from the linea aſpera near the inſertion of the glutæus maximus.	Into the upper and back part of the fibula (*s*).	To bend the leg.
2. Semi-tendinoſus.	From the tuberoſity of the iſchium.	Into the upper and inner part of the tibia.	To bend and draw the leg inwards.
3. Semi-membranoſus (*t*).	From the tuberoſity of the iſchium.	Into the upper and back part of the head of the tibia.	To bend the leg.
4. Tenſor vaginæ femoris.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the inner ſide of the faſcia lata, which covers the outſide of the thigh.	To ſtretch the faſcia.
5. Sartorius.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the upper and inner part of the tibia.	To bend the leg inwards (*u*).
6. Rectus.	By two tendons; one from the anterior and inferior ſpinous proceſs of the ilium; the other from the poſterior edge of the cotyloid cavity.	Into the upper and fore-part of the rotula.	To extend the leg.
7. Gracilis.	From the fore-part of the iſchium and pubis.	Into the upper and inner part of the tibia.	To bend the leg.
8. Vaſtus externus (*x*).	From the anterior and lower part of the great trochanter, and the outer edge of the linea aſpera.	To the upper and outer part of the rotula.	To extend the leg.
9. Vaſtus internus.	From the inner edge of the linea aſpera, beginning between the fore-part of the os femoris and the root of the leſſer trochanter.	Into the upper and inner part of the rotula.	To extend the leg.
10. Cruræus (*y*).	From the outer and anterior part of the leſſer trochanter.	Into the upper part of the rotula.	To extend the leg.
11. Pectinalis.	From the anterior edge of the os pubis, or pectinis, as it is ſometimes called.	Into the upper and fore-part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
12. Adductor longus femoris (*z*).	From the upper and fore part of the os pubis.	Near the middle and back part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
13. Adductor brevis femoris.	From the fore part of the ramus of the os pubis.	Into the inner and upper part of the linea aſpera.	
14. Adductor magnus femoris.	From the lower and fore part of the ramus of the os pubis.	Into the whole length of the linea aſpera.	
15. Obturator externus.	From part of the obturator ligament, and the inner half of the circumference of the foramen thyroideum.	Into the os femoris, near the root of the great trochanter.	To move the thigh outwards in an oblique direction, and likewiſe to bend and draw it inwards.
	Muscles *on the Leg.*		
. Gaſtrocnemius (*aa*) externus.	By two heads; one from the inner condyle, the other from the outer condyle of the os femoris.	By a great round tendon, common to this and the following muſcle.	To extend the foot.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
2. Gaſtrocnemius(*bb*) internus.	By two heads; one from the back part of the head of the fibula, the other from the upper and back part of the tibia.	By a large tendon (the *tendo achillis*) common to this and the former muſcle, into the lower and back part of the os calcis.	To extend the foot.
3. Plantaris (*cc*).	From the upper and poſterior part of the outer condyle of the os femoris.	Into the inſide of the back part of the os calcis.	To aſſiſt in extending the foot.
4. Popliteus (*dd*).	From the outer condyle of the thigh.	Into the upper and inner part of the tibia.	To aſſiſt in bending the leg and rolling it inwards.
5. Flexor longus digitorum pedis (*ee*).	From the upper and inner part of the tibia.	By four tendons, which after paſſing through the perforations in thoſe of the flexor digitorum brevis, are inſerted into the laſt bone of all the toes, except the great toe.	To bend the laſt joint of the toe.
6. Flexor longus pollicis pedis.	From the back part, and a little below the head of the fibula.	Into the laſt bone of the great toe.	To bend the great toe.
7. Tibialis poſticus.	From the back part and outer edge of the tibia, and likewiſe from the interoſſeous ligament and adjacent part of the fibula.	Into the inner and upper part of the os naviculare and ſide of the os cuneiforme medium.	To move the foot inwards.
8. Peroneus longus.	From the outer ſide of the head of the tibia, and alſo from the upper, anterior, and outer part of the *perone* or fibula, to which it adheres for a conſiderable way down.	Into the metatarſal bone of the great toe.	To move the foot outwards.
9. Peroneus brevis.	From the outer and fore part of the fibula.	Into the metatarſal bone of the little toe.	To aſſiſt the laſt deſcribed muſcle.
10. Extenſor longus digitorum pedis.	From the upper, outer, and fore part of the tibia, interoſſeous ligament, and inner edge of the fibula.	By four tendons into the firſt joint of the ſmaller toes.	To extend the toes.
11. Peroneus tertius.	From the fore part of the lower half of the fibula, and from the interoſſeous ligament.	Into the metatarſal bone of the little toe.	To bend the foot.
12. Tibialis anticus.	From the upper and fore part of the tibia.	Into the os cuneiforme internum.	To bend the foot.
13. Extenſor proprius pollicis pedis.	From the upper and fore part of the tibia.	Into the convex ſurface of the bones of the great toe.	To extend the great toe.

MUSCLES *on the Foot.*

1. Extenſor brevis digitorum pedis.	From the upper and anterior part of the os calcis.	By four tendons; one of which joins the tendon of the externus longus pollicis, and the other three the tendons of the extenſor digitorum longus.	To extend the toes.
2. Flexor brevis digitorum pedis.	From the lower part of the os calcis.	By four tendons, which, after affording a paſſage to thoſe of the flexor longus, are inſerted into the ſecond phalanx of each of the ſmall toes.	To bend the ſecond joint of the toes.
3. Abductor pollicis pedis.	From the inner and lower part of the os calcis.	Into the firſt joint of the great toe.	To move the great toe from the other toes.
4. Abductor minimi digiti.	From the outer tubercle of the os calcis, the root of the metatarſal bone of the little toe, and alſo from the aponeuroſis plantaris.	Into the outer ſide of the firſt joint of the little toe.	To draw the little toe outwards.
5. Lumbricales pedis.	From the tendons of the flexor longus digitorum pedis.	Into the tendinous expanſion at the upper part of the toes.	To draw the toes inwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
6. Flexor brevis pollicis pedis.	From the inferior and anterior part of the os calcis, and alſo from the inferior part of the os cuneiforme externum.	By two tendons into the firſt joint of the great toe.	To bend the firſt joint of the great toe.
7. Adductor pollicis pedis.	From near the roots of the metatarſal bones of the 2d, 3d, and 4th toes.	Into the outer os ſeſamoideum, or firſt joint of the great toe.	To draw the great toe nearer to the reſt, and alſo to bend it.
8. Tranſverſales pedis.	From the outer and under part of the anterior end of the metatarſal bone of the little toe.	Into the inner os ſeſamoideum, and anterior end of the metatarſal bone of the great toe.	To contract the foot.
9. Flexor brevis minimi digiti pedis.	From the baſis of the metatarſal bone of the little toe.	Into the firſt joint of the little toe.	To bend the little toe.
10. Interoſſei pedis interni (*ff*).	Situated between the metatarſal bones.		
——— externi (*gg*).			

NOTES referred to in the foregoing TABLE.

(A) Theſe are three ſmall ſlender muſcles. The inferior one is ſometimes wanting.

(B) The noſe is affected by fibres of the occipito frontalis, and by ſeveral muſcles of the face; but this pair, the compreſſores, is the only one that is proper to it.

(C) This muſcle is in a great meaſure, if not wholly, formed by the buccinator, zygomatici, depreſſores, and other muſcles that move the lips. Its fibres ſurround the mouth like a ring.

(D) Some of its fibres likewiſe have their origin from a ſtrong faſcia that covers the muſcle and adheres to the bone round the whole circumference of its origin. When we remove this covering, we find the muſcle of a ſemicircular ſhape with its radiated fibres, converging and forming a ſtrong middle tendon.

(E) So called from its uſe in chewing, its derivation being μασισαομαι, *manduco*, "to eat."

(F) This happens when the muſcle acts ſingly. When both act, the jaw is brought horizontally forwards.

(G) This broad and thin muſcular expanſion, which is ſituated immediately under the common integuments, is by Winſlow named *muſculus cutaneus*. Galen gave it the name of πλατυσμα μυωδες (*Platyſma-myoides*); the etymology of which is from πλατυσμος *dilatatio*, and μυς *muſculus*, and ειδος *forma*.

(H) This, on account of its two origins, is by Albinus deſcribed as two diſtinct muſcles, which he names *ſterno-maſtoideus* and *cleido-maſtoideus*.

(I) As this muſcle does not always ariſe from the coracoid proceſs, it ſeems to have been improperly named *coraco-hyoides*, by Douglas and Albinus. Winſlow calls it *omo-hyoideus*, on account of its general origin from the ſcapula.

(K) From δις and γαστηρ (*biventer*), becauſe it has two fleſhy bellies with a middle tendon. This tendon paſſes through the ſtylo-hyoideus.

(L) In ſome ſubjects we meet with another muſcle, which, from its having nearly the ſame origin, inſertion, and uſe as this, has been named *ſtylo-hyoideus alter*.

(M) So named from its ariſing near the dentes molares (μυλαι), and its being inſerted into the os hyoides.

(N) From γενυς, *mentum*, "the chin."

(O) From κερας, *cornu*, and γλωσσα, *lingua*, "the tongue."

(P) This muſcle in its courſe forms a round tendon, which, after paſſing over a kind of hook formed by the inner plate of the pterygoid proceſs of the ſphenoid bone, expands into a tendinous membrane.

(Q) The few fibres that ariſe from the Euſtachian tube are deſcribed as a diſtinct muſcle by Albinus, under the name of *ſalpingo-pharyngæus*. They ſerve to dilate the mouth of the tube.

(R) This muſcle, and the palato-pharyngæus, likewiſe ſerve to cloſe the paſſage into the fauces, and to carry the food into the pharynx.

(S) The three orders of fibres here mentioned, with a few others derived from the tongue, have given occaſion to Douglas to deſcribe them as four diſtinct muſcles under the names of *cephalo-pharyngæus*, *mylo-pharyngæus*, *ptery-pharyngæus*, and *gloſſo-pharyngæus*.

(T) Douglas makes two muſcles of this, the *hyo-pharyngæus*, and *ſyndeſmo-pharyngæus*.

(U) The crico-pharyngæus and thyro-pharyngæus of Douglas.

(W) When either this or the preceding muſcle acts with its fellow, the epiglottis is drawn directly downwards upon the glottis.

(X) When both muſcles act, the neck is drawn directly forwards.

(Y) The linea alba is that tendinous expanſion which reaches from the cartilago enſiformis to the os pubis. It is formed by the interlacement of the tendinous fibres of the oblique and tranſverſe muſcles, and on this account ſome anatomiſts have conſidered theſe as three digaſtric muſcles.

(Z) A little above the pubis the tendinous fibres of this muſcle ſeparate from each other, ſo as to form an opening called the *ring* of the obliquus externus, and commonly, though improperly, the ring of the abdominal muſcles, there being no ſuch aperture either in the tranſverſalis or obliquus internus. This ring in the male ſubject affords a paſſage to the ſpermatic veſſels, and in the female to the round ligament of the uterus.

(a) From the anterior and upper ſpinous proceſs of the ilium, this muſcle is ſtretched tendinous to the os pubis, and thus forms what is called by ſome *Fallopius's*, and by others *Poupart's ligament*. The blood-veſſels paſs under it to the thigh.

(b) The tendon formed by the upper part of this muſcle in its way to the linea alba is divided into two layers. The poſterior layer runs under, and the anterior one over, the rectus muſcle.

(c) From this part it detaches ſome fibres which extend downwards upon the ſpermatic chord, and form what is deſcribed as the cremaſter muſcle.

(d) The fibres of the rectus are generally divided by three tendinous interſections. The two upper thirds of this muſcle paſſing between the tendinous layers of the obliquus internus, are incloſed as it were in a ſheath; but at its lower part we find it immediately contiguous to the peritonæum, the inferior portion of the tendon of the tranſverſalis paſſing over the rectus, and adhering to the anterior layer of the obliquus internus.

(e) This muſcle is ſometimes wanting.

(f) The fibres of this muſcle paſs towards the axilla in a folding manner, and with thoſe of the latiſſimus dorſi form the arm-pit.

(g) This and ſome other muſcles derive their name of *ſerratus*, from their ariſing by a number of tendinous or fleſhy digitations, reſembling the teeth of a ſaw (*ſerra*).

(h) For a deſcription of the diaphragm, ſee Part III. Sect. VI. &c. See alſo pl. 11. fig. 3.

(i) The origin, inſertion, and uſe of the internal intercoſtals, are ſimilar to thoſe of the external. The reader, however, will be pleaſed to obſerve, that the intercoſtales externi occupy the ſpaces between the ribs only from the ſpine to their cartilages; there being from thence to the ſternum, only a thin membrane, which is ſpread over the intercoſtales interni; and that the latter, on the contrary, extend only from the ſternum to the angles of each rib.

The fibres of the external muſcles run obliquely forwards; thoſe of the internal obliquely backwards. This difference in the direction of their fibres induced Galen to ſuppoſe that they were intended for different uſes; that the external intercoſtals, for inſtance, ſerve to elevate, and the internal ones to depreſs the ribs. Fallopius ſeems to have been the firſt who ventured to diſpute the truth of this doctrine, which has ſince been revived by Boyle, and more lately ſtill by Hamberger, whoſe theoretical arguments on this ſubject have been clearly refuted by the experiments of Haller.

(k) Theſe conſiſt of four, and ſometimes five diſtinct muſcles on each ſide. Veſalius, and after him Douglas and Albinus, conſider them as forming a ſingle muſcle, which, on account of its ſhape, they name *triangularis*. Verheyen, Winſlow, and Haller, more properly deſcribe them as ſo many ſeparate muſcles, which, on account of their origin and inſertion, they name *ſterno-coſtales*.

(l) So named by Riolanus, from τραπαιξα, on account of its quadrilateral ſhape. Columbus and others give it the name of *cucullaris*, from its reſemblance to a monk's hood.

(m) The tendinous fibres of this muſcle, united with thoſe of its fellow in the nape of the neck, form what is called the *ligamentum colli*.

(n) This muſcle conſiſts of two diſtinct portions, which are deſcribed as ſeparate muſcles by Albinus, under the names of *rhomboideus minor* and *rhomboideus major*.

(o) According to ſome writers, this muſcle has gotten its name from its reſemblance to the ſpleen; others derive it from *ſplenium ſplint*.

(p) So named on account of its complicated ſtructure.

(q) So named from its origin from the neck (τραιχηλος) and its inſertion into the maſtoid proceſs.

(r) Several thin faſciculi of fleſhy fibres ariſe from the lower ribs, and terminate in the inner ſide of this muſcle. Steno names them *muſculi ad ſacro-lumbalem acceſſorii*. The ſacro-lumbalis likewiſe ſends off a fleſhy ſlip from its upper part, which by Douglas and Albinus is deſcribed as a diſtinct muſcle, under the name of *cervicalis deſcendens*. Morgagni has very properly conſidered it as a part of the ſacro-lumbalis.

(s) At the upper part of this muſcle a broad thin layer of fleſhy fibres is found croſſing, and intimately adhering to it. This portion, which is deſcribed by Albinus, under the name of *tranſverſalis cervicis*, may very properly be conſidered as an appendage to the longiſſimus dorſi. It ariſes from the tranſverſe proceſſes of the five or ſix ſuperior dorſal vertebræ, and is inſerted into the tranſverſe proceſſes of the ſix inferior cervical vertebræ. By means of this appendage, the longiſſimus dorſi may ſerve to move the neck to one ſide, or obliquely backwards.

(t) Anatomiſts in general have unneceſſarily multiplied the muſcles of the ſpine. Albinus has the merit of having introduced greater ſimplicity into this part of myology. Under the name of *multifides ſpinæ*, he has very properly included thoſe portions of muſcular fleſh intermixed with tendinous fibres, ſituated cloſe to the back part of the ſpine, and which are deſcribed by Douglas under the names of *tranſverſales colli*, *dorſi*, & *lumborum*.

(u) The ancients gave it this name from its reſemblance to an irregular triangle (σκαληνος). It conſiſts of three fleſhy portions. The anterior one affords a paſſage to the axillary artery, and between this and the middle portion we find the nerves going to the upper extremities. The middle is in part covered by the poſterior portion, which is the longeſt and thinneſt of the three.

(x) In the generality of anatomical books we find theſe muſcles divided into *inter-ſpinales cervicis*, *dorſi*, and *lumborum*, but we do not find any ſuch muſcles either in the loins or back.

(y) Theſe muſcles are to be found only in the neck and loins; what have been deſcribed as the *inter-tranſverſales dorſi* being rather ſmall tendons than muſcles.

(z) This and the following pair of muſcles derive their name of *pſoas* from ψοα *lumbus*, on account of their ſituation at the anterior part of the loins.

(*a*) So called from its ſhape, which is that of an irregular ſquare.

(*b*) Some of the fibres of this muſcle are united with thoſe of the levator ani, ſo that it aſſiſts in cloſing the lower part of the pelvis.

(*c*) So named from its ſuppoſed reſemblance to the Greek Δ reverſed.

(*d*) This and the following pair are called *teres*, from their being of a long and round ſhape.

(*e*) This muſcle affords a paſſage to the muſculo-cutaneous nerve.

(*f*) So called from αλκων, *cubitus*.

(*g*) Between the two origins of this muſcle we find the ulnar-nerve going to the fore arm.

(*h*) The aponeuroſis palmaris is a tendinous membrane that extends over the palm of the hand. Some anatomiſts have ſuppoſed it to be a production of the tendon of this muſcle, but without ſufficient grounds; for in ſome ſubjects we find the palmaris longus inſerted wholly into the annular ligament, ſo as to be perfectly diſtinct from this aponeuroſis; and it now and then happens that no palmaris longus is to be found, whereas this expanſion is never deficient.

(*i*) This muſcle is named *perforatus*, on account of the four tendons in which it terminates, being perforated by thoſe of another muſcle, the perforans.

(*k*) So named from their being ſhaped ſomewhat like the lumbricus or earth-worm.

(*l*) Fallopius was the firſt who remarked the two oppoſite uſes of this muſcle. Their extending power is owing to their connection with the extenſor communis.

(*m*) The third interoſſeus internus (for there are four of the externi and three of the interni) differs from the reſt in drawing the middle finger from the thumb.

(*n*) From γλουτος, *nates*.

(*o*) So named from its pear-like ſhape.

(*p*) The two portions of this muſcle having been deſcribed as two diſtinct muſcles by ſome anatomiſts, have occaſioned it

to be named *gemini*. The tendon of the obturator internus runs between these two portions.

(*q*) This muscle is not of the square shape its name would seem to indicate.

(*r*) The muscles of the leg and thigh are covered by a broad tendinous membrane called *fascia lata*, that surrounds them in the manner of a sheath. It is sent off from the tendons of the glutæi and other muscles, and dipping down between the muscles it covers, adheres to the linea aspera, and spreading over the joint of the knee, gradually disappears on the leg. It is thickest on the inside of the thigh.

(*s*) The tendon of this muscle forms the *outer ham-string*.

(*t*) So named on account of its origin, which is by a broad flat tendon three inches long.

(*u*) Spigelius was the first who gave this the name of *sartorius*, or the taylor's muscle, from its use in crossing the legs.

(*v*) The vastus externus, vastus internus, and cruræus, are so intimately connected with each other, that some anatomists have been induced to consider them as a *triceps*, or single muscle with three heads.

(*y*) Under the cruræus we sometimes meet with two small muscles, to which Albinus has given the name of *subcruræi*. They terminate on each side of the rotula, and prevent the capsular ligament from being pinched. When they are wanting, which is very often the case, some of the fibres of the cruræus are found adhering to the capsula.

(*z*) This and the two following muscles have been usually, but improperly, considered as forming a single muscle with three heads, and on that account named, *triceps femoris*.

(*aa*) Γαστροκνημια, *sura*, "the calf of the leg."

(*bb*) This muscle is by some anatomists named *soleus*, on account of its being shaped like the sole-fish.

(*cc*) This muscle has gotten the name of *plantaris*, from its being supposed to furnish the aponeurosis that covers the sole of the foot; but it does not in the least contribute to the formation of that tendinous expansion.

(*dd*) So called on account of its situation at the ham (*poples*).

(*ee*) This muscle, about the middle of the foot, unites with a fleshy mass, which, from its having first been described by Sylvius, is usually called *massa carnea* Jacobi Sylvii.

(*ff*) The interossei interni are three in number; their use is to draw the smaller toes towards the great toe.

(*gg*) The interossei externi are four in number; the first serves to move the fore-toe towards the great toe; the rest move the toes outwards. All the interossei assist in extending the toes.

EXPLANATION OF PLATES XI. XII. AND XIII.

EXPLANATION OF PLATE XI.

Fig. 1. *Muscles of the head, face, neck*, &c. 1. Musculus frontalis. 2. Temporalis. 3. Orbicularis. 4. The parotid gland, with its duct, which passes through the buccinator. 5. Mastoideus. 6. Zygomaticus. 7. Elevator labii superioris proprius. 8. Elevator labiorum communis. 9. Depressor labiorum communis. 10. Sphincter oris. 11. Depressor labii inferioris proprius. 12. Buccinator. 13. Sterno-hyoidei. 14. Coraco-hyoideus. 15. Mastoideus. 16. Trapezius. 17. Pectoralis. 18. Deltoides.

Fig. 2. *A posterior view of the muscles of the trunk*. 1. Trapezius. 2. Deltoides. 3. Infraspinatus scapulæ. 4. Teres major. 5. Rhomboides. 6. Latissimus dorsi. 7. Glutæi. 8. Obliquus descendens abdominis.

Fig. 3. *An anterior view of the viscera in situ*. 1. Trachea. 2. The internal jugular vein. 3 The subclavian vein. 4. Cava descendens. 5. The right auricle of the heart. 6. The right ventricle. 7. Part of the left ventricle. 8. Aorta ascendens. 9. Arteria pulmonalis. 10. The right lobe of the lungs, part of which is cut off to shew the great blood-vessels. 11. The left lobe of the lungs. 12. The diaphragm. 13. The liver. 14. The ligamentum rotundum. 15. The gall-bladder. 16. The stomach, pressed by the liver towards the left-side. 17. The small intestines. 18. The spleen.

Fig. 4. *A view of the posterior abdominal viscera*. 1. The under side of the liver. 2. Ligamentum rotundum. 3. The gall-bladder. 4. The pancreas. 5. The spleen. 6. The kidney. 7. Aorta ascendens. 8. Vena cava ascendens. 9. The emulgent vein. 10. A probe under the spermatic vessels and the arteria mesenterica inferior, and over the ureters. 11. The ureter. 12. The iliac vessels. 13. The rectum intestinum. 14. The bladder of urine.

EXPLANATION OF PLATE XII.

Muscles of the upper extremity. 1. Musculus deltoides. 2. Pectoralis. 3. Biceps flexor cubiti. 4. Triceps extensor cubiti. 5. The fascia tendinosa of the biceps muscle. 6. Supinator radii longus. 7. Flexor carpi radialis. 8. Brachiæus internus. 9. Extensores carpi radiales. 10. Extensor communis digitorum. 11. Extensor carpi ulnaris. 12. Flexor carpi ulnaris. 13. Anconæus. 14. Extensor pollicis primus. 15. Extensor pollicis secundus.

Muscles of the lower extremity. 1. Membranosus. 2. Rectus femoris. 3. Vastus internus. 4. Vastus externus. 5. Sartorius. 6. Pectinæus. 7. Gastrocnemius. 8. Solæus. 9. Tibialis anticus. 10. Extensores digitorum. 11. Glutæus. 12. Biceps femoris. 13. Semitendinosus. 14. Semimembranosus. 15. Gastrocnemius.

Arteries of the upper extremity. 1. The humeral artery. 2. Cubitalis superior. 3. Cubitalis inferior, which ends in the hand and the fingers, and communicates with the cubitalis superior, under the muscles of the thumb. 4. The place where the cubitalis media is given off.

Superficial absorbents of the lower extremity. A, The spine of the os ilium. B, The os pubis. C, The iliac artery. D, The knee. E, E, F, Branches of the crural artery. G, The musculus gastrocnemius. H, The tibia. I, The tendon of the musculus tibialis anticus. *On the outlines*, a, A lymphatic vessel belonging to the top of the foot. b, Its first division into branches. c, c, c, Other divisions of the same lymphatic vessel. d, A small lymphatic gland. e, The lymphatic vessels which lie between the skin and the muscles of the thigh. f, f, Two lymphatic glands at the upper part of the thigh below the groin. g, g, Other glands. h, A lymphatic vessel which passes by the side of those glands without communicating with them; and, bending towards the inside of the groin at i, opens into the lymphatic gland k, Lymphatic glands appear in the groin, which are common to the lymphatic vessels of the genitals and those of the lower extremity; and also a plexus of lymphatic vessels is passing on the inside of the iliac artery.

Posterior view of the lower extremity, dissected so as to shew the deeper seated lymphatic vessels which accompany the arteries. A, The os pubis. B, The tuberosity of the ischium. C, That part of the os ilium which was articulated with the os sacrum. D, The extremity of the iliac artery appearing above the groin. E, The knee. F, F, The two cut surfaces of the triceps muscle,

which was divided to ſhow the lymphatic veſſels that paſs through its perforation along with the crural artery. G, The edge of the muſculus gracilis. H, The gaſtrocnemius and ſoleus, much ſhrunk by being dried, and by the ſoleus being ſeparated from the tibia to expoſe the veſſels. I, The heel. K, The ſole of the foot. The ſuperficial lymphatic veſſels appear paſſing over the knee to get to the thigh.

EXPLANATION OF PLATE XIII.

FIG. 1. *Repreſents the ſecond layer of the muſcles on the back part of the body.*

Head and neck. *a*, Temporalis; its tendon is ſeen paſſing below the zygoma. *b*, Maſſeter. *c*, Splenius capitis et colli. *d*, Portion of the complexus. *e*, Levator ſcapulæ, ſeu muſculus paticntiæ.

Trunk. *a*, Rhomboides major. *b*, Rhomboides minor: and immediately above it the upper edge of the ſerratus poſticus ſuperior is ſeen. *c*, The ſerratus poſticus ſuperior on the right ſide. *d*, Serratus poſticus inferior. *e*, Part of the ſpinalis dorſi. *f*, Part of the longiſſimus dorſi. *g*. Part of the ſacrolumbalis. *h*, Serratus magnus. *i*, The broad tendon, by which the latiſſimus dorſi begins, and from which the tendon of the ſerratus poſticus inferior is inſeparable. *k*, Part of the obliquus internus aſcendens abdominis. *l*, The ſphincter ani, fixed to the point of the coccygis; at the ſide of which the coccygæus, and a portion of the levator ani are ſeen, and lower down, oppoſite to *l*, part of the tranſverſalis penis.

Superior extremity. *a*, Supra ſpinatus. *b*, Infra ſpinatus. *c*, Teres minor. *d*, Teres major. *e*, Triceps extenſor cubiti. *f*, Its head, called longus. *g*. The brevis. And, *h*, A ſmall portion of the third head, named Brachialis Externus. *i*, The tendon of triceps, inſerted into the olecranon. *k*, Part of the brachialis internus. And *l*, conæus, which ſeems to be continued from that part of the brachialis externus immediately above it. *m*, Extenſor carpi radialis longior; and beneath it the brevior; both are ſeen at the wriſt, inſerted into the metacarpal bones of the fore and middle fingers. *n*, Flexor carpi ulnaris. *o*, Part of the ſupinator radii brevis. *p*, Extenſor oſſis metacarpi pollicis manus. *q*, Extenſor primi internodii pollicis manus. *r*, Extenſor ſecundi internodii pollicis manus. *ſ*, Indicator, inſerted into the root of the firſt joint of the fore finger. *t*, One of the three external interoſſei manus. The other two are diſtinctly ſeen without letters. *u*, One of the tendons of the extenſors of the fingers cut; and the ſame is ſeen in each of the other three fingers, joining with the tendons and aponeuroſes of the interoſſei and lumbricales, and ſpread upon the back of the fingers.

On the right hand, part of the flexors of the fingers, the abductor pollicis, and minimi digiti, are ſeen.

Inferior extremity. *a*, Glutæus medius. *b*, Pyriformis. *c*, The two muſcles called Gemini, between which the tendon of the obturator internus paſſes over the tuberoſity of the os iſchium; and its fleſhy belly is ſeen within the pelvis, partly covered by the coccygæus and levator ani. *d*, Quadratus femoris. *e*, Vaſtus externus. *f*, *f*, Parts of the triceps magnus. *g*, Long head of the triceps flexor cruris; and beneath it part of the ſhort head is ſeen. *h*, Semitendinoſus, and beneath it parts of the ſemimembranoſus are ſeen on each ſide of it. *i*, Gracilis. *k*, A ſmall portion of the vaſtus internus. *l*, Popliteus. *m*, The fleſhy belly of the plantaris; and its long ſlender tendon is ſeen paſſing over the inſide of the ſoleus. *n*, Soleus. *o*. The place where the tendon of the gemellus was cut off; but the fleſh of the ſoleus runs further down. *p*, Tendo-achillis, with the plantaris. *q*. Peroneus longus, paſſing at the outer ancle to the ſole of the foot; beneath it, the peroneus brevis to the root of the metatarſal bone of the little toe; and between it and the tendo-achillis, a portion of the flexor longus digitorum pedis. *r*, Tendons of the extenſor longus digitorum pedis, with the peroneus tertius; and beneath theſe, the extenſor brevis digitorum pedis. *ſ*, Flexor brevis minimi digiti pedis.

FIG. 2. *Repreſents the ſecond layer of muſcles on the anterior part of the whole body.*

Muſcles ſituated on the head and neck. *a*, Corrugator ſupercilii. *b*, Temporalis. *c*, Maſſeter. *d*, Levator anguli oris. *e*, Buccinator. *f*, Orbicularis oris. Oppoſite to the right ala naſi, is the portion of this muſcle which Albinus names Naſalis labii ſuperioris. *g*, Depreſſor labii inferioris. *h*, Sterno-cleido-maſtoideus, which is ſeen below, ariſing from the ſternum and clavicle, by two heads. *i*, Sterno-hyoideus. On the outſide of it, the omo-hyoideus. Further out, a portion of the hyothyroideus. *k*, Levator ſcapulæ.

Trunk. *a*, Subclavius. *b*, Pectoralis minor. *c*, Serratus magnus. *d*, Rectus abdominis, divided into ſeveral fleſhy portions by its tendinous interſections. *e*, Pyramidalis. *f*, Obliquus aſcendens internus. *g*, Spermatic cord, with the origin of the cremaſter muſcle.

Superior Extremity. *a*, Biceps flexor cubiti. *b*, Short head of the biceps. Beneath the upper part of it, a portion of the coracobrachialis. Beneath the under part, a portion of the brachialis internus. *c*, Long head of the biceps. At the bending of the arm, the tendon of the biceps, and the place where the tendinous aponcuroſis was cut from it, are ſeen. *d*, Extenſor carpi radialis longior. Beneath it a portion of the extenſor carpi radialis brevior. *e*, Flexor ſublimis perforatus. *f*, Inſertion of the extenſor carpi ulnaris. *g*, Extenſors of the thumb. *h*, Opponens pollicis. On the inſide of it, is a portion of the flexor pollicis brevis. *i*, Tendon of the flexor longus pollicis manus, after paſſing through the flexor brevis pollicis manus. *k*, Abductor minimi digiti manus. *l*, Flexor parvus minimi digiti manus. *m*, Ligamentum carpi annulare.

Inferior Extremity. *a*, Iliacus internus. Between *a* and *b*, part of the pſoas magnus. *b*, Pectinalis. *c*, Triceps longus. *d*, Gracilis. *e*, Rectus cruris cut off near its origin. *f*, Tendon of the rectus cruris cut off above the patella, from which a ſtrong tendon is ſent to be inſerted into the tubercle of the tibia. *g*, Portion of the gluteus medius. On the inſide of it, is part of the gluteus minimus. *h*, Vaſtus internus. *i*, Vaſtus externus. *k*, Crureus. *l*, Inſertion of the biceps flexor cruris into the fibula. *m*, Tendons of the gracilis and ſemitendinoſus inſerted into the tibia. *n*, Soleus. *o*, Peroneus longus. *p*, Extenſor longus digitorum, with the peroneus tertius on the outſide, and extenſor pollicis proprius on the inſide. *q*, Soleus. *r*, Flexor longus digitorum. *ſ*, Tendons of the tibialis poſticus and flexor longus digitorum pedis. *t*, Flexor brevis digitorum pedis.

FIG. 3. *Muſcles and tendons of the inſide of the hand.*

1. Muſculus abductor pollicis. 2. Adductor pollicis. 3. Flexor brevis. 4. Quadratus ſeu palmaris brevis. 5. The ſtrong ligament of the carpus that binds down the tendons of the flexors of the fingers. 6. Abductor minimi digiti. 7. A probe thruſt under the tendons of the perforatus. 8. A probe under thoſe of the perforans. 9. Lumbricales. 10. Perforatus. 11. Flexor carpi radialis. 12. Flexor carpi ulnaris.

FIG. 4. *Muſcles and tendons of the fore part of the foot.*

1. Tendo achillis. 2. That part of the aſtragalus which articulates with the tibia. 3. The tendon of the tibialis anticus. 4. Tendon of the extenſor pollicis pedis longus. 5. Tendons of the extenſor digitorum communis. 6. Extenſor pollicis pedis brevis. 7. Extenſor digitorum brevis. 8. The union of the tendons of the extenſor longus and the extenſor brevis.

FIG. 5. *A view of the bladder and its appendages.*

1. The under ſide of the bladder. 2. The ureters. 3. Vaſa deferentia. 4. Veſiculæ ſeminales. 5. The proſtate gland. 6. Meatus urinarius.

FIG. 6. *A tranſverſe ſection of the penis.*

7. The corpora cavernoſa penis. 8. Corpus cavernoſum urethræ. 9. Urethra. 10. Septum penis. 11. The ſeptum between the corpus cavernoſum urethræ, and that of the penis.

PART III.

SECT. I. *Of the external Parts, and common Integuments.*

THE human body is commonly divided into the *head*, *trunk*, and *extremities*. The trunk is again ſubdivided into the *neck*, *thorax*, and *abdomen*; and the extremities into *ſuperior*, called the *arms*, and *inferior*, called the *legs*.

The hollow on the middle and inferior part of the thorax, below the breaſts, is called *ſcrobiculus cordis*. The middle of the abdomen for about three fingers breadth above and below the navel, is called *regio umbilicalis*; the middle part above this, *epigaſtrium*; on each ſide of the epigaſtrium, under the cartilages of the lower ribs, *hypochondrium*; and from below the regio umbilicalis, down to the oſſa ilia and oſſa pubis, *hypogaſtrium*.

1. *Cuticula*, or *ſcarf-ſkin*, is that thin inſenſible membrane which is raiſed by bliſters in living bodies. It is extended over every part of the true ſkin, unleſs where the nails are. It appears when viewed in a microſcope a very fine ſmooth membrane, only with ſome inequality of ſurface where the *rete mucoſum* adheres to it. When we examine narrowly the ſmall paſſages through which the ſebaceous matter of the ſkin paſſes, the cuticle ſeems to enter theſe, in order to complete the ſecretory tubes. The foſſulæ of the hairs have likewiſe the ſame productions of the cuticle, and it ſeems to give a kind of covering to the hairs themſelves. Laſtly, the almoſt imperceptible ducts of the cutaneous pores are lined by it. Its uſe is to defend the true ſkin that it may not be expoſed to pain from whatever it touches; and alſo to preſerve it from wearing. It is thickeſt on thoſe parts of the bottom of the foot which ſuſtain the body, and on the hands of perſons much uſed to labour, being ſo contrived by nature as to grow the thicker the more thoſe parts are uſed. In eruptive diſeaſes the cuticula will ſometimes become ſcurfy and full of little breaches, which are apt to remain even when the cauſe is taken away; but if the cuticle be taken off by a bliſter, the new cuticle will be reproduced in a ſound ſtate.

2. *Rete mucoſum*. Under the cuticle, we meet with a ſubſtance of a greyiſh colour, which has been thought to repreſent a net-work; hence it has got the name of *rete mucoſum*. It is of a ſoft, mucilaginous, and viſcid nature; and fills up the interſtices of the fibres running between the cutis vera and cuticula. After raiſing the cuticle in a negro, where it is thickeſt and moſt diſtinct, this ſubſtance appears of a black colour, and is compoſed of two layers. It is this that chiefly gives the colour to the ſkin; for it is black in the African; white, brown, or yelloviſh, in the European.

The origin of this mucous ſubſtance has not hitherto been ſufficiently explained; nor has it been fully determined what purpoſes it ſerves in the human body. Haller thinks it probable, that it is compoſed of a humour tranſuding from the ſurface of the cutis vera.

3. The *cutis vera*, or *ſkin* properly ſo called, is a ſubſtance of very large extent, made up of ſeveral kinds of fibres, cloſely connected, and running in various directions, being compoſed of the extremities of numerous veſſels and nerves. This texture is what we commonly call *leather*; and it makes, as it were, the body of the ſkin. It is not eaſily torn; may be elongated in all directions, and will afterwards recover itſelf; and it is thicker and more compact in ſome places than in others.

The outer ſurface of this ſubſtance is furniſhed with ſmall eminences, called *papillæ*. They appear through its whole ſurface like ſmall granulations; and ſeem to be calculated to receive the impreſſions of touch, being the moſt eaſily obſerved where the ſenſe of feeling is the moſt delicate, as in the points of the fingers and palms of the hands; and are ſuppoſed by many to be the capillary filaments of the cutaneous nerves, which terminate by ſmall radiated pencils.

The papillæ differ very much in figure and diſpoſition in different parts; and they may be diſtinguiſhed into ſeveral kinds. The papillæ of the palm of the hand, of the ſole of the foot, and of the fingers and toes, are higher than on the other parts of the body; but they are likewiſe ſmaller, cloſely united together, and placed as it were end-wiſe with reſpect to each other, in particular rows, which repreſent on the ſkin all kinds of lines, ſtraight, ſpiral, &c. Theſe lines are often diſtinctly viſible on the hand. The red part of the lips is made up of papillæ, reſembling very fine hairs or villi cloſely united; and there is another particular kind under the nails; the papillæ being there more pointed, or in a manner conical, and turned obliquely towards the ends of the fingers.

4. *Glands of the ſkin*. In different parts of the body, we meet with ſmall glands or follicles of an oval form, and ſeated chiefly under the ſkin in the corpus adipoſum. They are compoſed of convoluted veſſels; and by diſcharging through ſmall excretory ducts, a fat and oily matter, they ſerve to lubricate and moiſten the ſkin. The fluid thus ſecreted, ſometimes acquires a degree of thickneſs, and approaches to the conſiſtence of ſuet: and from this circumſtance theſe glands have derived the name of *ſebaceous*. They are found chiefly on the noſe, ears, axillæ, &c.

But beſides the ſebaceous glands, the ſkin abounds with a ſort of glands named *miliary*, which are ſaid to open on the ſurface of the cuticle, and diſcharge the ſweat and matter of inſenſible perſpiration; yet after all that has been ſaid by authors about them, it is certain there are no glands of this kind that can be traced by diſſection.

5. The filamentary ſubſtance, called the *body of the ſkin*, is the almoſt univerſal integument of the body, and the baſis of all the other cutaneous parts. The ſkin is able to reſiſt external injuries to a certain degree, and defend the parts over which it extends from the effects of friction, blows, &c. to which the human body is often liable. The papillæ are the organs of feeling, and alſo contribute to an univerſal evacuation, called *inſenſible perſpiration*. They likewiſe ſerve to tranſmit from without, inwards, the ſubtle particles of ſubſtances applied to the ſkin. The firſt of theſe three uſes depends on the extremities of the nerves; the ſecond, on the arterial ſtructure; and the third, on the exiſtence of abſorbent veſſels on the ſurface.

The cutaneous glands ſecrete an oily matter; yet without the epidermis, both the papillæ and glands would nevertheleſs be diſturbed in their functions. The epidermis keeps the nervous filaments of the papillæ in an even and regular ſituation; and likewiſe moderates the impreſſions of external objects. Another uſe of it is, to regulate the cutaneous evacuations already mentioned.

6. *Membrana adipoſa*; the innermoſt integument of the body. This is compoſed of a congeries of membranous laminæ, joined irregularly to each other at different diſtances, ſo as to form numerous interſtices that communicate with each other. Theſe interſtices have been named *cellulæ*, and the ſubſtance they compoſe the *cellular membrane*.

The thickneſs of the membrana adipoſa is not the ſame all over the body. It adheres very cloſely to the ſkin, and runs in between the muſcles, whoſe fibres it ſurrounds and connects. It is alſo the bond of union between the various cavities of the body and the membranes which line them. The cellular interſtices are ſo many little bags filled with *fat*; and theſe we find plentifully depoſited immediately under the ſkin, and filling up thoſe interſtices between the external muſcles, which would otherwiſe have exhibited diſagreeable hollow or void places. In ſome parts the fat ſerves for a cuſhion, as on the buttocks, where the laminæ and cells are very numerous. Other parts have little or no fat; as on the forehead, elbows, &c. The fat is likewiſe of great uſe to the muſcles in preſerving their flexibility, and in leſſening their mutual frictions. It may alſo be ſome defence againſt the cold, which we find makes more impreſſion on lean than on fat perſons.

This maſs of fat, which makes an univerſal integument of the body, is different from that which is found in the abdomen, thorax, canal of the ſpina dorſi, articulations of the bones, and in the bones themſelves.

With regard to the difference exiſting between particular maſſes of fat in different parts, it conſiſts chiefly in the thickneſs or fineneſs of the pellicles, in the largeneſs or ſmallneſs of the cells, and in the conſiſtence of the contained matter.

7. The *nails* and *hair* belong alſo to the common integuments; but they are ſo well known as to need no anatomical deſcription.

Sect. II. *On the Uſe of the Skin, and the Nature of Touch.*

The papillæ of the fingers, or inſide of the hand, may, by the operations of the mind, become erect or elevated, which appears from ſhiverings, frights, &c.; and being then gently preſſed or rubbed againſt a tangible body, they receive an impreſſion, which is conveyed to the brain, and is what we call the *touch*. By this ſenſe we perceive heat in certain bodies, or weight, when the body preſſes more than uſual. Humidity, ſoftneſs, hardneſs, figure, &c. are the reſult of examination by the touch, which likewiſe ſerves to correct the miſtakes of our other ſenſes, though it ſometimes errs itſelf.

The rete mucoſum moderates the action of the object touched, and preſerves the ſoftneſs of the papillæ. The cuticle excludes the air from withering and deſtroying the ſkin; qualifies the impreſſions of bodies, ſo that they may be only ſufficient to affect the touch, without cauſing pain. The hairs ſerve to defend the cuticle from abraſion; to preſerve and increaſe the heat; to cover what ought to be concealed; to render more irritable the membranes of thoſe parts, which ought to be defended againſt the injuries of inſects, &c. The nails ſerve to guard the ends of the fingers, increaſe our power of graſping large bodies, and of more nicely handling ſmall ones.

But a moſt important office of the ſkin is, to exhale moiſture from the body, and to abſorb vapours from the atmoſphere. The ſkin is replete with ſmall arteries, either coiled up into papillæ, or paſſing directly through it, which afford a paſſage to the inſenſible perſpiration; and leſt it ſhould be collected, as is the caſe in ſome diſeaſes, between the ſkin and the cuticle, there are pores in the cuticle correſponding with the exhaling arteries of the ſkin, through which it freely paſſes.

In a living perſon, this exhalation is many ways demonſtrable. A clean looking-glaſs placed againſt the warm and naked ſkin, is quickly obſcured by the moiſt vapour. In ſubterraneous caverns, where the air is more denſe, it is evidently ſeen to fly off from the whole ſurface of the body, like a thick cloud.

Whenever the blood's motion is increaſed, the ſmall cutaneous pores, inſtead of an inviſible vapour, diſcharge *ſweat*, conſiſting of minute but viſible drops. The parts moſt ſubject to ſweat, are the head, breaſt, and foldings of the ſkin, as being the warmeſt. There exiſt many reaſons for ſuppoſing, that the perſpirable matter and ſweat are diſcharged through one and the ſame kind of veſſels, and that they differ only in the quantity and celerity of the matter. The nature and quality of the perſpirable matter may be inveſtigated by experiments, and by conſidering its analogy to the pulmonary exhalation. What flies off from the lungs in this exhalation is chiefly water; and that the perſpirable matter is alſo chiefly water, is demonſtrated by its obſcuring a glaſs on which it is received, and alſo by ſeveral other teſts. The water of theſe vapours proceeds chiefly from what we drink, but it is alſo in part ſupplied from what is inhaled by the ſkin. The particular ſmell of the aliments taken into the ſtomach, may be ſometimes plainly perceived in the fluids we perſpire.

The quantity of our perſpiring moiſture is very large, whether we conſider the extent of the organ by which it is ſeparated, the abundance of vapours derived from the lungs only; or barely take a review of the experiments made by Sanctorius. This indefatigable man concluded, that five pounds out of eight of the aliment was diſcharged in a healthy perſon by the inſenſible perſpiration alone, independent of the viſible ſweat, and other excretions. In colder climates, the quantity perſpired was found to be $4\frac{5}{7}$ out of 8. But the cutaneous exhalation is even much larger than this; ſince it not only throws off a quantity of the aliment, but likewiſe what is added to the blood by inhalation, which entering, often in a very conſiderable quantity, is thus again expelled. But different diſpoſitions of the air, and of the human body, cauſe great variations in theſe proportions. The difference of time after feeding alſo in ſome meaſure varies the quantity perſpired; but in general it is moſt copious when the greater part of the digeſted nouriſhment is conveyed into the blood. It is naturally diminiſhed in ſleep, even in the warmer climates; but it is increaſed by the heat of bed-clothes.

A moderate and uniform perſpiration is uſually reckoned a ſign of health, becauſe it denotes a free pervious diſpoſition of the veſſels and a complete digeſtion of the aliment. When it is diminiſhed, it indicates either a conſtriction of the ſkin, a weakneſs of the heart, or an imperfect digeſtion. Moderate exerciſe increaſes perſpiration conſiderably; as do alſo warm, watery, and vinous drinks, animal food of eaſy digeſtion, a moderately warm atmoſphere; and laſtly, a chearful and tranquil ſtate of mind. But though the contrary of theſe either leſſen or ſuppreſs perſpiration, we do not find that the continuance of life depends on a ſcrupulous exactneſs in the quantity diſcharged, which is ſo eaſily increaſed or diminiſhed by ſlight cauſes. When ſuppreſſed, however, it tends to produce diſeaſes of that nature which depend on the putreſcent quality of the particles retained along with it.

The uſes of perſpiration are, to free the blood from its redundant water, and to throw out thoſe particles, which, by repeated circulations, have become excrementitious. Perſpiration likewiſe qualifies and ſoftens the cuticle, which is a neceſſary medium extended before the tender ſenſible papillæ of the ſkin. Haller contended, that beſides the exhalent veſſels before mentioned, the ſkin is full of ſmall veſſels, which inhale or abſorb thin vapours from the air. Theſe he conceived to have been demonſtrated by anatomical injections, which, if thin or watery, ſweated through them as through the arteries,

But, according to later phyſiologiſts, abſorption is performed ſolely by the lymphatic veſſels. That abſorption, however, does take place is ſufficiently proved by the operation of medicines pervading the air, or applied to the ſkin: but ſtill more, by the phenomena of ſome diſeaſes, where a much greater quantity of urine has been diſcharged than the quantity of drink taken in.

Theſe cutaneous veſſels, both exhaling and inhaling, are capable of contraction and relaxation by the power of the nerves. The truth of this appears from the effects of the paſſions of the mind; which, if joyful, increaſe the circulation, and relax the exhaling veſſels, ſo as to yield eaſier to the impulſe of the blood; from whence, with a ſhortening of the nerves, there follows a redneſs, moiſture, and turgeſcence of the ſkin. Thoſe paſſions, on the contrary, which are ſorrowful, and retard the circulation, contract the exhaling veſſels; as appears from the dryneſs and corrugation of the ſkin, like a *gooſe-ſkin*, after frights; and from a diarrhœa being cauſed by terror. The ſame affections ſeem to open and increaſe the power of the inhaling veſſels, ſince variolous or peſtilential contagion is more liable to be contracted by perſons under the influence of fear.

Sect. III. *Of the Membranes in general.*

Each diſtinct part of the body is covered, and every cavity is lined with a ſingle membrane, whoſe thickneſs and ſtrength is as the bulk of the part it belongs to, and as the friction to which it is naturally expoſed. Thoſe membranes that contain diſtinct parts, keep the parts they contain together, and render their ſurfaces ſmooth, and leſs ſubject to be lacerated by the actions of the body; and thoſe which line cavities ſerve to render the cavities ſmooth, and fit for the parts they contain to move againſt. The membranes of all the cavities that contain ſolid parts, are either beſet with glands, or provided with veſſels, which ſecrete a fluid or mucus, calculated to make the contained parts move freely againſt each other, and prevent their growing together; and thoſe cavities which are expoſed to the air, as the noſe, ears, mouth, and trachea, have in their membranes numerous little glands which ſeparate a mucus thick enough to defend them from the action of the air in reſpiration. Thoſe membranes that have diſtinguiſhing names, and deſerve a particular deſcription, will be treated of as occaſion may require.

Sect. IV. *Of the Salival Glands, Thymus, &c.*

The glands termed *ſalival*, may be enumerated thus: Glandulæ parotides, maxillares, ſublinguales, molares, buccales, labiales, linguales, amygdalæ, glandulæ palatinæ, glandulæ uvulares, glandulæ arytenoidææ, and glandula thyroidæa. Of theſe we ſhall only mention the moſt conſiderable.

1. The *parotides* are two large, whitiſh glands, irregularly oblong and protuberant, ſituated on each ſide, between the external ear and the poſterior or aſcending ramus of the lower jaw, and lying on ſome part of the neighbouring maſſeter muſcle. The ſuperior portion of this gland lies before the cartilaginous meatus of the ear, and touches the apophyſis zygomatica of the os temporis; extending forward and backward under the lobe of the ear, as far as the maſtoid apophyſis.

From the anterior and ſuperior portion of this gland, a duct runs obliquely forward on the outſide of the maſſeter; and then perforates the buccinator, oppoſite to the interſtice between the ſecond and third dentes molares. The external carotid artery and vein, and the portio dura of the ſeventh pair of nerves, paſs through the ſubſtance of the parotid gland, to which they give branches.

2. The maxillares are ſmaller and rounder than the parotides; and are ſituated each on the inſide of the angle of the lower jaw, near the muſculus pterygoidæus inferior. From the inſide, or that which is turned to the muſculus hyo-gloſſus, each of them ſends out a duct in the ſame manner as the parotides; but it is ſmaller and longer, and goes by the name of *ductus ſalivalis Whartoni*, or *ductus inferior*.

3. The *glandulæ ſublinguales* are likewiſe two in number, of the ſame kind with the former, only ſmaller, ſomething oblong, and flatted like a blanched almond. They are ſituated under the anterior portion of the tongue, one on each ſide, and ſend out laterally ſeveral ſmall ſhort ducts which open near the gums, at a ſmall diſtance from the frænum, and a little more backward.

4. The *molares* are two glands nearly of the ſame kind with the former, each being ſituated between the maſſeter and buccinator. Their ſmall ducts perforate the latter muſcle, and open into the mouth, near the laſt dentes molares; from which circumſtance they take their name.

5. The *glandulæ linguales* are thoſe of the foramen cæcum of the baſis of the tongue.

6. The *uvular* glands are only a continuation of the membrane of the palate, in form of a ſmall bunch of grapes. We might likewiſe reckon among the ſalival glands thoſe of the ſuperior portion of the pharynx, and alſo the follicles of the membrana pituitaria of the nares, and of the ſinuſes which communicate with them.

7. The *amygdalæ* are two glandular bodies of a reddiſh colour, lying in the interſtices between the two lateral half-arches of the ſeptum palati, one on the right, the other on the left ſide of the baſis of the tongue. They ſomewhat reſemble an almond-ſhell, in having an uneven ſurface, and in being full of little holes, through which their ſecretions are evacuated.

8. The *thyroidæa glandula* is a large reddiſh maſs, covering the anterior convex ſide of the larynx. It ſeems at firſt ſight to be made up of two oblong glandular portions united by their inferior extremities, below the cricoid cartilage, in ſuch a manner as to have ſome reſemblance to a creſcent, with the cornua turned upward. The two lateral portions lie on the muſculi thyroidæi, and the middle or inferior portion on the crico-thyroidæi. This gland ſeems to be of the ſame kind with the other ſalival glands, but is more ſolid. It is formed of glandulous grains, and of veſicles of different ſizes, full of a yellowiſh oily liquor, which may ſerve to lubricate the parts in its neighbourhood.

9. The *thymus* is a glandular ſubſtance, the uſe of which is not perfectly aſcertained, its excretory duct not having yet been diſcovered. It is of an oblong figure, and is larger in the fœtus and in young children than in adults, being ſometimes nearly effaced in very old ſubjects. It is placed in the upper part of the thorax, between the two laminæ of the mediaſtinum; but at firſt is not altogether contained within the cavity of the cheſt, being found to border upon the upper extremity of the ſternum.

Pressure upon the ſurface of a gland very much promoting the ſecretion that is made in it, the ſalival glands are ſo ſeated as to be preſſed by the lower jaw, and its muſcles, which will chiefly happen at thoſe times when the fluid is wanted. The force too with which the jaw muſt be moved, being as the dryneſs and hardneſs of the food maſticated, the ſecretion from the glands will depend very much upon the exertion of that force. All food requires to be reduced to a pulp, and mixed with ſaliva before it can be fitted for digeſtion; therefore the drier and harder foods needing more of this ſecretion, will, from this mechaniſm, be ſupplied with more than moiſter foods, in about that proportion in which they are drier and harder. What quantity of ſaliva theſe glands can ſeparate from the blood, in

a given time, is not eaſy to determine, but we all know from experience how freely they act when neceſſity requires.

A *gland* is chiefly compoſed of a convolution of one or more arteries of a conſiderable length, from whoſe ſides ariſe a vaſt number of excretory ducts. But though the larger ſecretions are made by viſible glands, yet unconvolved arteries may alſo have excretory ducts for the ſame purpoſe. In this way probably, ſecretions are made from all the membranes that line cavities, as well as in ſome other inſtances. There alſo ariſe from the arteries which enter into the compoſition of a gland, lymphatic veſſels, whoſe uſe ſeems to be that of taking off the thinner parts of the blood, in thoſe caſes where a thick fluid is to be ſecreted. For lymphatics are found in greateſt plenty, in ſuch glands as ſeparate the thickeſt fluids; as in the teſticles and liver; and it is obſervable, that where the thickeſt ſecretions are made, the velocity of the blood is the leaſt, as if nature intended to give thoſe ſeemingly more tenacious parts more time to be ſeparated from the blood. The arteries that compoſe different glands are convolved in different manners; but whether or no their different ſecretions depend at all upon that, is ſomewhat difficult to determine. The excretory ducts ariſe from the arteries, and unite in their progreſs, as the roots of trees do from the earth; whilſt the ducts, opening into different glands, ſeparate from the ſame maſs of blood their different juices. What theſe different ſecretions however depend on, whether the peculiar œconomy of the parts, or the different attractions, of which they are rendered capable, we are unable to ſay; although this ſubject has employed the attention of ſeveral ingenious anatomiſts.

Sect. V. *Of the Peritonæum, Omentum, Ductus Alimentalis, and Meſentery.*

1. The *peritonæum* is that membrane which lines the whole cavity of the abdomen. It alſo ſeverally incloſes the liver, ſpleen, omentum, ſtomach, inteſtines, and meſentery, with all their veſſels and glands. The ſuperior portion of it extends over that part of the diaphragm which conſtitutes a part of the cavity of the abdomen. It may be looked upon as a ſingle membrane, though deſcribed by many anatomiſts as a duplicature of two diſtinct membranous laminæ. Its inner ſubſtance is very ſmooth and poliſhed on that ſide which is next the viſcera, and it is continually moiſtened by a ſerous fluid diſcharged through almoſt imperceptible pores opening chiefly from the exhalent veſſels.

The cellular ſubſtance, or external portion of the peritonæum, adheres very cloſely to the parts which form the inſides of the cavity of the abdomen; but it is not every where of an equal thickneſs.

The great blood veſſels, namely, the aorta and vena cava, are involved in this cellular ſubſtance of the peritonæum. Indeed, it involves immediately and ſeparately, all the parts and organs which are commonly ſaid to lie in the duplicature of the peritonæum.

The uſes of the peritonæum ſeem to be very evident. It ſerves to line the cavity of the abdomen, to inveſt the viſcera contained in that cavity as in a common bag, to ſupply them with particular coats, and to form productions, ligaments, connections, folds, vaginæ, &c. as we ſhall ſee hereafter. The fine fluid which tranſudes through the whole internal ſurface of the peritonæum prevents the inconveniencies which might ariſe from the continual frictions and motions to which the viſcera of the abdomen are expoſed, either naturally or by external impulſes.

2. The *omentum* is a fine membrane, larded with fat, in a kind of net-work. It is formed by a duplicature of the peritonæum, and falls looſely over the ſurface of the ſmall inteſtines reſembling an apron tucked up. Its outer or ſuperior portion, termed *ala ſuperior*, is connected to the bottom of the ſtomach, the ſpleen, and part of the duodenum; and thence deſcending a little lower than the navel, is reflected and tied to the colon, the ſpleen, and part of the duodenum. This laſt part is called *ala inferior;* and the ſpace between the alæ is named *burſa*. This cavity is very diſtinct in moſt brutes, but ſeldom ſo in men. Sometimes both alæ are tied to the liver, and, in diſeaſed bodies, where there has exiſted inflammation, to the peritonæum. Its uſe is to lubricate the inteſtines, in order that they may the eaſier perform their periſtaltic motions. Malpighi deſcribes adipoſe ducts in this membrane to carry the fat from the cells into the vena portæ, and thinks it a neceſſary ingredient in the bile.

3. *Appendices epiploicæ.* The fatty appendices of the colon and rectum are conſidered by Winſlow as a kind of ſmall omenta or appendices epiploicæ. They are ſituated at different diſtances, along theſe inteſtines, being particular elongations of their common or external coat. They are of the ſame ſtructure with the great omenta; and there is a cellular ſubſtance contained in their duplicature, more or leſs filled with fat, according as the ſubject is fat or lean.

Ductus alimentalis. The alimentary duct or canal conſiſts of the œſophagus, and ſtomach, together with the large and ſmall inteſtines; to wit, the duodenum, jejunum, ilium, colon, cæcum or appendicula vermiformis, and rectum.

1. The *œſophagus* is a canal partly muſcular and partly membranous; which commences at the inferior part of the pharynx, and deſcends along the neck and back part of the thorax, into the abdomen, where it joins itſelf to the ſtomach. It is made up of ſeveral coats, almoſt in the ſame manner as the ſtomach. The firſt is formed only by a duplicature of the poſterior part of the mediaſtinum, and is wanting above the thorax and in the neck. The ſecond coat is made up of ſeveral ſtrata of fleſhy fibres, moſtly longitudinal, and their quantity is conſiderably greater. The third is termed the *nervous coat*, and is like that of the ſtomach and inteſtines. It is diſtributed in folds or plaits according to its length, and is ſurrounded by a whitiſh cotton-like ſubſtance which, when ſteeped in water, ſwells and grows thicker. The fourth or innermoſt coat reſembles, in ſome meaſure, that of the inteſtines; except that, inſtead of the villi, it has ſmall and very ſhort papillæ. It is folded lengthwiſe like the third coat; ſo that the œſophagus, when cut acroſs, repreſents one tube within another. Through the pores of this coat a viſcid lymph is continually diſcharged to facilitate the paſſage of food into the ſtomach.

2. *Ventriculus*, the *ſtomach*, is a great bag or reſervoir, ſituated partly in the left hypochondrium, and partly in the epigaſtrium. Its figure is like that of the bag of a bagpipe; oblong, incurvated, large and capacious at one end, and ſmall and contracted at the other. We ſee in this kind of figure two arches or curvatures, one large, which runs along the greateſt convexity; and one ſmall, directly oppoſite to the former. The ſtomach has two openings, called its *orifices;* one between the great extremity and the ſmall curvature, the other at the end of the ſmall or contracted extremity. The firſt opening is a continuation of the œſophagus; the other joins the inteſtinal canal, and is called by the name of *pylorus*.

The great extremity of the ſtomach is in the left hypochondrium, and cloſe under the diaphragm. Yet the ſuperior orifice is not in the left hypochondrium, but almoſt oppoſite to, and very near the middle of, the bodies of the loweſt vertebræ of the back. Its ſmall extremity does not reach to the right hypochondrium, but bends obliquely backwards toward the upper orifice; ſo that the pylorus lies about two fingers breadth

rom the body of the vertebræ immediately under the ſmall ortion of the liver.

The coats of the ſtomach are three; the external membra- ous; the middle muſcular, whoſe fibres are chiefly longitudi- al and circular; the inner membranous, and beſet with glands, vhich ſecrete the juices neceſſary for digeſting the aliment. This laſt coat is again divided by anatomiſts into a fourth, vhich they call *villoſa*. As the muſcular coat of the ſtomach ontracts, the inner coat falls into rugæ or folds.

The manner in which *digeſtion* is performed, has been matter f great controverſy. The different doctrines of fermentation, ttrition, and ſolution by heat, as in the machine called Papin's Digeſter, have given way to more rational opinions. The ex- eriments of the Abbe Spalanzani and Mr. Hunter uniformly rove that digeſtion is not effected by any fermenting power, y contractions of the ſtomach, or by heat; but by a *peculiar* luid ſecreted in the coats of the ſtomach. This is poured into ts cavity, and there animalizes the food, or aſſimilates it to the ature of blood. It has alſo appeared, that animals, or parts f animals, poſſeſſed of the living principle, when taken into he ſtomach, are not in the leaſt affected by the action of that iſcus; but the moment they loſe the living principle, they be- ome ſubject to its digeſtive powers. This ſeems to be the caſe vith the ſtomach, which is enabled to reſiſt the action of its uices in the living body; but when deprived of the living prin- iple, it is then no longer able to reſiſt the powers of that men- truum, which it had itſelf formed for the digeſtion of its con- ents; the proceſs of digeſtion appearing to be continued after leath.

By *digeſtion* is to be underſtood, the changes the aliment un- lergoes for the formation of chyle. After having been ſuffi- iently divided by maſtication, and mixed with ſaliva, the food nters into the ſtomach, where it is thoroughly blended with the aſtric juice. Here it is capable alſo of irritating the inner coat f the ſtomach to a certain degree, and occaſioning a contrac- ion of its two orifices. In this membranous bag, ſurrounded y the abdominal viſcera, and with a certain degree of natural eat, the contents of the ſtomach undergo a conſtant agitation y means of the abdominal muſcles and of the diaphragm, and ikewiſe by a certain contraction or expanſion of the muſcular ibres of the ſtomach itſelf. By this motion, every part of the ood is expoſed to the action of the gaſtric juice, which gradual- y divides and attenuates it, and prepares it for its paſſage into he inteſtines.

The food, after having remained one, two, or three hours n the ſtomach, is converted into a greyiſh pulp, and ſome few nilky particles begin to appear. But the term of its reſidence n this bag is proportioned to the nature of the aliment, and to he ſtate of the ſtomach and its juices. The thinner and more erfectly digeſted parts paſs by a little at a time into the duo- enum; while the groſſer and leſs digeſted particles remain in he ſtomach, till they acquire a ſufficient fluidity to paſs into he inteſtines, where the nature of this pulp is perfectly chan- ged. The bile and pancreatic juice which flow into the duode- num, and the mucus, which is every where diſtilled from the urface of the inteſtines, mix themſelves with the ejected mat- er, and ſtill farther attenuate and diſſolve it.

Two matters very different from each other in their nature nd deſtination are the reſult of this combination. One of hese, which is compoſed of the liquid parts of the aliment, nd of ſome of its more ſolid particles, extremely divided and nixed with the juices we have deſcribed, conſtitutes a very nild, ſweet, and whitiſh fluid, reſembling milk, and diſtin- guiſhed by the name of *chyle*. This fluid is abſorbed by the acteal veſſels, which convey it into the circulation, where, by eing aſſimilated into the nature of blood, it affords that ſup- ly of nutrition, which the continual waſte of the body is found to require. The other is the remains of the alimentary maſs, deprived of all its nutritious particles, and containing only ſuch parts as were rejected by the abſorbing mouths of the lacteals. This groſſer part, called the *fæces*, paſſes on through the courſe of the inteſtines, and is voided at the anus.

3. *Duodenum* is the firſt of the three ſmall inteſtines. It begins from the pylorus at the extremity of the ſtomach, and is thence reflected downwards. It firſt paſſes by the gall bladder, then under the following gut and meſentery, and coming once more in ſight in the left hypochondrium, it there commences jejunum, which is the ſecond of the ſmall inteſtines; but the place where this ends and the other begins is not preciſely determined.

4. The *jejunum* is ſo called from its being found for the moſt part empty. It is ſituated in the regio umbilicalis, and makes ſomewhat more than a third part of the ſmall inteſtines. It is diſtinguiſhed from the next ſucceeding inteſtine by its coats, which are ſomewhat thinner and leſs pale.

5. The *ilium* is a continuation of the former gut. It is ſituated in the hypogaſtrium, and very often ſome part of it paſſes into the pelvis, and lies upon the urinary bladder, eſpecially in women. It enters the colon on the right ſide, near the upper edge of the os ilium. This great length of the ſmall inteſtines is evidently for the convenience of a greater number of lacteals, that the chyle which miſſes their orifices in one place may not eſcape them in another. Thoſe animals which ſwallow their food whole, and retain it for a long time, have the alimentary canal furniſhed with ſhorter and fewer lacteals.

6. The *colon* is the firſt of what are called the large inteſtines. It begins at the upper edge of the right os ilium; from which place it aſcends, paſſing under ſome part of the liver, and the bottom of the ſtomach, from the right hypochondrium to the left, and thence deſcends into the pelvis at the place where the cæcum joins the colon; one portion of the circumference of both is depreſſed, and forms a large fold on the inſide, which advances into the cavity of the inteſtine, and gets the name of *valve* of the *colon*.

7. The *cæcum*, or *appendicula vermiformis*, is ſituated on the beginning of the colon. It is leſs than an earth-worm, and has a ſmall orifice opening into the colon. This gut, which is hardly worthy of being called ſo, has ſeldom any thing in it. It is a little prepoſterous to rank the *cæcum*, which is the ſmalleſt of all, among the *large* inteſtines; but in this anatomiſts have erred by copying the ancients, whoſe deſcriptions of all the parts contained in the abdomen ſeem to have been taken from quadrupeds, in ſome of whom the *cæcum* is very large. Some fiſh have theſe *appendiculæ* in great numbers, but very ſmall. A mackarel has been found to contain above one hundred and fifty.

8. The gut named *rectum*, or *ſtraight gut*, is the laſt of all the inteſtines. It is ſo named, becauſe when viewed directly forward, it appears to run down in a ſtraight courſe from the laſt vertebra of the loins, on the foreſide of the os ſacrum, all the way to the os coccygis, where it ends in the *anus*. This inteſtine, properly ſpeaking, is a true continuation of the laſt convolution of the colon; and it is the repoſitory, ſink, and common ſewer of the whole inteſtinal canal.

The figure of the rectum varies according as it is full or empty. When empty, it is irregularly cylindrical, and ſinks in by a kind of tranſverſe folds; and in that ſtate it is about three fingers breadth in diameter. When full, it is wider in proportion; and may be diſtended to a conſiderable ſize.

The extremity of the inteſtine which forms the *anus*, has ſeveral muſcles belonging to it, ſome ſurrounding it like ſphincters; the reſt broad fleſhy planes inſerted in it, and which, being likewiſe fixed to other parts, ſuſtain it in its natural ſituation, and reſtore it to that ſituation after being diſturbed by the force neceſſary for the exclusion of the fæces.

9. *Meſentery.* This great bundle of inteſtines is not left to move at random in the cavity of the abdomen; but artfully bound down by a membranous web, which prevents the inteſtinal convolutions from being intangled in each other, and yet allows them a gentle floating, but limited motion.—This web, which is called the *meſentery*, is diſtinguiſhed into two portions; one very broad, and much plaited, which connects the ſmall inteſtines; the other, long and incurvated, which does the ſame to the large ones. But in fact theſe two portions conſiſt only of the membranous lamina of the peritonæum doubled back upon itſelf, after having incloſed the inteſtines, and are diſtinguiſhed only by their breadth. Taken both together, they form a kind of ſpiral roll, more or leſs plaited in its circumference. The firſt portion has retained the name of *meſentery;* the other is termed *meſocolon* from its more peculiar attachment to the colon.

The laminæ of the meſentery contain a great number of glands which lie in their intervening cellular ſubſtance. Theſe glands are ſomething of the figure of little beans, ſomewhat flatted.

Between the ſame laminæ we find numerous blood-veſſels, many nervous filaments, and an infinite number of ſmall lymphatic veſſels which run from gland to gland.—The latter are extremely thin and tranſparent, and furniſhed on the inſide with numerous valves, which appear on the outſide like little ſmall knots very near each other. They go out from each gland by ramifications, as by ſo many roots; and having formed a ſmall trunk, they are again divided, and enter ſome neighbouring gland by the ſame kind of ramifications by which they went out from the former.

Theſe *lymphatic veſſels* are ſo called, becauſe for the moſt part they contain a very clear, limpid, though mucilaginous ſerum, called *lympha* by anatomiſts. But as they have likewiſe been obſerved to be filled with a white milky fluid, called *chyle*, they have been called *vaſa chylifera*, or *venæ lacteæ*. They have the name of *veins*, becauſe their valves are diſpoſed as thoſe of the ordinary blood veins, and becauſe the fluid which they contain runs from ſmaller into larger tubes. But more will be ſaid on this ſubject when we ſpeak of the abſorbent ſyſtem.

10. The *inteſtines* have the ſame *coats* with the ſtomach; the fibres of their middle or muſcular coat are circular, or ſpiral, and longitudinal; of the latter indeed but very few. The antagoniſts to theſe muſcular fibres of the ſtomach and guts, are formed by their contents, which are preſſed from one place to another, and muſcles of the abdomen, for theſe alſo preſſing upon them alter their form into one leſs capacious, which neceſſarily extends their circular fibres. The large inteſtines have three membranes or ligaments on the outſide, running their whole length, and ſupporting the ſacculi, into which thoſe inteſtines are divided. The leſſer inteſtines have, at very ſmall diſtances, ſemilunar valves placed oppoſite to the interſtices of each other, to prevent the aliment from paſſing too ſpeedily through them; and the better to anſwer that end, they are larger and more numerous near the ſtomach, where the food is thinner, than they are towards the colon, where the food is continually made thicker in its progreſs, by a diſcharge of part of the chyle. This contrivance, ſo neceſſary to men, becauſe of their erect poſture, when they are obliged, by ſickneſs or accidents, to lie in an horizontal poſture, becomes a great inconvenience, and calls for the help of clyſters and purges. But brutes have not theſe valves, becauſe they are not convenient in an horizontal poſture. At the entrance of the ilium into the colon are two very large valves, which effectually hinder the regreſs of the fæces into the ilium. But clyſters have been frequently known to paſs them, and be vomited up; though it is doubtful whether the excrement that is ſometimes vomited up, is ſuch as had not paſſed into the large inteſtines. The *valvulæ conniventes* in the colon are placed oppoſite, yet not in the ſame plane, to each other, and make, with their anterior edges, an equilateral triangle; but as the gut approaches the anus, they become leſs remarkable, and fewer in number. All the inteſtines have in their inner membrane an almoſt infinite number of very ſmall glands. Theſe glands will, eſpecially ſome of them in the larger guts, appear to the naked eye when they are diſeaſed. They have been called *glandulæ pierianæ*.—The length of all the inteſtines put together, is to that of the body as five to one in a middle-ſized man; in taller men the proportion is uſually leſs, and in ſhort men greater.

Sect. VI. *Of the Liver, Gall-bladder, Pancreas, Spleen, and Diaphragm.*

1. The *liver* is the largeſt gland in the body; and its colour is that of a duſky or brown red. It is ſituated immediately under the diaphragm in the right hypochondrium. Its exterior ſide is convex, and interior concave. Backward towards the ribs it is thick, and thin on its fore-part, where it covers the upper ſide of the ſtomach, and ſome of the inteſtines. The upper-ſide of it is connected with the diaphragm, being alſo tied to that and the ſternum by a thin ligament, which is deſcribed commonly as two; the upper portion being named *ſuſpenſorium*, and the anterior *latum:* but either of theſe names is ſufficient for the whole. It is alſo tied to the navel by a round ligament called *teres* or *umbilicale*, which is merely the umbilical vein of the fœtus condenſed into a ligament; and which is inſerted into the liver at a ſmall fiſſure in its lower edge. The ligamentum latum, or ſuſpenſorium, ſuſtains the liver in an erect poſture, or rather fixes it in its ſituation, while it is ſupported by the other viſcera, they being compreſſed by the abdominal muſcles. When we are placed in an horizontal poſture, the teres prevents it from preſſing on the diaphragm; and in lying on the back, they both together ſuſpend it, that it may not compreſs and obſtruct the aſcending vena cava. It is ſupplied with blood by the branches of the celiac and meſenteric arteries, in the liver called arteriæ hepaticæ; but its blood veſſels, that compoſe it as a gland, are the branches of the vena portæ, which enters the liver, and diſtributes its blood like an artery, to have the bile ſecreted from it; and the branches of the cava in the liver, which return the redundant blood into the cava aſcendens. It has alſo ſeveral branches of nerves, and a great number of lymphatics. Thoſe quadrupeds that have a great deal of motion in their backs, have their livers divided into many diſtinct lobules; which, by yielding to each other, obey thoſe motions, without any danger of laceration.

2. The *gall-bladder* is a receptacle for the bile, ſeated upon the inferior and concave ſurface of the liver. It is ſhaped like a pear, and compoſed of one denſe and ſomewhat muſcular coat, which is covered with peritoneum like that of the liver. It is alſo lined with another membrane that cannot eaſily be ſeparated, making three coats in the whole. From the gall-bladder towards the duodenum runs a duct called *cyſticus*; and from the liver to this duct one called *hepaticus*, which carries off the gall this way, when the gall-bladder is full. The ductus cyſticus and hepaticus being then united and forming one common channel, commence *ductus communis choledochus*, which enters the duodenum obliquely about four inches below its commencement. The orifice of this duct in the gut is ſomewhat eminent, elevated above the ſurface, but has no caruncle, as has been deſcribed by ſome. As the liver, from its ſituation in the ſame cavity with the ſtomach, will be moſt preſſed, and conſequently ſeparate moſt gall when the ſtomach is fulleſt, namely, the time when it is moſt wanted; ſo the gall-bladder, lying next the duodenum, will have its fluid preſſed out by the aliment paſſing through that gut, and conſequently at a right

time and in due proportion; becauſe the greater that quantity of aliment is, the greater will be the compreſſion; and *vice verſa*. A chemical analyſis of the bile and experiments of its mixture with various ſubſtances, demonſtrate, that it contains a large portion of water, and a conſiderable quantity of inflammable oil, which appears very evidently in gall ſtones. The bile, therefore, is a natural ſoap; but of that ſort which is made from a volatile ſaline lixivium, mixed with oil and water. This, therefore, being intermixed with the aliment, reduced to a pulp, and ſlowly expreſſed from the ſtomach by the periſtaltic force of the duodenum and preſſure of the abdominal muſcles, incorporates them all together; and the acid or aceſcent qualities of the food are in ſome meaſure thus corrected. The curd of milk is alſo diſſolved by it into a liquid, and the whole maſs of aliment inclined more to a putrid alkaleſcent diſpoſition. It diſſolves the oily matters, ſo that they may freely incorporate with the watery parts, and make up an uniform maſs of chyle to enter the lacteals; the ſurrounding mucus in the inteſtines is thereby abſterged and attenuated, and the periſtaltic motion is excited by its acrimony; all which offices are confirmed, by obſerving the contrary effects from a want or defect of this neceſſary fluid. The bile deſcends ſlowly along with the alimentary maſs; and having ſpent its force, moſt of it is afterwards excluded with the fæces; but probably ſome of the more ſubtile, watery, and leſs bitter parts, are again taken up by the abſorbents. See Pl. 15.

3. The *pancreas*, or *ſweet-bread* as it is vulgarly called, is a large gland of the ſalivary kind, lying acroſs the upper and back part of the abdomen, near the duodenum. It has a ſhort excretory duct, about half as large as a crow quill, though it is commonly painted as large as the ductus communis choledochus. It always enters the duodenum together with the bile duct, but in dogs at ſome diſtance from it; and, for the moſt part, in two ducts at a diſtance from one another. The fluids of this gland, together with the bile, help to complete the digeſtion of the aliment, and render it fit to be taken up by the lacteal veſſels. Winſlow has alſo obſerved, that, where the great extremity of the pancreas is connected to the curvature of the duodenum, it ſends down an elongation, which adheres very cloſely to the following portion of the inteſtine; and, upon a careful examination, he found a particular pancreatic duct ramified like the large one, which ran toward and interſected this great duct, into the extremity of which it opened after having perforated the duodenum. This portion he termed *pancreas minus*. It ſometimes opens ſeparately into the duodenum, in which we likewiſe obſerve ſeveral ſmall holes round the ductus choledochus, which anſwer to the pancreas.

4. *Lien*, the *ſpleen*, is ſeated in the left hypochondrium, immediately under the diaphragm, and above the kidney, between the ſtomach and the ribs. It is ſupported by the ſubcontained parts, and fixed to its place by an adheſion to the peritoneum and diaphragm. It alſo furniſhes a point of attachment to the omentum, as has been already obſerved. The figure of it is a ſort of depreſſed oval, near twice as long as broad, and almoſt twice as broad as thick. Sometimes it is divided into lobules, but for the moſt part has only one or two ſmall fiſſures on its edge, and ſometimes none. In its colour it reſembles caſt iron. The inner texture, in brutes, is veſicular, like the penis, and contains grumous blood, and alſo ſmall bodies like glands; but Ruyſch denies that the human ſpleen is of the ſame texture. The ſpleen has often been removed from dogs without any remarkable inconvenience to them. Mr. Cheſelden ſpeaks of having ſeen in the human ſubject, two, three, and in one inſtance four ſpleens. Some of theſe, though ſmall, differed from each other in ſize; others were nearly equal in bulk, but the whole together in any one of theſe ſubjects would not amount in ſize to more than a ſpleen of ordinary dimenſions. The want of an excretory duct to this viſcus has occaſioned the uſe of it to be doubtful and controverted. Anatomiſts indeed have gone no further than to conjecture, that it may prepare the blood for ſupplying a ſort of watery juice (probably of a ſubalkaline nature and rendered ſomewhat ſharp by the remora of the blood) to the bile.

5. The *diaphragm*, or *midriff*, is compoſed of muſcular fibres; and on this account ſyſtematic writers uſually place it among the muſcles. Its middle part is tendinous, and it is covered by the pleura above, and by the peritonæum below. It ſeems to have been improperly named *ſeptum tranſverſum*, as it does not make a plane tranſverſe diviſion of the two cavities, but forms a kind of vault, the fore-part of which is attached to the ſternum. Laterally it is fixed to the laſt of the true ribs, and to all the falſe ribs; and its lower and poſterior part is attached to the vertebræ lumborum, where it may be ſaid to be divided into two portions or crura. The principal arteries of the diaphragm are derived from the aorta, and its veins paſs into the vena cava. Its nerves are chiefly derived from the cervical pairs. It affords a paſſage to the vena cava through its tendinous part, and to the œſophagus through its fleſhy portion. The aorta paſſes down behind it, between its crura.

The diaphragm not only ſerves to divide the thorax from the abdomen, but by its muſcular ſtructure is rendered one of the chief agents in reſpiration. When its fibres contract, its convex ſide, which is turned towards the thorax, becomes gradually flat, and by increaſing the cavity of the breaſt, affords room for a complete dilatation of the lungs, by means of the air which is then drawn into them by the act of inſpiration. The fibres of the diaphragm then relax; and as it reſumes its former ſtate, the cavity of the thorax becomes gradually diminiſhed, and the air is driven out again from the lungs by a motion contrary to the former one, called *exſpiration*.

It is in ſome meaſure, by means of the diaphragm, that we void the fæces at the anus, and empty the urinary bladder. Beſides theſe offices, the acts of coughing, ſneezing, ſpeaking, laughing, gaping, and ſighing, could not take place without its aſſiſtance; and the gentle preſſure which all the abdominal viſcera receive from its conſtant and regular motion, cannot fail to aſſiſt in the performance of the ſeveral functions which were aſcribed to thoſe viſcera.

Sect. VII. *Of the Pleura, Mediaſtinum, Trachea, Lungs, Pericardium, and Heart.*

1. *Pleura* is a fine membrane which lines the whole cavity of the thorax, and envelops the whole of its contents, in the ſame way as the peritoneum incloſes the contents of the abdomen. An inflammation of this membrane conſtitutes the diſeaſe called pleuriſy.

2. The *mediaſtinum* is formed by the union of the two lateral portions of the pleura, and divides the thorax lengthways into two cavities, one for each lobe of the lungs. It does not however divide the thorax exactly in the middle, but towards the left ſide, and is ſo diſpoſed, that the two cavities, into which it divides the thorax, do not end toward this membrane in an angle, but a ſegment of a circle. Its uſe is to prevent one lobe of the lungs from preſſing on the other, as in lying on one ſide the uppermoſt might do. But it is of ſtill more importance in preventing the diſorders of one lobe of the lungs from affecting the other, for if the functions of both lobes were ſuſpended by any diſeaſe at the ſame time death muſt enſue.

3. The *trachea*, or *windpipe*, is a cartilaginous and membranous canal, through which the air paſſes into the lungs. Its upper part, which is called the *larynx*, is compoſed of five cartilages. The uppermoſt of theſe cartilages is placed over the

glottis or mouth of the larynx, and is called *epiglottis*, which performs the office of closing the passage to the lungs in the act of swallowing. At the sides of the glottis are placed the two arytenoide cartilages, which are of a very complex figure, not easy to be described. The anterior and larger part of the larynx is made up of two cartilages, one of which is called *thyroides* or *scutiformis*, from its being shaped like a buckler; and the other *cricoides* or *annularis*, from its resembling a ring. Both these cartilages may be felt immediately under the skin, at the fore-part of the throat; where the thyroides, by its convexity, forms an eminence called *Pomum Adami*, which is usually more considerable in the male than in the female subject.

All these cartilages are united to each other by means of very elastic, ligamentous fibres; and are enabled, by the assistance of their several muscles, to dilate or contract the passage of the larynx, and to perform that variety of motion which seems to point out the larynx as the principal organ of the voice; for when the air passes out through a wound in the trachea, it produces no sound.

These cartilages are moistened by a mucus, which seems to be secreted by minute glands situated near them. The upper part of the trachea is covered anteriorly and laterally by a considerable body, which is supposed to be of a glandular structure, and from its situation near the thyroid cartilage is called the *thyroid gland*; though its excretory duct has not yet been discovered, or its real use ascertained.

The glottis is interiorly covered by a very fine membrane, which is moistened by a constant supply of a watery fluid. From the larynx, the canal begins to take the name of *trachea* or *aspera arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tubes. Each of these bronchi ramifies through the substance of that lobe of the lungs, to which it is distributed, by an infinite number of branches, which are formed of cartilages separated from each other like those of the trachea, by an intervening membranous and ligamentary substance. Each of these cartilages is of an angular figure; and as they become gradually less and less in their diameter, the lower ones are in some measure received into those above them, when the lungs, after being inflated, gradually collapse by the air being pushed out from them in exspiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at last become invisible.

The trachea is furnished with fleshy or muscular fibres; some of which pass through its whole extent longitudinally, while the others are carried round it in a circular direction; so that by the contraction or relaxation of these fibres, it is enabled to shorten or lengthen itself, and likewise to dilate or contract the diameter of its passage.

The trachea and its branches, in all their ramifications, are furnished with a great number of small glands which are lodged in their cellular substance, and discharge a mucous fluid on the inner surface of these tubes.

The cartilages of the trachea, by keeping it constantly open, afford a free passage to the air, which we are obliged to be incessantly respiring; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air in a greater or less quantity, and with more or less velocity, as may be required in singing or in declamation. This membranous structure of the trachea posteriorly, seems likewise to assist in the descent of the food, by preventing that impediment to its passage down the œsophagus, which might be expected if the cartilages were complete rings.

The trachea receives its arteries from the carotid and subclavian arteries, and its veins pass into the jugulars. Its nerves arise from the recurrent branch of the eighth pair, and from the cervical plexus.

4. The *lungs* are composed of two lobes, one seated on each side of the mediastinum. Each of these lobes is subdivided into two or three lobules, a kind of structure particularly distinguishable in such animals as have much motion in their backs, and for the same end that the liver is in the same animals. Their substance is composed of very small cells, which are the extremities of the *trachea arteria* or *bronchos*. The figure of these cells is irregular; yet they are fitted to each other so as to have common sides, and leave no void space. Within these cells there is secreted a quantity of mucus, and also a large quantity of the materia perspirabilis, which at once keeps the lungs from being dried by the air, and produces that necessary discharge from the blood which also takes place by perspiration through the skin. Throughout the whole texture of these cells are distributed the branches of the pulmonary artery and vein, which ramify to an infinite degree of minuteness, and supply the last-mentioned secretions.

The pulmonary artery and vein, however, are not intended for the nourishment of the lungs; but the blood in its passage through them, acquires certain essential properties from the action of the air, which it had lost in circulating through the rest of the body.

Respiration constitutes one of those functions which are properly termed *vital*, as being essential to life; for to live and to breathe are in fact synonymous terms. It consists in an alternate contraction and dilatation of the thorax, by first inspiring air into the lungs, and then expelling it from them in exspiration. It will perhaps be easy to distinguish and point out the several phenomena of respiration; but to explain their physical cause will be attended with difficulty: for it will naturally be enquired, how the lungs, when emptied of the air, and contracted by exspiration, become again inflated, they themselves being perfectly passive? How the ribs are elevated in opposition to their own natural situation? and why the diaphragm is contracted downwards towards the abdomen? Were we to assert that the air, by forcing its way into the cavity of the lungs, dilated them, and consequently elevated the ribs, and pressed down the diaphragm, we should speak erroneously. What induces the first inspiration, it is not easy to ascertain; but after an animal has once respired, it would seem likely that the blood, after exspiration, finding its passage through the lungs obstructed, becomes a stimulus, which induces the intercostal muscles and the diaphragm to contract, and enlarge the cavity of the thorax, in consequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air rushes into the lungs; every branch of the bronchial tubes, and all the cellular spaces into which they open, become fully dilated; and the pulmonary vessels being equally distended, the blood flows through them with ease. But as the stimulus which first occasioned this dilatation ceases to operate, the muscles gradually contract, the diaphragm rises upwards again, and diminishes the cavity of the chest; the ribs return to their former state; and as the air passes out in exspiration, the lungs gradually collapse, and a resistance to the passage of the blood again takes place. But the heart continuing to receive and expel the blood, the pulmonary artery begins again to be distended, the stimulus is renewed, and the same process is repeated, and continues to be repeated, in a regular succession during life.

Till within these few years physiologists were entirely ignorant of the use of respiration. It was at length discovered in part by the illustrious Dr. Priestley, who found, that the air exspired by animals was phlogisticated; and that the air was fitter for respiration, or for supporting animal life, in proportion

as it was freer from the phlogiſtic principle. It had long been obſerved, that the blood in paſſing through the lungs became more florid. He therefore ſuſpected, that it was owing to its having imparted phlogiſton to the air: and he ſatisfied himſelf of the truth of this idea by experiments, which ſhowed, that the craſſamentum of extravaſated blood, phlogiſticated air in proportion as it loſt its dark colour. He farther found, that blood thus reddened had a ſtrong attraction for phlogiſton; inſomuch, that it was capable of taking it from phlogiſticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial ſyſtem, imbibes a conſiderable quantity of phlogiſton, which is diſcharged from it to the air in the lungs. This curious and important ſubject has ſince been farther elucidated by the experiments of Dr. Crawford and other ingenious phyſiologiſts.

4. The *pericardium* is a ſtrong membranous capſula, which incloſes the heart in a two-fold manner; for, after ſurrounding the heart, it is itſelf ſurrounded by a reflexion of its own ſubſtance. It is made up of three laminæ, the middle and chief of which is compoſed of very fine tendinous filaments, cloſely interwoven, and croſſing each other in different directions. The internal lamina ſeems to be a continuation of the outer coat of the heart, auricles, and great veſſels.

The uſes of the pericardium are, to keep the heart in its place without interrupting its office; to keep it from having any injurious friction with the lungs; and to contain a liquor to lubricate its own ſurface and that of the heart, ſo as to prevent the friction which would otherwiſe happen between both.

5. The *heart* is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left. Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*. Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres ſeem to originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner.

The heart includes two cavities or *ventricles*, which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left*, *ventricle*. The heart is exteriorly covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres paſſing in different directions; ſome longitudinally from the baſis to the apex; others in an oblique or ſpiral courſe; and a third ſort placed in a tranſverſe direction.

Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy *columnæ* in the two cavities, and are attached to the valves of the auricles. That the uſe of theſe and the other valves of the heart may be underſtood, it muſt be obſerved, that four large veſſels paſs out from the baſis of the heart, viz. two arteries and two veins; and that each of theſe veſſels is furniſhed with a thin membranous production, which is attached all round to the borders of their ſeveral orifices, from whence hanging looſely down they appear to be divided into two or three diſtinct portions. But as their uſes in the arteries and veins are different, ſo are they differently diſpoſed. Thoſe of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return; and, on the contrary, the valves of the veins are conſtructed ſo as to allow the blood only to paſs into the heart. In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the artery; and their convex ſurfaces, which mutually meet together, being placed towards the ventricle, only permit the blood to paſs one way, which is into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; and from their figure they are called *valvulæ ſemilunares*. The communication between the two great veins and the ventricles is by means of the two appendages or auricles into which the blood is diſcharged; ſo that the other valves which may be ſaid to belong to the veins are placed in each ventricle, where the auricle opens into it. The valves in the right ventricle are uſually three in number, and are named *valvulæ tricuſpides*; but in the left ventricle we commonly obſerve only two, and theſe are the *valvulæ mitrales*. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the *tricuſpides* and the *mitrales* are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy *columnæ*.

By the contraction of either ventricle the blood is driven into the artery which communicates with that ventricle; and theſe tendinous ſtrings being gradually relaxed as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery. The right ventricle is not quite ſo long, though ſomewhat larger than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

The *auricles* are two muſcular bags, ſituated at the baſis of the heart, at the ſides of each other; and, correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into *right* and *left*. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their appellation of auricles.

From the par vagum and intercoſtals the heart is ſupplied with nerves. The arteries which are diſtributed to it, ariſe from the aorta, and are called *coronary arteries*. From theſe the blood is returned into the auricles by the *coronary veins*.

The heart, at the time it contracts, drives the blood from its ventricles into the arteries; and the arteries being thus filled and diſtended, are naturally inclined to contract the moment the heart begins to dilate, and ceaſes to ſupply them with blood. Theſe alternate motions of contraction and dilatation of the heart and arteries, are diſtinguiſhed by the names of *ſyſtole* and *diaſtole*. When the heart is in a ſtate of contraction or ſyſtole, the arteries are at that inſtant diſtended with blood, and in their diaſtole; and it is in this ſtate we feel their pulſatory motion, which we call the *pulſe*. When the heart dilates, and the arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its ſyſtole, the blood cannot paſs from the veins into the ventricles, but is detained in the auricles, which are two reſervoirs formed for this uſe, till the diaſtole, or dilatation of the heart, takes place; and then the diſtended auricles contract, and drive the blood into the ventricles: ſo that the auricles have an alternate ſyſtole and diaſtole as well as the heart.

Although both the ventricles of the heart contract at the ſame time, yet the blood paſſes from one to the other. In the ſame moment, for inſtance, that the left ventricle drives the blood into the aorta, the right ventricle impels it into the pul-

monary artery, which is distributed through all the substance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary vein, at the same time that the blood is returned by the cavæ, into the right ventricle, from all the other parts of the body. This seems to be the mode of action of the heart and its vessels; but as to the cause of this action, anatomists are by no means agreed.

Sect. VIII. *Of the Mammæ.*

1. The name of *mammæ*, or *breasts*, is given to two eminences, more or less round, situated in the anterior and a little toward the lateral parts of the thorax, their centre or middle part lying almost opposite to the bony extremity of the sixth true rib on each side. Their size and figure vary in the different sexes and different ages.

In children of both sexes, and in males of all ages, they are commonly no more than cutaneous tubercles, or soft verrucæ of a reddish colour, called *papillæ* or *nipples*; each of them being surrounded by a small, thin, and pretty broad circle or disk, more or less of a brownish colour, and an uneven surface, termed *areola*.

In females come to the age of puberty, which is sometimes sooner, sometimes later, a third part is joined to the two former, which is a convex protuberance, more or less round, of about five or six fingers in breadth; the papilla and areola being situated near the middle of its convex surface. This is what is properly called *mamma*; and it may be termed the *body of the breast*, when compared with the other two parts. It increases with age, and is very large in women with child, and in those that give suck. In old age it decreases, and becomes flabby, losing its natural consistence and solidity.

2. The *body of the mamma* is partly glandular, and partly consists of fat; or it is a gland of the conglomerate kind, surrounded on all sides with cellular substance and fat. The glandular part is divided into little masses, separated also by fat, and again subdivided into small granulæ, from which the lactiferous ducts arise. The cellulous pelliculæ support a great many blood-vessels, lymphatics, and serous or lactiferous ducts, together with the small glandular moleculæ already mentioned; all of them being closely surrounded by two membranes continued from the pelliculæ.

The innermost of these two membranes, which is in a manner the basis of the body of the mamma, is thick, and almost flat, adhering to the musculus pectoralis major. The second, or external membrane, is thinner, forming a particular integument for the body of the mamma, more or less convex, and adhering closely to the skin.

The corpus adiposum of the mamma, in particular, is a spongy cluster, more or less interlarded with fat, or a collection of membranous pelliculæ, which, by the particular disposition of their outer sides, form a kind of membrane in shape of a bag, in which all the rest of the corpus adiposum is contained. The anterior or outer portion of this bag, or that which touches the skin, is very thin; but that side next the pectoralis major is thick.

3. *Ductus lactiferi.* The glandular body contains a white mass, which is merely a collection of membranous ducts, narrow at their origin, broad in the middle, and which contract again as they approach the papilla, near which they were supposed by some to form a circle of communication; but, from the observations of the latest anatomists, the ducts have little or no communication with each other at this place. They are named *ductus lactiferi*; and, in their course, are accompanied by a ligamentous elastic substance, which terminates with them in the nipple. Both this substance, and the ducts it contains, are capable of considerable extension and contraction; but, in their natural state, they are moderately corrugated, so as to prevent an involuntary flow of milk, unless the distending force be very great, from the accumulation of too great a quantity.

4. *Areola.* The coloured circle or disk, already mentioned, is formed by the skin; the inner surface of which sustains a great number of small glandular moleculæ, of that kind which Morgagni calls *glandulæ sebaceæ*. They appear very plainly all over the areola, even on the outside, where they form little flat heights or eminences, at different distances, quite round the circle.

These tubercles are perforated by small holes, through which a kind of sebaceous matter, more or less liquid, is poured out, to defend the areola and nipple. Sometimes one or more of the lactiferous ducts have been found to terminate upon the surface of the areola. Hence Morgagni was led to think that the glands there are of the lactiferous kind.

5. *Papilla.* The tubercle which lies in the centre of the areola, is termed *papilla* or the *nipple*. It is of different sizes in different ages and constitutions, and in the different conditions of females in particular. In women with child, or who give suck, it is large, and generally longer or higher than it is thick or broad; and when it happens to be short it causes great uneasiness to the child.

The texture of the nipple is spongy, elastic, and liable to divers changes of consistence, being sometimes harder, sometimes more flaccid. It seems to consist chiefly of ligamentary fasciculi; the extremities of which form the basis and apex of the nipple. These fasciculi appear to be gently folded, or curled, during their whole length; and if, by drawing the fibres out, these folds be destroyed, they return again as soon as that action ceases.

Between these spongy and elastic fasciculi, from twelve to fifteen or twenty particular tubes are lodged at small distances from each other, and all in the same direction. These tubes go to the basis of the papilla, and run through the apex by the same number of almost imperceptible holes or orifices; and as they are closely united to the elastic fasciculi, they are folded in the same manner with them.

The body of the papilla is covered by a thin cutaneous production, and by the epidermis. Its outer surface is uneven, being full of small tubercles and wrinkles; among which, those near the circumference of the nipple seem to have a transverse or annular disposition, which, however, is not uniform.

This disposition or direction seems to be owing to the elastic folds already mentioned: and, from this simple structure, it is easy to explain how infants, in sucking the nipple, and women in drawing the teats of cows, bring out the milk. For the excretory tubes, being wrinkled in the same manner as the fasciculi, do, by these wrinkles or folds, as by so many valves, hinder the milk contained in the ducts from flowing out; but, when the nipple is drawn and elongated, the tubes lose their folds, and the passage becomes straight. Besides this, when they are drawn with a considerable force, the whole body of the mamma is increased in length, and contracted in breadth, and thereby the milk is pressed into the open tubes; and thus, by barely pressing the body of the breast, the milk may be forced toward the nipple, and even through the tubes. Those who understand the principles of the air-pump will more readily conceive the manner in which the child draws out the milk.

6. *Arteries, veins, nerves,* &c. The arteries and veins, distributed through the mammæ, are ramifications of the arteriæ and venæ mammariæ; of which one kind comes from the subclaviæ, and are named *mammariæ internæ*; the others, from the axillares, called *mammariæ externæ*.

These vessels communicate with each other, with those near

them, and with the vaſa epigaſtrica. The nerves come chiefly from the coſtales, and, by means of theſe, communicate with the great nervi ſympathetici. The mamma has numerous lymphatic veſſels, which Wriſberg obſerves run in two ſets: moſt of theſe veſſels gradually collect into a great plexus, which go to the axillary glands; but others enter the thorax, through the interſtices of the ribs, near the ſternum, and communicate with the glands behind the mammary veſſels.

Sect. IX. *Of the Arteries and Veins.*

From the right ventricle of the heart ariſes the pulmonary artery, which ſoon divides into two branches, one to each lobe of the lungs. They then ſubdivide into ſmaller and ſmaller branches, until they are diſtributed through every part of the lungs. From the extreme branches of the pulmonary artery ariſe the ſmall branches of the pulmonary veins; which, as they approach the left auricle of the heart, unite in a manner ſimilar to the ramifications of the pulmonary artery in its egreſs from the heart; except that the veins enter the muſcular appendix of the left auricle in ſeveral branches, and the blood being brought back from the lungs by theſe veſſels to the left auricle and ventricle of the heart, is from the left ventricle of the heart thrown into the aorta.

1. The *aorta*, or *great artery*, ariſes from the left ventricle of the heart, and deals out branches to every part of the body. The firſt part of this veſſel is called aorta aſcendens. It paſſes over the left pulmonary artery, and veins, and branch of the trachea, and being reflected under the left lobe of the lungs, it commences aorta deſcendens; which name it keeps through the thorax and abdomen, where it paſſes on the left ſide of the ſpine, till its diviſion into iliac arteries between the third and fourth vertebræ of the loins.

2. From beneath two of the ſemilunar valves of the aorta, and ere it leaves the heart, ariſe two branches, which are beſtowed upon the heart itſelf, as we juſt now obſerved, and which are called *coronariæ cordis*. From the curved part of the aorta, which is about two or three inches above the heart, ariſe the ſubclavian and carotid arteries; the right ſubclavian and carotid in one trunk, but the left ſingle.

3. The *carotid* arteries run on both ſides the larynx to the ſixth foramina of the ſcull, through which they enter and proceed to the brain; but as they paſs through the neck, they detach branches to all the adjoining parts. Theſe branches are called by the names of the parts they are beſtowed upon; as, laryngeæ, thyroidæ, pharyngeæ, linguales, temporales, occipitales, faciales, &c. but juſt before they enter the ſixth foramina of the ſcull, they each ſend a ſmall branch through the fifth foramina to that part of the dura mater which contains the cerebrum. It is theſe arteries which make thoſe impreſſions that are conſtantly obſerved on the inſide of the oſſa bregmatis: theſe branches, however, often ariſe from the temporal arteries. The internal carotids ſend two branches to the back part of the noſe, and ſeveral branches through the firſt and ſecond foramina of the ſcull to the face and parts contained within the orbits of the eyes, and then piercing the dura mater, they each divide into two branches, one of which they ſend under the falx of the dura mater, between the two hemiſpheres of the brain, and the other between the anterior and poſterior lobes. Theſe branches take a great many turns, and divide into very ſmall branches in the pia mater before they enter the brain, as if the pulſe of larger arteries would make too violent an impreſſion on ſo tender and delicate a part.

4. But beſides the two carotids, the brain has two more arteries, called *cervicales*, which ariſe from the ſubclavian arteries, and aſcend to the head through the foramina, in the tranſverſe proceſſes of the cervical vertebræ, and into the ſcull through the tenth or great foramen. Theſe two arteries uniting ſoon after their entrance, ſend branches to the cerebellum, and then paſſing forwards, divide and communicate with the carotids; and the carotid arteries anaſtomoſing with each other, there is an entire communication between them all; and theſe interpoſing branches are ſo large that every one of theſe four great veſſels, with all their branches, may be eaſily filled with the common wax injections through any one of them.

5. The *ſubclavian arteries* are each continued to the cubit in one trunk, which is called *axillaris* as it paſſes the arm-pits, and *humeralis* as it paſſes by the inſide of the os humeri, between the muſcles that bend and extend the elbow. From the ſubclavians within the breaſt ariſe the *arteriæ mammariæ*, which run on the inſide of the ſternum, and lower than the cartilago enſiformis. Soon after the arteria humeralis has paſſed the joint of the cubit, it divides into two branches, called *cubitalis ſuperior*, and *cubitalis inferior*; which latter ſoon ſends off a branch called *cubitalis media*, which is beſtowed upon the muſcles ſeated about the elbow. The cubitalis ſuperior paſſes near the radius, and round the root of the thumb, and gives one branch to the back of the hand, and two to the thumb; one to the firſt finger, and a branch to communicate with the cubitalis inferior. The cubitalis inferior paſſes near the ulna to the palm of the hand, where it takes a turn, and ſends one branch to the outſide of the little finger; another between that and the next finger, dividing to both; another in the ſame manner to the two middle fingers; and another to the two fore-fingers. Theſe branches which are beſtowed on the fingers run one on each ſide of each finger internally to the top, where they have ſmall communications, and very often there is a branch of communication between the humeral and inferior cubital arteries. This communicant branch is ſometimes very large, and liable to be pricked in opening the baſilic vein, immediately under which this branch almoſt always lies. See Pl. 12. Arteries.

6. From the deſcending aorta on each ſide is ſent a branch under every rib, called *intercoſtalis*, and about the fourth vertebra of the back it ſends off two branches to the lungs, called *bronchiales*, which are ſometimes both given off from the aorta, ſometimes one of them from the intercoſtal of the fourth rib on the right ſide. As the aorta paſſes under the diaphragm, it ſends two branches into the diaphragm, called *arteriæ phrenicæ*, which ſometimes riſe in one trunk from the aorta, and ſometimes from the cœliac; but oftener the right from the aorta, and the left from the cœliac. Immediately below the diaphragm ariſes the *cœliac artery* from the aorta. It ſoon divides into ſeveral branches, which are beſtowed upon the liver, pancreas, ſpleen, ſtomach, omentum, and duodenum. Theſe branches are named from the parts they are beſtowed on, except two that are ſent to the ſtomach, and which are called *coronaria ſuperior* and *inferior*, and the branch running on the duodenum, which is named *inteſtinalis*. At a very ſmall diſtance below the arteria cœliaca from the aorta, ariſes the meſenterica ſuperior, whoſe branches are diſtributed upon the whole of the inteſtinum jejunum and ilium, part of the colon, and ſometimes one branch upon the liver. A little lower than the ſuperior meſenteric artery ariſe the *emulgents*, which are the arteries of the kidneys; and a little lower than the emulgents, anterior to the aorta, ariſe the *arteriæ ſpermaticæ*, which are diſtributed to the genital parts in men. Laterally and lower down the aorta ſends branches to the loins, called *lumbales*; and one forward, to the lower part of the colon and the rectum, called *meſenterica inferior*. Between the arteria cœliaca, meſenterica ſuperior and inferior, and the branches of each near the inteſtines, there are large communicant branches to convey the blood from one to another, when they are either compreſſed by excrements, or from any other cauſe.

7. As ſoon as the aorta divides upon the loins, it ſends off an

artery into the pelvis upon the os ſacrum, called *arteria ſacra*; and the branches into which the aorta divides are called *iliacæ*. Theſe again at about the diſtance of two inches divide into external and internal. The iliacæ internæ firſt ſend off the the umbilical arteries, which are obliterated in adult bodies, except at their beginnings, which are kept open for the collateral branches on each ſide, one to the bladder, and one to the penis in men, and in women the uterus. The reſt of theſe branches are beſtowed upon the glutæi muſcles and upper part of the thighs. The iliacæ externæ run over the oſſa pubis into the thighs; and as they paſs out of the abdomen they ſend off branches, called *epigaſtricæ*, to the fore part of the integuments of the abdomen under the recti muſcles. The epigaſtric arteries ſend each a branch into the pelvis, and through the foramina of the oſſa innominata to the muſcles thereabouts. As ſoon as the iliac artery has paſſed out of the abdomen into the groin it is called *inguinalis*, and in the thigh *cruralis*. Here it ſends a large branch to the back-part of the thigh; but the great trunk is continued internally between the flexors and extenſors of the thigh, and paſſing through the inſertion of the triceps muſcle into the ham, it is there called *poplitea*. It then, below the joint, divides into two branches, one of which is called *tibialis antica*, which paſſes between the tibia and fibula down the fore-part of the leg, and is beſtowed upon the great toe, and one branch to the next toe to the great one, and another between theſe toes, to communicate with the *tibialis poſtica*; which artery, ſoon after it is divided from the antica, ſends off the *tibialis media*, which is beſtowed upon the muſcles of the leg. The tibialis poſtica goes to the bottom of the foot and all the leſſer toes. The tibialis antica is diſpoſed like the cubitalis ſuperior; the poſtica like the cubitalis inferior; and the mediæ in each have alſo like uſes. Theſe arteries are uniform in moſt bodies, but the leſſer branches are diſtributed like the branches of trees, in ſo different a manner in one body from another, that it is highly probable no two bodies are exactly alike, nor even the two ſides in any one ſubject.

8. The *veins* ariſe from the extremities of the arteries, and compoſe trunks which accompany the arteries in almoſt every part of the body, and bear the ſame names. The veins of the brain unload themſelves into the ſinuſes, and the ſinuſes into the internal jugulars and cervicals; and the internal jugulars and cervicals into the ſubclavians, which joining, make the cava deſcendens. The internal jugulars are ſeated near the carotid arteries, and receive the blood from all the parts which are ſupplied by the carotids, except the hairy ſcalp and part of the neck, whoſe veins enter into the external jugulars, which run immediately under the muſculus quadratus genæ, often two on each ſide. The *cervical veins* deſcend, two through the foramina in the tranſverſe proceſſes of the cervical vertebræ, and two through the great foramen of the ſpine, and one on each ſide the ſpinal marrow. Theſe join at the loweſt vertebra of the neck, and then empty into the ſubclavians, and at the interſtices of all the vertebræ communicate with each other.

The veins of the extremities are more than double the number of the arteries, there being one placed on each ſide of each artery, even to the ſmalleſt branches that we can trace, beſides the veins which lie immediately under the ſkin. Thoſe which accompany the arteries, have the ſame names with the arteries. Thoſe which run immediately under the ſkin on the back of the hand, have no proper names; they run from thence to the bend of the elbow, where the uppermoſt is called *cephalica*, the next *mediana*, and the laſt *baſilica*. Theſe all communicate near the joint of the elbow, and then ſend one branch which is more directly from the cephalica, and bears that name until it enters the *ſubclavian* vein. It paſſes immediately under the ſkin, in moſt bodies, between the flexors and extenſors of the cubit, on the upper ſide of the arm. The other branches joining, and receiving thoſe which accompany the arteries of the cubit, they paſs with them by the artery of the arm into the ſubclavian vein. The *cephalic* vein, as it runs up the arm, is very viſible in moſt men, but in children is rarely to be ſeen.

9. In the thorax, beſides the two cavæ, there is a vein called *azygos*, or *vena ſine pari*. It is made up of the intercoſtal, phrenic, and bronchial veins, and enters the deſcending cava near the auricle, as if its uſe was to divert the deſcending blood from falling too directly upon the blood in the aſcending cava, and to direct the blood of the deſcending cava into the auricle.

10. In the abdomen, beſides the cava aſcendens and other veins which are named like the arteries, there is one large one called *vena portæ*. Its branches ariſe from all thoſe of the cœliac and two meſenteric arteries, except thoſe branches of the cœliac and ſuperior meſenteric, which are beſtowed on the liver, and uniting in one trunk enters the liver. In this ſituation it is again diſtributed like an artery, and has its blood collected and brought into the cava by the branches of the cava in the liver; this vein being made uſe of inſtead of an artery to carry blood to the liver, for the ſeparation of bile. The blood moves here conſiderably ſlower than in the arteries, this ſlow circulation being probably neceſſary for the ſecretion of the bile.

In the leg the veins accompany the arteries in the ſame manner as in the arm, the external veins of the foot being on the upper ſide, and from them is derived one called *ſaphena*, which is continued on the inſide of the limb through its whole length, and has different names given it according to the different places through which it paſſes.

11. *Arteries* have *three coats*; a middle muſcular, and an external and internal membranous. The *veins* are ſaid to have the ſame, though this is to be doubted. The internal coat of an artery may be pretty eaſily ſeparated, but not the external; but though the veins have muſcular fibres, it is not very poſſible to ſeparate any one of them diſtinctly into three coats. In the inſide of the veins there are many valves, eſpecially in the lower extremities. Theſe hinder any reflux of the venal blood, which otherwiſe would happen from the frequent actions of the muſcles on the outſides of the veins. Both the arteries and veins, as they run on the inſide of the limb, or as they appear in parts that are liable to great diſtenſion, as the ſtomach, inteſtines, uterus, &c. are curved in ſuch a manner as to comply with thoſe diſtenſions by being merely ſtraightened, and without being leſſened in their diameters.

The ſmall arteries near the heart go off from the large trunks at obtuſe angles, farther at leſs obtuſe angles, then at right angles, farther ſtill at acute angles, and near the extremities at very acute angles; becauſe the blood in the veſſels far from the heart, moving with leſs velocity than the blood in the veſſels near the heart, the blood in the collateral branches more remote from the heart wants the advantage of a more direct courſe: and becauſe a very large branch ariſing out of another, might weaken too much the ſides of the veſſel it would ariſe from, that inconvenience is prevented by increaſing the number, and ſo leſſening the ſize of the collateral branches, where otherwiſe one large branch would have ſerved better; as in the going off of the ſubclavian and carotid arteries, which might have gone off for ſome ſpace in one trunk; but this mechaniſm is moſt evident in the going off of the arteria cœliaca and meſenterica ſuperior. And the ſmall arteries always divide ſo as that the leſſer branch may lie leaſt in the direction of the blood flowing into them, which makes the blood flow moſt freely into that branch that has fartheſt to carry it; and the ſmaller branches ariſe more or leſs obliquely from the ſides of other arteries, according to the proportion they bear to the arteries they ariſe from; becauſe an artery comparatively large

arifing obliquely from the fide of another, would make an orifice in that it arifes from too large, and weaken it. And both thefe ends are at once brought about, by making the arteries, that give off the branches, bend more or lefs towards the branches they afford, according to the comparative magnitude of the branches given off.

12. It has been computed by Borelli, that the force which the heart exerts at every fyftole, is equal to 3000lb. weight; that the force which all the arteries exert at every fyftole, is equal to 16,000lb. weight; and that they together overcome a force equal to 136,000lb. weight; whilft Dr. Keil has computed, that the heart in every fyftole exerts a force not exceeding eight ounces. The firft computation was made by comparing the heart with other mufcles, whofe power to fuftain a weight could be beft determined; and the latter was made from the velocity of the blood moving in an artery. If therefore, we confider that Borelli's way of computing led him to find out the abfolute force of the heart, and Dr. Keil's the force which the heart ufually exerts, perhaps thefe very different computations may be accounted for; for if the force of the heart, which is conftantly exerted, fhould, compared with any other mufcle, be but in a reciprocal proportion to the frequency of their actions, and the importance of their ufes; may not the heart very fitly have a force vaftly greater than ufually it exerts, becaufe it is always in action, and muft be able to exert a certain force in the loweft ftate of health? What force the heart ever exerts in a grown man, it is difficult to fay; but it muft be lefs in each ventricle than is fufficient to burft the valves, which hinder the blood from returning into the auricles out of the ventricles, or than is fufficient to break thofe threads by which thefe valves are tied to the papillæ. Experiments made upon living animals fufficiently evince the impulfe and rapidity with which the blood is moved, particularly through the arteries. The height to which blood afcended from the carotids, when cut, according to Hale's calculation, Dr. Wrifberg faw confirmed in robuft men who were beheaded. It is generally about feven feet, with this difference, however, that in two examples the blood fprung higher from the vertebrals than from the carotids. In the larger trunks it runs fwifteft, but in the leaft of them, fomewhat flower. In the larger veins, the blood's celerity is lefs than in the arterial trunks, in the fame proportion as the fections of the arteries are lefs than thofe of the veins, *i. e.* twice or almoft thrice as flow. Another argument of the circulation is the compreffure and relaxation of a vein, whereby the motion of the blood is promoted from one valve to another. The motion of the blood through the veins is uniform or equable; but in the arteries, it is alternately greater when the veffel is more dilated, and lefs when it is contracted. This indeed is proved by ocular infpection in living animals.

13. When we draw blood recently from a vein into a bafon, it feems to be an homogeneous fluid of a red colour; but when it is fuffered to reft, it foon coagulates, and divides into two parts, which are diftinguifhed by the names of *craffamentum* and *ferum*. The craffamentum is the red coagulum, and the ferum is the water in which it floats. Each of thefe may be again feparated into two other parts; for the craffamentum, by being repeatedly waffhed in warm water, gives out all its red globules, and what remains appears to be compofed of the coagulable lymph, which is a gelatinous fubftance, capable of being hardened by fire till it becomes perfectly horny: and if we expofe the ferum to a certain degree of heat, part of it will be found to coagulate like the white of an egg, and there will remain a clear and limpid water, refembling urine both in fmell and appearance.

The proportions of ferum and craffamentum differ in different conftitutions. In a ftrong perfon, the craffamentum is in a greater proportion to the ferum than in a weak one; and the fame difference is found to take place in difeafes.

By putrefaction alone, or the diffolving power of the air, in a heat equal to 96 degrees, the whole mafs, but efpecially the ferum, diffolves or melts into a fœtid liquor; firft the ferum, and then the cruor more flowly, till at length the whole mafs, both of ferum and cruor, is turned into a volatile and fœtid exhalation, leaving very few fœces behind. The blood being a little diffolved by the beginning putrefaction, becomes fœtid; with the fœtor it affumes an alkaline nature, and effervefces with acids. This property it afterwards lofes, the alkaline falt being deftroyed by the complete putrefaction. The putrid blood cannot by any art be infpiffated, and it is very difficult to refolve it, after it has been coagulated by fpirit of wine. By too fevere exercife, heat, and malignant diforders, the cohefion of the blood is diffolved, and it affumes an alkaline nature, almoft as if from putrefaction.

The blood contains in its fubftance a quantity of *fea falt*, which is difcernible to the tafte, and fometimes vifible by the microfcope. That there is *earth* in the blood is demonftrated from nutrition, and from a chemical analyfis; and this earth is chiefly found in the moft fluid, and efpecially in the oily parts of the blood. By fome very late experiments, it appears, that a confiderable quantity of ferruginous earth, eafily reducible into metal by the addition of phlogifton, is contained in the blood when calcined. Laftly, another part in the blood is *air* in an unelaftic ftate, and that in a very confiderable quantity, as is proved by putrefaction and diftillation, or by removing the ambient air by the pump; but we are not to fuppofe that the blood-globules are bubbles full of air, for they are fpecifically heavier than the ferum.

By the admixture of neutral falts the colour of the blood becomes deeper and brighter, without the blood's being either diffolved or thickened. It is fcarcely altered by a weak acid. By fermented liquors it is coagulated. Fixed alkaline falts have almoft the fame effect as the neutrals. The volatile alkalies rather turn it brown, and coagulate it. Alcohol and diftilled oils, and likewife vinegar, coagulate it. It does not effervefce with any falt.

PART IV.

SECT. I. *Of the Abforbent Syftem.*

THE abforbent fyftem confifts of the lacteals, the lymphatic veffels, the thoracic duct, which is their common trunk, and the glands called *conglobate*.

1. The *lacteals* begin from the inteftinal tube, and can generally be feen in any large quadruped that is killed two or three hours after eating. They then appear filled with a white chyle; but they do not always contain a fluid of this colour; for, if the animal be opened long after a meal, they are found diftended with a liquor that is tranfparent and colourlefs like the lymph. In birds the chyle is never found white, but always tranfparent; fo that thefe veffels might, with fome propriety, be called the *lymphatics of the inteftines*.

2. The *lymphatic* veffels are fmall pellucid tubes that exift in moft parts of the human body. Their fluids are generally as colourlefs as water; a circumftance which procured them at firft the name of *ductus aquofi*, and afterwards that of *vafa lymphatica*. The courfe of the lymph, like that of the chyle, is from the extreme parts of the body towards the centre, and

many of the lymphatic veſſels lie cloſe to the large blood-veſſels. If therefore a ligature be made on the blood veſſels of the extremities of a living animal, or of one juſt dead, that ligature, by embracing the lymphatics, will ſtop the courſe of the lymph, which by diſtending the veſſels will make them viſible below the ligature.

All the lacteals, and moſt of the lymphatic veſſels, open into the thoracic duct, which lies upon the ſpine, and runs up towards the neck of the animal, where it commonly opens into the angle between the internal jugular and ſubclavian veins of the left ſide; and thus both the chyle and lymph are mixed with the blood, (ſee Pl. 14. fig. 4.) If therefore a ligature be made on the thoracic duct immediately after killing an animal, not only the lacteal, but alſo the lymphatic veſſels, in the abdomen and lower extremities, become diſtended with their natural fluids, the courſe of thoſe fluids being ſtopped by the ligature.

3. The lacteals, the lymphatics, and the thoracic duct, have their coats thinner and more pellucid than thoſe of the blood-veſſels. But though their coats are ſo thin, they are very ſtrong, as we daily ſee on injecting them with mercury, ſince they reſiſt a column of that fluid, the weight of which would burſt the blood-veſſels.

The thinneſs of the coats prevents our dividing them from one another, and thereby aſcertaining their number, as we do thoſe of the blood-veſſels. But as the blood-veſſels have a denſe internal coat to prevent tranſudation, we have reaſon to believe the lymphatics have the ſame. And as the blood-veſſels have a muſcular coat, which aſſiſts in the circulation; ſo may the lymphatics. This is rendered probable from what Haller ſays of his having found them irritable in his experiments, and alſo from what is obſerved on ſeeing them in living animals diſtended with their lymph, in which caſe they appear of a conſiderable ſize; but upon emptying them, they contract ſo much as not to be eaſily diſtinguiſhed. This experiment, Mr. Hewſon informs us, he frequently made in the trunk of the lacteals in a gooſe, and on the lymphatic veſſels on its neck; both of which, when diſtended with their natural fluids, are as large as a crow-quill; but, upon emptying them in the living animal, he has ſeen them contract ſo much that it was with the greateſt difficulty he could diſtinguiſh them from the fibres.

The coats of the lymphatic veſſels have, in common with all other parts of the body, arteries and veins, for their nouriſhment. This is rendered probable by their being ſuſceptible of inflammation; for they are frequently found in the form of a cord, painful to the touch, and extending from an ulcer to the next lymphatic gland. Theſe painful ſwellings of lymphatic veſſels likewiſe ſhow that their coats have ſenſibility, and therefore that they have nerves as well as arteries and veins. Beſides, we can clearly trace, in different parts of the body, blood-veſſels running along their ſurfaces.

4. The lymphatic ſyſtem in moſt animals, but particularly in man and quadrupeds, is full of valves. Theſe valves have been deſcribed by the celebrated Nuck, Ruyſch, and others, and are much more frequent than in the common veins, and thence theſe lymphatics have ſometimes been diſtinguiſhed by the name of *valvular lymphatic veſſels*. Theſe valves are generally two in number, are of a ſemilunar ſhape, and the one is ſometimes much larger than the other. In moſt parts of the body theſe valves are ſo numerous, that there are three or four pair in an inch, but ſometimes there is no more than one pair, and ſometimes ſeveral inches appear without a valve. They are leſs numerous in the thoracic duct than in the branches of the ſyſtem; thence it might be ſuppoſed, that in proportion as we go from the trunk to the branches, we ſhould find them in greater number: but this is not always true, for Mr. Hewſon obſerved them more numerous in the lymphatic veſſels of the thigh than on thoſe of the leg. When the veſſels are diſtended with lymph, they appear larger on that ſide of the valves next the heart; which ſometimes gives a lymphatic veſſel an appearance of being made of a chain of veſicles: as ſuch they are repreſented by ſome authors; but it is an appearance that very ſeldom occurs in the human body. In quadrupeds, however, this appearance is very remarkable. Wherever a lymphatic veſſel enters the thoracic duct or a red vein, we find either one or two valves which prevent the return of the lymph, or hinder the blood from getting into the lymphatic.

5. Laſtly, the lymphatic ſyſtem, in different parts of its courſe, has the *glands* called *conglobate* or *lymphatic*. Theſe glands are ſo placed, that the veſſels come in on one ſide, and paſs out on the other, in their way to the thoracic duct. They are commonly of an oval, though ſometimes of a round form, and frequently ſomewhat flattened, and of various ſizes, ſome being no larger than a millet ſeed, while others are almoſt an inch in diameter. They vary in colour in different parts of the body, and at different times of life. In young people they are generally of a reddiſh or brown colour; but become paler with age: they have a ſhining external ſurface, which is owing to a ſmooth denſe coat that covers them. Like other glands, they have arteries, veins, and nerves, which enter into their compoſition: but with reſpect to the reſt of their ſtructure, anatomiſts are much divided in opinion; ſome endeavouring to prove that they are formed of cells, while others of equal credit conſider them as a collection of veſſels. Before the diſcovery of the lymphatic veſſels in birds, fiſh, and turtle, ſome anatomiſts conſidered theſe glands as ſo eſſentially neceſſary to the lymphatic ſyſtem, that they generally ſet about diſcovering the veſſels by firſt looking for the glands: and wherever they found glands, they pronounced that there muſt be veſſels; and when no glands could be ſeen, they thought it as certain a proof of there being no veſſels. But that the glands are wanting in ſome animals, is now generally known.

Sect. II. *Of the ſuperficial and deep-ſeated Lymphatics of particular Parts.*

From the general deſcription we have given of the Abſorbent Syſtem of the Human body, it appears, that, beſides the glands, it is divided into three parts, viz. the *lacteals*, the *lymphatic veſſels*, and the *thoracic duct*. The lacteals belong to the inteſtinal tube; the lymphatics, to all the other parts of the body; and the thoracic duct is the common trunk which receives both the lacteals and lymphatics. Of theſe a copious deſcription has been given by Dr. William Hunter, Mr. Hewſon, and other anatomiſts, by whoſe induſtry this part of anatomy has been ſo greatly illuſtrated. Since, notwithſtanding their importance in the animal economy, a very minute account of the courſe and number of lymphatic veſſels in each particular part of the body cannot be of any great degree of practical advantage to the ſtudent, we ſhall not purſue the ſubject to any unneceſſary length.

The lymphatics may be divided into two kinds, viz. *ſuperficial* and *deep-ſeated*.—The *ſuperficial lymphatics* conſiſt of numerous veſſels that lie between the ſkin and the muſcles, and belong to the ſurface of the body or the ſkin, and to the cellular membrane which lies immediately under it. Numerous large branches of them can be readily enough diſcovered in the limbs of dropſical ſubjects. Many of them run upon the top of the foot; others are generally to be found juſt under the inner ankle. By means of tubes which have been introduced into two of them, the lymphatics have been filled the whole length of the lower extremity. See Pl. 12. Absorbents.

1. The greater number of ſuperficial lymphatics accompany the *vena ſaphena major*. They can be firſt traced from the toes,

where they run somewhat like the arteries and veins. A plexus, consisting of several vessels, runs over the top of the foot with the saphena to the inner ankle, and from thence upwards to the inner side of the knee. Here they are joined by another plexus which arises from the sole, and passes up on the inner and back part of the leg. A third plexus arises from the outer side of the foot, and runs by the outer ankle. Upon the outer part of the leg, these split into two divisions; one of which crosses obliquely over the fore-part of the leg to the lymphatics at the inner side of the knee, while the remaining part accompanies the vena saphena minor, and runs to the glandulæ popliteæ. From the inside of the knee a plexus runs up, consisting of from a dozen to twenty trunks, which pass afterwards on the anterior and inner side of the thigh to the inguinal glands. In their passage they receive branches from the outer and back parts of the thigh; but these are few in number when compared with the rest.

2. The *lymphatic glands of the groin* are six, seven, eight, or upwards, varying much in number. Of these, some lie in the very angle between the thigh and the abdomen, and others a few inches down on the fore part of the thigh. The lymphatic vessels, above described, enter the lowermost of these glands. One or more of these branches, however, frequently avoids a gland, and afterwards bends over it to another gland; from which vessels go to other lymphatic glands that lie in the angle between the thigh and the abdomen, and sometimes a few enter no glands till they reach those on the inside of Poupart's ligament.

Numerous lymphatics also pass into the inguinal glands from the superficial parts of the abdomen and pelvis. It is into these upper glands alone that the lymphatic vessels of the genitals enter, so that the venereal bubo, which arises in consequence of an absorption of matter from the organs of generation, is always seated in those upper glands; and the lower glands are never affected, except by the regurgitation of the matter, or from their vicinity to the glands first diseased, which very seldom happens. And, as the upper glands are affected by the absorption of matter from the genitals, so the lower are commonly first affected from the absorption of the acrid matter of an ulcer, diseased joint, or carious bone, in the parts below these glands; a circumstance that may assist us in the diagnosis of these two kinds of buboes: remembering, however, that this rule may be liable to an exception from one or more of the lymphatic vessels passing the lower glands, and only entering at the upper.

3. In the *penis* three principal vessels commonly take their origin from the prepuce. These soon unite, but afterwards separate upon the middle of the dorsum penis into two parts; one of which goes to the inguinal glands on the right side, the other to those of the left.—The *deep-seated lymphatics* arise from the glands and body of the penis, and accompany the arteries into the lower part of the pelvis. Hence if venereal matter be absorbed by these vessels, the constitution may be affected without our being aware of it.

4. The lymphatic vessels of the *testicle* are numerous and very large for the size of this organ. They arise from its coats, from the body of the testicle, and from the epididymis; and after running along the spermatic cord, they terminate in the lumbar glands. In their course they have few communications with each other.

5. The lymphatics of the *scrotum*, which are also numerous, go chiefly to the glands of the groin, though some pass along with those of the testicle to the lumbar glands.

The lymphatic vessels of the penis and scrotum having joined those of the thigh, a net-work is formed, which enters the abdomen under the edge of the tendon of the external oblique muscle, called *Poupart's ligament*. This plexus on the inside of Poupart's ligament consists of many branches; some of which embrace the iliac artery, but the greatest number of them pass up on the inside of the artery.

The superficial lymphatics of the inferior extremity are the trunks of those vessels which absorb from the skin and the cellular membrane immediately under it; but they likewise communicate with the deep-seated absorbents: and the same thing is to be observed with respect to the lymphatics on all the other parts of the surface of the body.—Upon these vessels, from the foot to the groin, there are commonly no other lymphatic glands than those of the ham. But this rule has some exceptions.

Having given the preceding account, we shall now proceed to give a description of the *Lacteal Sac and Duct*, for a view of which see Pl. 14. fig. 4.

Sect. III. *Of the Lacteal Sac and Duct.*

The *receptacle of the chyle* is a membranous somewhat pyriform bag, two-thirds of an inch long, one-third of an inch over in its largest part when collapsed; situated on the first vertebra of the loins to the right of the aorta, a little higher than the right emulgent artery, behind the right inferior muscle of the diaphragm. It is formed by the union of three tubes; one from under the aorta, the second from the interstice of the aorta and cava, the third from under the emulgents of the right side.

The lacteal sac, becoming gradually smaller towards its upper part, is contracted into a slender membranous pipe, of about a line diameter, which is generally named the *thoracic duct*. This passes between the muscular appendices of the diaphragm, on the right of the aorta. It then mounts between the aorta and the vena azygos as far as the fifth vertebra of the thorax, where it is hid by the azygos, as this vein rises forwards to join the descending or superior cava; after which the duct passes obliquely over to the left side behind the œsophagus, aorta descendens, and the great curvature of the aorta, until it reaches the left carotid artery; behind which, on the left side of the œsophagus, it runs to the interstice of the first and second vertebræ of the thorax, where it begins to separate from the carotid, stretching farther towards the left internal jugular vein by a circular turn, whose convex part is uppermost. At the top of this arch it splits into two branches for a line and an half; the superior branch receiving into it a large lymphatic vessel from the cervical glands. When the two branches are again united, the duct continues its course towards the internal jugular vein, behind which it descends, and, immediately at the left side of the insertion of this vein, enters the superior posterior part of the left subclavian vein, whose internal membrane being duplicated, forms a semilunar valve that is convex externally, and covers two-thirds of the orifice of the duct.

The coats of the sac and duct are thin transparent membranes; from the inside of which, in the duct, ten or twelve small semilunar valves are produced, most commonly in pairs; which are so situated as to allow the passage of liquors upwards only. This is the most simple and common course, situation, and structure of the receptaculum chyli and thoracic duct; but there exists not unfrequently, a variety in these parts, in different subjects. The sac is sometimes situated lower down than in the former description; is not always of the same dimensions; is not composed of the same number of ducts; and frequently appears to consist of several small cells or ducts, instead of being one simple cavity. Besides these deviations from the original structure many other differences have been observed in dissections.

Sect. IV. *Absorbent Vessels of the Trunk.*

The lymphatics of the lower extremities having reached the trunk of the body, and passed under Poupart's ligament, ap-

pear upon the ſides of the oſſa pubis near the pelvis. A part of them paſſes up along with the iliac artery upon the brim of the pelvis; and another part dips down into the cavity of the pelvis, and joins the internal iliac artery near the ſciatic notch. At this place they are joined by the lymphatics from the contents of the pelvis, particularly from the bladder and veſiculæ ſeminales in the male, and from the uterus in the female; and there are likewiſe ſeveral branches which paſs through the ſciatic notch from the neighbourhood of the glutæi muſcles. The lymphatic veſſels of the uterus, like its blood-veſſels, are much enlarged, and therefore eaſily diſtinguiſhed, in the pregnant ſtate of that organ. They are in two ſets; one runs along with the hypogaſtric arteries and veins; the other with the ſpermatic veſſels. The lymphatics of the external parts of generation in the female go partly to the inguinal glands of each ſide, and partly through the rings of the external oblique muſcles to terminate in the glands of the loins or pelvis. At this part, where ſo many lymphatic veſſels join, there are commonly one or two glands.

But beſides thoſe lymphatic veſſels which dip down into the cavity of the pelvis on the inſide of the external iliac artery, there are others which keep on the outſide of that artery upon the pſoas muſcle. Of theſe, one part paſſes up to the loins, and goes under the aorta in different branches, getting from the left ſide to the right, and joining the thoracic duct. Another part paſſes under the iliac arteries, and appears upon the os ſacrum making a beautiful net-work, joining the lymphatics of the right ſide, and paſſing under the iliac artery, to form a net-work upon the upper part of the right pſoas muſcle. In different parts of this courſe from Poupart's ligament to the loins, and alſo in the loins themſelves, there are, in moſt ſubjects, many lymphatic glands.

The lymphatic veſſels of the right ſide, joined by ſome from the left, having now reached the right lumbar region, appear there in the form of a plexus of large veſſels, and paſs through ſeveral glands. At this part likewiſe they receive large branches, under the aorta, from the plexus on the left ſide of the loins; and having at laſt got up as high as the ſecond, or third, lumbar vertebra, they all join, and form a ſingle trunk called the *thoracic duct*, which is ſeen in pl. 14. fig. 4. At this part they are likewiſe joined by the lacteals, which ſhall be next deſcribed.

The *lacteal veſſels*, ſo called from their commonly conveying a fluid that is of the colour of milk, are found in two ſets which communicate with each other; the internal begin from the inner ſurface of the inteſtines, where each lacteal is at firſt formed upon the ſurface of the villi by numerous ſmall radiated branches, with orifices deſtined to imbibe the nutritious fluid or chyle. From the cavity of the inteſtines theſe veſſels paſs obliquely through their coats, uniting as they go, ſo as to form larger branches. They follow the courſe of the arteries and the veins, and are double their number; one being ſituated on each ſide. Theſe branches run on the outſide of the gut to get to that part which is next the meſentery; and, whilſt they are yet upon the gut, they are ſometimes of a ſize ſufficient to admit a ſmall pipe, ſo that they have been frequently injected with mercury in the human ſubject. And in man, as well as in different animals, the external ſet appear between the peritonæal and muſcular coat, and commonly run for a conſiderable way in the ſame direction with the inteſtine.

From the inteſtines they run along the meſentery and meſocolon, towards the ſpine; paſſing through the lacteals in their way to the conglobate or meſenteric glands. Theſe glands divide the lacteals into two regions: from the inteſtines to the glands theſe veſſels are called *lactea primi generis*; and from the glands to the thoracic duct, *lactea ſecundi generis*.

1. The lacteals of the *jejunum* are larger and more numerous than thoſe of the *ilium*. Thoſe of the ſmall inteſtines, as they run upon the meſentery, commonly accompany the ſuperior meſenteric artery, and unite, as they proceed, into larger branches; ſo that by the time they arrive at the root of the meſentery, they are of a conſiderable ſize. From the meſenteric artery they deſcend by the ſides of the aorta, and open at laſt into the thoracic duct: the lymphatics of the large inteſtines run ſomewhat differently. Thoſe from the cœcum, and from the right part and great arch of the colon, join the trunks of the lacteals of the ſmall inteſtines about the root of the meſentery, whilſt thoſe from the reſt of the colon terminate in the lumbar glands, or lower part of the thoracic duct, accompany the inferior meſenteric artery, and communicate with the large lymphatic veſſels near its root.

2. Into the thoracic duct, likewiſe enters the lymph of the other abdominal viſcera. This is brought by a number of veſſels, which in all the viſcera run in a ſuperficial, and in a deep ſet, a plexus of them may be traced from each *kidney*, lying principally behind the emulgent artery, and opening into large lymphatic veſſels near the aorta. The lymphatics of the kidney are ſeldom ſeen in the ſound ſtate of that viſcus; but when it is enlarged or ulcerated, they are ſometimes diſtinctly obſerved: they run from its outer towards its inner edge, and immediately afterwards they paſs through the glands of the loins. The lymphatics of the glandulæ renales, or renal capſulæ, likewiſe terminate in the renal plexus.

3. The lymphatic veſſels of the *ſpleen* paſs from the concave ſide of that viſcus, along with the ſplenic artery in the ſinuoſity of the pancreas, by the lymphatic veſſels of which they are joined. The deep-ſeated lymphatics of the ſpleen are very conſiderable, and can be readily ſeen at its concave edge, but thoſe on its ſurface are ſmall and few in number; in quadrupeds, however, as in the bullock, they are remarkably numerous and large.

4. Two ſets of lymphatic veſſels belong to the *ſtomach*, the one running upon its leſſer, and the other upon its greater curvature. Of theſe, the former accompanies the coronary artery, and paſſes through ſome lymphatic glands that lie by its ſides. The other ſet paſſes from the great curvature of the ſtomach, partly to the left and partly to the right ſide. Thoſe on the left ſide receive the lymphatics of the left half of the great omentum, and run with the lymphatics of the ſpleen and pancreas to the thoracic duct. Thoſe on the right ſide receive the lymphatics from the right half of the great omentum, and paſs through ſome lymphatic glands that lie cloſe to the arteria gaſtrica dextra. Deſcending by the pylorus, they meet the plexus that accompanied the coronary artery; and near the leſſer curvature of the duodenum, form a conſiderable net-work. Into this not only the lymphatics from the ſpleen enter, but likewiſe thoſe from the gall-bladder, together with the deep-ſeated lymphatics of the liver. Several branches proceed from this net-work; ſome running under the duodenum, and others over it; which all open into the thoracic duct, near the termination of the large trunk of the lacteals. The thoracic duct is therefore the common trunk which receives the abſorbent veſſels of the lower extremities, the lacteals, and the lymphatics of the abdominal viſcera.

5. The lymphatics of the *liver*, like thoſe of the other viſcera, are in two ſets; one which lies upon the ſurface of the organ, and the other which accompanies the large blood-veſſels in its centre. Here theſe two ſets are found to communicate with each other very freely; ſo that, by injecting mercury into the lymphatic veſſels which lie upon its convex ſurface, we may fill thoſe which accompany the pori biliarii and vena portarum in its centre. Moſt of the lymphatic veſſels which lie upon the convex ſurface of the liver, run towards its falciform ligament, and paſs through the diaphragm into glands which are ſituated

on the anterior part of the pericardium. But others of them run towards the lateral ligaments of the liver, where they pafs alfo through the diaphragm, and afterwards run on its upper furface, to join thofe from the ligamentum latum. This is the common courfe of the abforbents on the convex fide of the liver; but there is great variety.

From the glands above mentioned, a large trunk runs up behind the fternum, between the laminæ of the anterior mediaftinum, and commonly joins the thoracic duct near its termination. Sometimes, however, inftead of finding one trunk behind the fternum, we meet with two or more on each fide of the thorax, accompanying the internal mammary veffels; thofe of the left fide ending in the thoracic duct; thofe of the right going into the lymphatic trunk on that fide of the neck.

The lymphatics on the concave furface run towards the portæ, where they join thofe which come from the centre of the liver along with its large blood-veffels. After they get from the liver, they are found to be very numerous. They pafs into glands on the vena portarum; and afterwards end in the thoracic duct, near the root of the fuperior mefenteric artery. It is remarkable, that the valves of thofe lymphatic veffels which run upon the furface of the liver, can readily be made to give way, fo that they may be injected from their trunks to their branches, with great minutenefs.

It has been fuggefted by Dr. Meckel, that the lymphatics of the ftomach do not open into the thoracic duct like thofe of the other viícera, but into the fanguiferous veins of the ftomach. From repeated diffections of the human fubject, Mr. Hewfon has, however, been convinced of the contrary, and likewife from analogy with other animals, particularly fifh, whofe lymphatic veffels either have no valves, or the valves readily give way; fo that he has repeatedly puffhed injections from the thoracic duct into the lymphatics of their ftomachs, as he has alfo done into the lymphatics of the other viícera contained in the cavity of their abdomen.

6. The *thoracic duct*, which receives all the veffels that we have yet deferibed, differs in its fize in different fubjects; but it is always fmaller in its middle than at its beginning. Sometimes its lower part is ftill larger, and that enlargement has been called *receptaculum chyli*. It is conffderable in fome quadrupeds, in turtle, and in fifh; but many anatomifts have denied that there is any part of the thoracic duct in the human fubject that deferves the name of *receptaculum*, having never feen any thing like a pyriform bag, as it has been deferibed, but merely an enlargement not unlike a varix, and that only in few fubjects; it generally appears only a little larger at its middle than at its ends. This lower extremity of the thoracic duct is formed by the union of two or three very large trunks of lymphatic veffels. The firft and fecond are formed by the lymphatics of the inferior extremities, and other parts already deferibed; the third belongs chiefly to the lacteals. Thefe large veffels unite fo as to form the duct over the third vertebra lumborum, reckoning from above downwards. Upon the fecond vertebra of the loins, the union of thefe veffels is fometimes twice or thrice as large in diameter as the duct is higher up; at other times little or no enlargement can be obferved.

Thefe large lymphatic trunks which form the thoracic duct are fpread out upon the fpine, thofe of the right fide lying below the right crus diaphragmatis, and thofe of the left paffing between the aorta and the fpine; whilft the thoracic duct itfelf lies at firft behind the aorta; but afterwards paffes from that upwards, and a little to the right fide, till it gets before the firft vertebra of the loins. Here it is fituated behind the right crus of the diaphragm, where it enlarges again; and fometimes forms a pyriform bag, which has been conffdered by authors as the beginning of the duct. From this part it paffes upwards, being at firft covered by the crus diaphragmatis, and afterwards appears in the thorax, upon the fpine between the aorta and the vena azygos. In the thorax it receives fome lymphatics from the intercoftal fpaces, and afterwards veffels from the lungs.

7. The fuperficial lymphatics of the *lungs* form a beautiful net-work, the larger branches running chiefly between the lobules, the fmaller paffing over them; and here, as well as on the liver, and other parts, there are numerous valves, the exiftence of which has been denied by fome authors. From the furface they pafs to the root of the lungs, and there they go through the bronchial glands. At this place they are joined by the deep-feated abforbents, which creep along the branches of the trachea, and likewife on thofe of the pulmonary artery and vein. Having left the glands, the principal part of thofe from the left lung form a trunk which terminates in the thoracic duct, behind the diviffon of the trachea into its right and left branches. The reft of the abforbents of the left lobe pafs through glands behind the arch of the aorta, and which are likewife common to thofe of the heart. They run at laft into the thoracic duct near its termination in the red veins.

After leaving the bronchial glands, the abforbents of the right lung form three or four principal trunks; one of which commonly afcends on the fore-part of the vena cava fuperior, and opens into the lymphatic trunk, that terminates in the veins of the right fide of the neck. The reft of thefe trunks go into the thoracic duct at the root of the lungs; and near this place the abforbents of the right and left lungs communicate pretty freely together.

At the root of the lungs, where the large blood-veffels enter, are many glands called *bronchial*. They are generally of a blackifh colour in the human fubject, and have been fufpected to fecrete the mucus which is fpit up from the trachea; but later anatomifts having frequently diftinctly filled them with mercury, by injecting the lymphatic veffels of the lungs, think it evident that they are not mucous but lymphatic glands.

8. The abforbents of the *heart*, which have been known only by the lateft anatomifts, come from its fuperficial and deep parts. Thefe afterwards form principal trunks which accompany the coronary arteries and veins, and like them the largeft belong to the left ventricle. From the fide of the right coronary artery an abforbent paffes over the arch of the aorta to a gland commonly found behind the origin of the carotid arteries. The lymphatic accompanying the left coronary artery is formed of two principal branches; one of which runs up in the groove between the ventricles, and on the fuperior furface of the heart; the other runs in a correfponding groove on the under fide of the heart: and having reached the fpace between the auricles and ventricles, turns round to join the former branch near the origin of its correfponding artery. Frequently, there are a conffderable number on its fides, and upon the lumbar vertebræ.

Over the trunks of the blood-veffels of the fpleen, liver, kidneys, and renal capfulæ, there are alfo lymphatic glands which belong to the lymphatic veffels of thefe organs. In the thorax, a few glands are found on the fore-part of the pericardium and upper furface of the diaphragm, and belong to the liver or diaphragm. Others are fituated between the laminæ of the anterior portion of the mediaftinum.

There are likewife lymphatic glands fometimes obferved by the fides of the thoracic duct, particularly about the middle of the thorax; which glands belong principally to the veffels of the lungs.

There are alfo many lymphatic glands, called *bronchial*, near the root of the lungs: thefe glands are placed upon the lymphatic veffels, juft where they quit the lungs. But no lymphatic glands have yet been obferved in the fubftance of the lungs; and the tubercles, which fome fufpect to be obftructed

lymphatic glands, ſeem to have a different origin. There are likewiſe ſome glands ſeen on the lymphatic veſſels which lie near the ſubclavian veins at the upper part of the thorax, and which belong to the lungs.

Beſides theſe, there are ſome lymphatic glands upon the aorta near the œſophagus, and there are alſo others occaſionally met with in the intercoſtal ſpaces. There are generally two or three contiguous to the thoracic duct at the lower part of the neck and upper part of the thorax, near the termination of that duct in the angle between the left jugular and the left ſubclavian vein; and a few are found over the internal mammary veſſels where the abſorbents of the liver paſs up within the thorax.

PART V.

SECT. I. *Of the Brain and Nerves.*

THE name of *brain* is given to all that maſs which fills the cavity of the cranium, and which is immediately ſurrounded by two membranes, called *meninges* by the Greeks, and *matres* by other ancients, becauſe they were commonly of opinion, that theſe membranes were the origin, and, as it were, the mother of all the other membranes of the body.

This general maſs is divided into three particular portions; the *cerebrum* or *brain* properly ſo called, the *cerebellum*, and *medulla oblongata*. To theſe three parts contained within the cranium, a fourth is added, which fills the great canal of the ſpina dorſi, and is known by the name of *medulla ſpinalis*, being a continuation of the medulla oblongata.

The meninges, or membranes, are two in number; one of which is very ſtrong, and lies contiguous to the cranium; the other is very thin, and immediately touches the brain. The firſt is named *dura mater*, the ſecond *pia mater*. This laſt is again divided into two; the external lamina being termed *arachnoides*, the internal retaining the common name of *pia mater*. We begin with theſe meninges.

1. The *dura mater* is a very compact ſtrong membrane, lining the inſide of the ſcull, firmly adhering at its baſis, though but lightly at the upper part, except at the ſutures. It has three proceſſes; the firſt, named *falx*, begins at the *criſta galli*, and runs backwards under the ſutura ſagittalis to the cerebellum, dividing the cerebrum into two hemiſpheres. Its uſe is ſaid to be that of ſupporting one ſide of the cerebrum from preſſing on the other when the head is inclined to one ſide. But it rather appears calculated to divide the brain into ſuch portions as are leaſt liable to be diſturbed by any violent motions of the head; the under-ſide of the brain being at the ſame time kept ſteady by the inequalities of the baſis of the ſcull, which the brain is exactly fitted to. In brutes the falx is always very ſmall; therefore in thoſe that have the brain of a larger ſize, as oxen, ſheep, horſes, &c. the upper part of the ſcull is made uneven, exactly to fit the folds of the brain, which ſecures the upper parts from concuſſion, in the ſame manner that the lower parts are ſecured. The ſecond proceſs runs from the lower and back-part of the former to the upper edge of each os petroſum, and ſuſtains the poſterior lobes of the cerebrum, that they might not compreſs the cerebellum. In ſome animals this proceſs is compoſed of bone. The third is a very ſmall proceſs, which runs from that laſt deſcribed, down towards the great foramen of the ſcull, and poſſeſſes that ſmall ſpace in the cerebellum, between the proceſſus vermiformis. Theſe proceſſes of the dura mater alſo ſerve to keep the brain ſteady.

2. The dura mater has in it ſeveral *ſinuſes*, which anſwer the end of large veins to receive the blood from the leſſer veins of the brain. Their number is uncertain, and thoſe that are conſtant are not deſcribed in the ſame order by writers. The firſt that preſents itſelf is the *longitudinalis ſuperior*, running from a blind hole a little above the criſta galli all along the upper edge of the falx. A tranſverſe ſection of this veſſel is not circular, like other veſſels, but a triangle, whoſe ſides are arches of a circle; the upper ſide convex outwards, and the two lower convex inwards. The figure of this veſſel is preſerved by ſmall ligaments running acroſs in the inſide, that it might not become conical, or cylindrical, like other veſſels, from the equal preſſure of the contained blood, and thereby incommode the upper edges of each hemiſphere of the cerebrum. On the lower edge of this proceſs is generally another very ſmall one, called *longitudinalis inferior*. This runs into the rectus, and when wanting, is ſupplied by a vein. The *rectus* runs between the two firſt proceſſes of the dura mater, and unloads with the ſinus longitudinalis ſuperior into the two lateral ſinuſes; but for the moſt part the longitudinal ſinus goes more directly into one of the lateral ſinuſes, and the ſtraight ſinus into the other. There is ſometimes a ſmall one in the third proceſs, which empties in the ſame place with the former. From the terminations of the longitudinal and ſtraight ſinuſes, begin the two lateral ſinuſes, which, when they come to the os petroſum, dip down and paſs through the eighth foramina into the internal jugular veins. Another named *circularis*, runs round the fore-part only of the cella turcica. The two extremities of this empty into four ſinuſes, one on the top of each os petroſum, which paſs into the ſinus lateralis, and one at the inferior parts of the ſame bones, which paſs indifferently into both the lateral and cervical ſinuſes. Theſe two laſt ſinuſes have always communicating branches. The *cervical* ſinuſes run from the baſis of the ſcull through the great foramen on both ſides of the medulla ſpinalis colli, and through the tranſverſe proceſſes of the cervical vertebræ; the laſt of theſe have ſometimes proper foramina running from the eighth foramina to the back-part of the apophyſis of the occipital bone. There are alſo two more of theſe veſſels, which run from the circular ſinus between the os ſphenoides and fore-part of the os petroſum directly into the internal jugular veins.

3. The *pia mater* is an exceedingly fine membrane immediately inveſting the brain, even between its lobes, hemiſpheres, and folds. It ſerves to contain the brain, and ſupport its blood-veſſels, which run here in great numbers, and are divided into an infinite degree of minuteneſs, in order that the blood may not enter the brain too impetuouſly. Between the dura and pia mater, is deſcribed, by ſeveral anatomiſts, a membrane called *tunica arachnoides*, which is eaſily ſeen at the back-part of the cerebrum, upon the cerebellum and back-part of the medulla ſpinalis.

SECT. II. *Of the Cerebrum, Cerebellum, Medulla Oblongata, and Medulla Spinalis.*

1. *Cerebrum* is that part of the brain which occupies all the upper and fore-part of the cranium; being ſeparated from the cerebellum by the ſecond proceſs of the dura mater. Its upper ſide is divided into two hemiſpheres, and its lower ſide into four lobes, two anterior and two poſterior, which latter are much the largeſt. At the meeting of the four lobes appears the *infundibulum*, which ſeems to be a lymphatic, running from the ventricles of the brain into the *glandula pituitaria*: this gland is ſeated in the cella turcica. Immediately behind the infundibulum appear two ſmall bodies, named *protuberantiæ duæ albæ pone infundibulum*. Between the two hemiſpheres of the cerebrum, lower than the circumvolutions, appears a white

body named *corpus callosum*. Under the corpus callosum appear the two lateral or superior ventricles, which are divided into right and left by a very thin membrane, named *septum lucidum*, which is extended between the corpus callosum and fornix. The *fornix* is a medullary body beginning from the forepart of these ventricles, with two small roots which soon unite; then running towards the back part, they divide into parts, called *crura fornicis*. In the basis of these two ventricles are four prominences: the two anterior are called, from their inner texture, *corpora striata*; the other two, *thalami nervorum opticorum*. Beyond these are two more processes, called *nates*; and under them, nearer the cerebellum, two called *testes*. Above the nates is situated the *glandula pinealis*, famous for being supposed, by Des Cartes, the seat of the soul. Upon the thalami nervorum opticorum are a number of blood-vessels, glands, and lymphatics, called *plexus choroides*. Under the beginning of the fornix is a small hole, called *foramen ad radices fornicis*, or *iter ad infundibulum*; and under the middle of the fornix, one called *foramen posterius*, which is covered with a valve, named *membrana*, or *valvula major*; and the space under the two anterior ventricles between the foramina and the cerebellum is the third ventricle.

2. *Cerebellum* is situated under the second process of the dura mater. By dividing this part of the brain lengthways we discover more plainly the fourth ventricle, whose extremity is called *calamus scriptorius*. Here also appear two medullary bodies, called *pedunculi*, which are the basis of the cerebellum. The medullary part in the cerebellum, though it is inmost, as in the cerebrum, yet is of a different shape, being branched out like a plant.

The substance of the brain is distinguished into outer and inner; the former called *corticalis*, *cinerea*, or *glandulosa*; the latter *medullaris*, *alba*, or *nervea*.

3. *Medulla oblongata* is a medullary continuation of the under part of the cerebrum and cerebellum. It first appears in two bodies from the anterior part of the posterior lobes of the cerebrum, called *crura medullæ oblongatæ*. The union of these crura between the cerebrum and cerebellum is called *isthmus*; and immediately beyond this is an eminence named *processus annularis*.

4. *Medulla spinalis* is a production of the medulla oblongata through the great foramen of the scull, and through the channel of the spine. It enlarges about the last vertebræ of the back and first of the neck, where the large nerves are given off to the arms. It again enlarges in the loins, where the crural nerves begin; and the lower end of it, with those and other nerves, is called, from its resemblance to the tail of a horse, *cauda equina*. The coats of this part are the same with those of the brain; but the membrane here, which is analogous to the dura mater, is thinner and more connected to the bones, and the tunica arachnoides more conspicuous.

Sect. III. *Of the Distribution and Functions of the Nerves.*

From the medullary part of the cerebrum, cerebellum, and medulla-spinalis a vast number of small medullary white fibres are sent out, which, at their first egress, seem easily to separate, but as they pass forward are somewhat more, but still loosely connected, by the coat which they obtain from the pia mater, and at last piercing the dura mater, are closely embraced by that membrane, which covers them in their progress. Hence they become white, firm, strong cords, and are well known to anatomists by the name of *nerves*. To these coats an infinite number of vessels, both arteries and veins, are distributed. The nerves, which if all joined together would hardly make a cord of an inch diameter, would seem, from their existing in almost every part, to be distributed with the utmost degree of minuteness. In their course to the places for which they are destined they generally run as straight as the part over which they are to pass, and their own security from external injuries will allow, sending off their branches at very acute angles, and consequently running more parallel than the blood-vessels. Their distribution is seldom different in the opposite sides of the same subject, nor indeed in any two subjects is there any considerable variety to be found. Frequently nerves which come out distinct or separate, afterwards conjoin into one fasciculus, under the same common covering; and though the nervous fibrils probably do not communicate, yet because the coats at the conjoined part are common, and these strong coats may have great effects on the soft pulpy nerves, it is evident all such will have a considerable sympathy with one another. In some parts where there exist these conjunctions, the bulk of the nerves seems much increased, and those knotty oval bodies, named *ganglions*, are formed. The coats of these knots are stronger, thicker, and more muscular than the whole nerves which enter into them would seem to constitute; while the nervous fibrils pass through without any great change.

All anatomists agree, that to the nerves we owe all sensation and motion, of which they are the proper organs; and the sensations in the minutest parts being very distinct, the instruments of such sensations must have distinct origins directed to each part. Though all are agreed as to the effect, yet anatomists have hitherto vainly endeavoured to shew how it is produced. Some have contended, that sensation and motion are occasioned by a vibration communicated to the nerves, which they supposed entirely solid and tense in their structure; whilst others accounted for it by supposing the existence of a subtle fluid which was moved in them, and to which they gave the name of *animal spirits*. But a later and much more probable hypothesis than either of these has arisen from the discovery of a species of electricity peculiar to animal bodies, and concerning which very interesting accounts have been lately given by Galvini and others. These, though sufficiently decisive to render nugatory all that has before been advanced on this difficult and almost inscrutable topic, is yet so far from supplying a satisfactory solution of the phenomena of nervous influence, as not to require being brought forward in this place. It may not be amiss however to relate what are the prevailing opinions concerning the influence of the nerves in producing muscular motion.

A muscle, when pricked or irritated, immediately contracts. This is called its irritable principle; and this irritability is to be considered as the characteristic of muscular fibres, and may serve to prove their existence in parts that are too minute to be examined by the eye. This power, which disposes the muscles to contract when stimulated, independent of the will, is supposed to be inherent in them; and is therefore named *vis insita*. This property is not to be confounded with elasticity, which the membranes and other parts of the body possess in a greater or less degree in common with the muscles; nor with sensibility, for the heart, though the most irritable, seems to be the least sensible of any of the muscular parts.

When a muscular fibre has contracted, it soon returns to a state of relaxation, till it is excited afresh, and then it contracts and relaxes again. We may likewise produce such a contraction, by irritating the nerve leading to a muscle, although the nerve itself is not affected. This principle is found to be greater in small than in large, and in young than in old animals. In the voluntary muscles these effects of contraction and relaxation of the fleshy fibres are produced in obedience to the will, by what may be called the *vis nervosa*, a property that is not to be confounded with the *vis insita*. As the existence of a *vis insita* different from a *vis nervea*, was the doctrine taught by Dr. Haller in his *Elementa Physiologiæ*, but is at pre-

ſent called in queſtion by ſeveral, particularly Dr. Monro, we think it neceſſary to give a few objections, as ſtated by the latter in his Obſervations on the Nervous Syſtem:

"The chief experiment (ſays the Doctor) which ſeems to have led Dr. Haller to this opinion, is the well-known one, that the heart and other muſcles, after being detached from the brain, continue to act ſpontaneouſly, or by ſtimuli may be rouſed into action for a conſiderable length of time; and when it cannot be alleged, ſays Dr. Haller, that the nervous fluid is by the mind, or otherwiſe, impelled into the muſcle.

"That in this inſtance, we cannot comprehend by what power the nervous fluid or energy can be put in motion, muſt perhaps be granted; but has Dr. Haller given a better explanation of the manner in which his ſuppoſed vis inſita becomes active?

"If it be as difficult to point out the cauſe of the action of the vis inſita as that of the action of the vis nervea, the admiſſion of that new power, inſtead of relieving, would add to our perplexity.

"We ſhould then have admitted, that two cauſes of a different nature were capable of producing exactly the ſame effect; which is not in general agreeable to the laws of nature.

"We ſhould find other conſequences ariſe from ſuch an hypotheſis, which tend to weaken the credibility of it. For inſtance, if in a ſound animal the vis nervea alone produces the contraction of the muſcles, we will aſk what purpoſe the vis inſita ſerves? If both operate, are we to ſuppoſe that the vis nervea, impelled by the mind or living principle, gives the order, which the vis inſita executes, and that the nerves are the internuntii; and ſo admit two wiſe agents employed in every the moſt ſimple action? But inſtead of ſpeculating farther, let us learn the effect of experiments, and endeavour from theſe to draw plain concluſions.

"1. When I poured a ſolution of opium in water under the ſkin of the leg of a frog, the muſcles, to the ſurface of which it was applied, were very ſoon deprived of the power of contraction. In like manner, when I poured this ſolution into the cavity of the heart, by opening the vena cava, the heart was almoſt inſtantly deprived of its power of motion, whether the experiment was performed on it fixed in its place, or cut out of the body.

"2. I opened the thorax of a living frog; and then tied or cut its aorta, ſo as to put a ſtop to the circulation of its blood.

"I then opened the vena cava, and poured the ſolution of opium into the heart; and found, not only that this organ was inſtantly deprived of its powers of action, but that in a few minutes the moſt diſtant muſcles of the limbs were extremely weakened. Yet this weakneſs was not owing to the want of circulation, for the frog could jump about for more than an hour after the heart was cut out.

"In the firſt of theſe two experiments, we obſerve the ſuppoſed vis inſita deſtroyed by the opium; in the latter, the vis nervea; for it is evident that the limbs were affected by the ſympathy of the brain, and of the nervous ſyſtem in general, with the nerves of the heart.

"3. When the nerve of any muſcle is firſt divided by a tranſverſe ſection, and then burnt with a hot iron, or punctured with a needle, the muſcle in which it terminates contracts violently, exactly in the ſame manner as when the irritation is applied to the fibres of the muſcle. But when the hot iron or needle is confined to the nerve, Dr. Haller himſelf muſt have admitted, that the vis nervea, and not the vis inſita, was excited. But here I would aſk two queſtions.

"Firſt, Whether we do not as well underſtand how the vis nervea is excited when irritation is applied to the muſcle as when it is applied to the trunk of the nerve, the impelling power of the mind ſeeming to be equally wanting in both caſes?

"Secondly, If it appears that irritation applied to the trunk of a nerve excites the vis nervea, why ſhould we doubt that it can equally well excite it when applied to the ſmall and very ſenſible branches and terminations of the nerve in the muſcle?

"As, therefore, it appears that the ſuppoſed vis inſita is deſtroyed or excited by the ſame means as the vis nervea; nay, that when, by the application of opium to the heart of a frog, after the aorta is cut and the circulation interrupted, we have deſtroyed the vis inſita, the vis nervea is ſo much extinguiſhed, that the animal cannot act with the diſtant muſcles of the limb; and that theſe afterwards grow very torpid, or loſe much of their ſuppoſed vis inſita; it ſeems clearly to follow, that there is no juſt ground for ſuppoſing that any other principle produces the contraction of a muſcle."

The *vis nervoſa*, or operation of the mind, if we may ſo call it, by which a muſcle is brought into contraction, is not inherent in the muſcle like the *vis inſita*, neither is it perpetual, like this latter property. After long continued or violent exerciſe, for example, the voluntary muſcles become painful, and at length incapable of further action; whereas the heart and other involuntary muſcles, the motions of which depend ſolely on the *vis inſita*, continue through life in a conſtant ſtate of action, without any inconvenience or waſte of this inherent principle. In a word, the action of the vis nervoſa on the voluntary muſcles conſtitutes what is called muſcular motion; a ſubject that has given riſe to a variety of hypotheſes, many of them ingenious, but none of them ſatisfactory.

The nerves are diſtinguiſhed into two claſſes, viz. thoſe of the *encephalon* and thoſe proceeding from the *medulla ſpinalis*. Of the firſt there are generally ten pair reckoned, of the laſt thirty. We ſhall deſcribe the nerves in the order in which they are generally ranked, though it is not poſſible to proſecute the diſſection of them after the ſame manner; but to ſupply this deficiency, we ſhall afterwards mention the order wherein they may be all demonſtrated on one ſubject.

1. Of the ten pair proceeding from the encephalon, the firſt is the *olfactory*, which in brutes, juſtly enough, has the name of proceſſus mamillares beſtowed on them; but in man, are ſmall, long, and without any cavity. Riſing from that part of the brain where the carotid arteries are about to enter, and running under the anterior lobes of the brain, they become a little larger, till they reach the os cribriforme, into the foramina of which the ſmall filaments inſinuate themſelves, and are immediately ſpread on the membrana narium.

2. The ſecond pair are the *optic*, which ariſe ſingle from the thalami nervorum opticorum, and then uniting at the fore-part of the cella turcica, ſeem to be pretty much blended. They afterwards divide, and running obliquely forwards, paſs out at their proper orifice in the ſphenoide bone, and enter the globe of the eye to be expanded into the membrana retina. The blood-veſſels running through the middle of theſe nerves, and the ramifications of the retina are very obſervable, whence we may account for ſuch objects as fall on the entry of the optic nerve being loſt to us.

3. The third pair of nerves firſt appear at the anterior part of the proceſſus annularis, and going out at the foramen laceerum, are diſtributed to the globe of the eye, muſculus rectus Fallopii, attollens, adducens, deprimens, and obliquus minor; therefore this pair has juſtly got the name of *motores oculi*.

4. The fourth pair, which are the ſmalleſt of any, derive their origins from the anterior lateral part of the proceſſus annularis, and go out at the foramina lacera, to be entirely ſpent on the muſculi trochleares, or obliqui majores oculorum, to

which muſcles chiefly the rotatory motion of the eyes in ogling, and their advance forwards in ſtaring is to be attributed. For theſe reaſons anatomiſts have called theſe nerves *pathetici*.

5. The fifth pair ariſe from the ſides of the annular proceſs, and after piercing the dura mater divide into three branches. The firſt of theſe is the *ophthalmic*, which, as it is about to enter the orbit by the foramen lacerum, ſends off a ſmall chord that aſſiſts in the formation of the intercoſtal, and then the nerve is diſtributed to the glandula lacrymalis, fat, membranes, and palpebræ of the eye, while it ſends one conſiderable branch through the orbiter internus anterior hole to be diſtributed through the membrana narium, and a ſecond paſſes the foramen and ſupercilia to ſupply the muſcles and teguments of the forehead. Hence we may account for the muſcles of reſpiration being ſo much affected on the application of any ſubſtance to the membrana narium, which provokes that violent convulſive motion called ſneezing. The ſecond branch of the fifth pair, which may be called *maxillaris ſuperior*, paſſes out through the foramen rotundum oſſis ſphenoidis, and immediately gives nerves to the fat under the crotaphite muſcle, and to the palate, ſinus ſphenoidalis, and noſtrils. The remaining trunk inſinuating itſelf into the channel on the top of the antrum Highmorianum, to which cavity and to the teeth of the upper jaw it gives ſmall twigs, at laſt comes out at the orbiter externus hole, and is ſpent on the muſculus orbicularis palpebrarum, noſe, and upper lip, where ſome branches of the ſeventh pair ſeem to unite themſelves to different portions of this. The third branch, or *maxillaris inferior*, goes out at the foramen ovale, and ſoon dividing into a great many branches, is diſtributed to the muſculus crotaphites, maſſeter, pterygoides, digaſtricus, buccinator, mylohyoideus, geniohyoideus, genioglooſſus and baſio-glooſſus, glandula ſublingualis, maxillaris inferior, and parotis; and laſtly, to the external ear, where it ſeems to join the portio dura to the ſubſtance of the tongue, in which it is pretty much confounded with the ninth pair. From the root of this laſt branch the *chorda tympani* is reflected. The laſt ramification of this branch which we ſhall mention, is that which enters into the canal of the lower jaw, furniſhes the teeth there, and comes out at the chin, on which and the lower lip it is beſtowed; at this place it is again conjoined to the ſeventh pair.

6. The ſixth pair of nerves ariſing from the fore part of the corpora pyramidalia, after piercing through the dura mater, give off a branch, which, joined with the reflected portion of the ophthalmic branch of the fifth pair, forms the original of the *intercoſtal*, paſſes through the foramen lacerum to be ſpent entirely on the muſculus abductor oculi.

7. The ſeventh pair iſſues out from the ſide of the root of the annular proceſs, and entering the meatus auditorius internus, and immediately dividing, one part ſoon loſes its firm coats, and is expanded on the inmoſt camera of the ear, while the other paſſing through the aquæductus Fallopii comes out of the ſcull involved in all its coats between the ſtyloide and maſtoide proceſſes. Hence we ſee the reaſon of the firſt being named *portio mollis*, and the other *dura*. This laſt after its exit ſupplies the muſculi obliqui capitis ſtylohyoidei, ſtyloglooſſi, and ſtylopharyngæi, and platyſma-myoides, on which, and to the ſkin of the neck, a great number of its ſmall filaments run, which are ſometimes cut in opening the jugular vein, whence ariſe pain at firſt, and a little numbneſs afterwards. The ſuperior branches of it ſupply the parotid gland, external ear, and whole ſide of the face as far forwards as the chin. It is ſaid to communicate thrice with the fifth pair, and twice with the ſecond vertebra.

8. The eighth pair of nerves derive their origin from the ſide of the baſis of the corpora olivaria, where their looſe filamentous texture is very conſpicuous; then running to the hole common to the oſſa temporum and occipitis, they are there joined by the acceſſorius Williſii, which has its beginning from the two or three ſuperior nerves of the medulla ſpinalis, and mounts upwards thither, to paſs out with the eighth pair, at that common foramen juſt now mentioned. Very ſoon after they, incloſed in the ſame coat, have got out of the cranium, the acceſſorius ſeparates from its companion, and after paſſing through the middle of the muſculus maſtoideus, is loſt in the muſculus trapezius and rhomboides ſcapulæ; while the large trunk, which, from the great number of branches it ſends off, obtains the name of *vagus*, runs ſtraight down the neck, near the carotid artery, in its courſe giving ſeveral branches to the larynx. After entering the thorax, it ſplits into two portions, the anterior of which ſerves the pericardium, ſends branches to join with thoſe of the intercoſtal that go to the heart, and then on the right ſide turns round the ſubclavian, and on the left round the ductus arterioſus, to mount again upwards at the ſide of the œſophagus and be loſt in the larynx. This recurrent branch it is that we are cautioned to avoid in bronchotomy, though for no good reaſon. The poſterior branch of the eighth pair goes along with the œſophagus, and ſupplies the lungs, the gula, and ſtomach very plentifully; and as all the nerves beſtowed on this viſcus enter at its ſuperior orifice, the ſenſation here muſt be very acute, whence Van Helmont imagined the orifice of the ſtomach to be the ſeat of the ſoul. What remains of this par vagum is adjoined to the intercoſtal immediately below the diaphragm.

9. The ninth pair appear firſt at the inferior part of the corpora pyramidalia, paſs out at their proper holes of the occipitis, and after ſending off ſome nerves to the glandula thyroidea, and muſculi ſterno-hyoidei, and ſterno-thyroidei, are loſt in the ſubſtance of the tongue. Authors have diſputed whether this ninth or the fifth is the guſtatory nerve.

10. The tenth pair proceeds from the beginning of the medulla ſpinalis, betwixt the os occipitis and firſt vertebra colli, and is all, except what goes to the ganglion of the intercoſtal, ſpent on the muſculi obliqui, and extenſores capitis.

The only nerves proceeding from the encephalon not deſcribed, are the reflected branches of the fifth and ſixth, which indeed are ſo ſmall and pappy, and hid by the carotid artery as they go out with it in its crooked canal, as not to be eaſily traced; but whenever they have eſcaped from the os petroſum, they are joined by branches from the eighth, ninth, tenth, and firſt and ſecond ſpinal, and the largeſt ganglion of the body is formed, from which the nerve named now intercoſtal, goes out to deſcend down the neck with the carotid, ſupplying in its courſe the flexor muſcles of the head and neck, and communicating with the cervical nerves. As the intercoſtal nerve is about to enter the thorax, it again forms a ganglion, from which the nerves to the trachea, and the heart are ſupplied, which join with the branches of the eighth, and paſs between the two large arteries and auricles to the ſubſtance of that muſcle. The intercoſtal after this runs down on the ſide of the vertebræ of the cheſt, having additional nerves conſtantly ſent to it from between theſe vertebræ, till it paſſes through its own proper opening through the diaphragm; whence it again forms another ganglion cloſe by the glandulæ renales, into which the eighth pair enter. From a ſimilar knot on each ſide, the nerves of the inteſtines, liver, ſpleen, pancreas, and kidneys are derived; nay the extremity of this nerve is ſent down into the pelvis to ſupply the parts contained in it. Hence their ſtrong ſympathy with each other may be eaſily imagined, and a reaſon may be given for the violent vomiting that commonly attends the nephritic paroxyſms, and for the colic and ſtomach-achs, which often precede obſtructions of the menſes in women.

11. Before we proceed to the ſpinal nerves, we ſhall point out the order in which the nerves already deſcribed are to be diſſected, in order to demonſtrate them all in one ſubject; but to them we muſt annex the three firſt cervical nerves, for a reaſon which will hereafter be evident.

Portio dura ſeptimi, frontalis quinti, facialis quinti, mentalis quinti, ſpinalis ſecundus, ſpinalis primus, olfactorius, ophthalmicus quinti, motorius oculi, patheticus ſextus, opticus, maxillaris inferior quinti, maxillaris ſuperior quinti, acceſſorius Williſii, nonus, decimus, octavus intercoſtalis, portio mollis ſeptimi.

The thirty pair of nerves proceeding from the medulla ſpinalis are generally divided into four ſpecies; of the neck ſeven, of the back twelve, of the loins five, and of the os ſacrum ſix. Now as the medulla ſpinalis has none of theſe inequalities ſo obſervable on the medulla oblongata encephali, the riſe of the nerves is not ſo accurately deſcribed, being only determined by the bones through which they paſs.

The firſt cervical goes out between the firſt and ſecond vertebra, and, after ſending off branches that communicate with the tenth and ſecond vertebral, is ſpent on the muſculus flexus colli, ſplenius, complexus, and teguments of the occiput.

The ſecond cervical communicates with the ninth, and with the firſt and third of the neck, and then is diſtributed to the teguments of the neck and ſide of the head, and to the glandula parotis and external ear, where it joins with the portio dura.

The third of the neck paſſes out between the third and fourth vertebra, ſoon communicating with the ſecond, and ſending down a large branch, which being joined by another from the fourth forms the phrenic nerve that runs along the pericardium and is loſt in the diaphragm. In this courſe the right phrenic is obliged to make a ſmall turn round that part of the pericardium which covers the apex of the heart. The other branches of this third cervical are diſtributed to the muſculus trapezius and deltoides, and to the teguments on the top of the ſhoulder; which, with the deſcription of the eighth pair, leads us evidently to the cauſe of Hippocrates's obſervation, that an inflammation of the liver is generally attended with a hiccough; and a ſuppuration of that viſcus, with a violent pain on the top of the ſhoulder.

The fourth cervical nerve, after ſending off that branch which joins with the third to form the phrenic, runs ſtraight to the axilla, where it meets with the fifth, ſixth, and ſeventh cervicals, and firſt dorſal. All theſe eſcape in the interſtices of the muſculi ſcaleni; and all of them are ſo often conjoined and blended, after they have given off nerves to the muſcles of the neck, ſcapula, arm, and thorax, and to the teguments, that when the ſeveral ramifications go off in the axilla to the different parts of the ſuperior extremity, it is impoſſible to determine which of them the branches belong to. The conſiderable branches into which they are divided, are ſix; and to theſe proper diſtinguiſhing names have been given, by which the young anatomiſt's memory will be aſſiſted.

1. *Cutaneus* runs down the fore-part of the arm, and ſerves the teguments, as far as the palm of the hand and fingers.

2. *Muſculo-cutaneus*, or *perforans caſſerii*, paſſes through the muſculus coracobrachialis, and after ſupplying the biceps and brachiæus internus, is ſpent on the teguments of the back of the cubitus and hand.

3. *Muſcularis*, which runs down the fore-part of the arm to be loſt in the muſculi flexores carpi, digitorum, &c.

4. *Ulnaris*, which ſupplies the extenſores cubiti, and teguments of the elbow, and then paſſing through the ſinuoſity at the back of the external condyle of the humerus, runs along the ulna, where it gives portions to the teguments and and neighbouring muſcles. At length it is loſt in the back of the hand, muſculi interoſſei, and lumbricales in the little finger, and ſide of the ring finger next to this. The courſe of this nerve is ſufficiently felt, when we lean on our elbow, by the inſenſibility and prickling pain in the parts to which it is diſtributed.

5. *Radialis* goes down the fore-part of the arm, near the radius, beſtowing branches in its progreſs on the circumjacent muſcles; then dividing at the ligamentum annulare carpi it is ſent to the thumb, fore finger, middle finger, and half the ring finger, and to the back of the hand.

6. *Articularis* runs almoſt round the top of the os humeri, and ſerves the muſculi extenſores, cubiti retractores, and elevatores humeri.

The twelve dorſal nerves all communicate with one another. As ſoon as they make their way out between the vertebræ, each of them gives a poſterior branch to the muſculi erectores trunci corporis. The firſt, after having ſent off the brachial nerve, already deſcribed, is, after the ſame manner with the ſucceeding eight, beſtowed on the pleura and intercoſtal muſcles. The tenth and eleventh are moſt of them ſent to the abdominal muſcles. The twelfth communicates with the firſt lumbar, and is beſtowed on the muſculus quadratus lumbalis and iliacus internus. See Pl. 14. fig. 5.

The fifth lumbar alſo communicates and gives poſterior branches. The firſt ſends ſeveral branches to the abdominal muſcles, pſoas, and iliacus, while others go from it to the teguments and muſcles on the ſuperior and anterior part of the thigh; and the main trunk of it is loſt in the crural. The ſecond paſſes through the pſoas muſcle, and is diſtributed much as the former. The third is loſt in the muſculus pectineus. Branches proceeding from the firſt, ſecond, and third, make up one trunk, which runs along the anterior part of the pelvis, and ſlipping through a ſmall ſinuoſity in the anterior part of the foramen magnum iſchii, is ſpent in the muſculus triceps. This nerve is commonly known by the name of *obturator*, or *poſterior crural* nerve. By the union of branches from the firſt, ſecond, third, and fourth lumbar nerves, the anterior crural nerve is formed, which running along the pſoas muſcle, eſcapes with the large blood-veſſels out of the abdomen below the tendinous arcade of its muſcles, and is diſtributed to the muſcles and teguments on the fore-part of the thigh. One branch of this crural nerve accompanies the vena ſaphena as far as the ancle. The remainder of the fourth and the fifth lumbar nerves join with the firſt, ſecond, and third that proceed from the os ſacrum. Theſe five, when united, conſtitute the largeſt nerve of the body, ſo well known by the name of the *ſciatic*, or *iſchiatic* nerve, which ſeems to be bigger, in proportion to the part for the uſe of which it is deſigned, than the nerves of any other part are. The intention of this may be to afford ſufficient ſtrength to the muſcles of the lower extremity, for exerting a force ſuperior to what is required in any other part of the body. When the functions of this nerve are in any way impeded, we know how difficult it is to ſupport ourſelves, or to walk. The ſciatic nerve goes out at the large hollow behind the great tubercle of the os iſchium, and paſſing over the quadrigemini muſcles, runs down the poſterior part of the thigh, giving off, every where as it goes, nerves to the teguments and muſcles of the thigh and leg. At the ham it divides into two; the ſmaller part mounts over the fibula, and ſerving the muſculi peronei, flexores pedis, and extenſores digitorum, is continued to the toes along the broad of the foot, while the larger trunk ſinks under the muſculi gemelli, and then divides. One part of this diviſion is ſpent in the muſcles at the back of the leg and teguments, while the other is continued by the inner ancle to the foot.

Theſe then ſubdivide; one branch of each ſubdiviſion is diſtributed after the ſame manner as the ulnaris, and the other as the radialis in the hand. The other nerves that come out of the os ſacrum, are ſent to the organs of generation, muſculi levatores ani, and obturatores.

EXPLANATION of PLATE XIV.

FIG. 1. *A View of the Heart and Blood Veſſels.*

1. The right ventricle of the heart of a fœtus injected with wax. 2. The right auricle. 3. The left auricle. 4. Branches of the pulmonary veins of the right lobe of the lungs, thoſe of the left being cut off ſhort. 5. The arteries of the left lobe of the lungs. 6. The vena cava deſcendens. 7. Aorta aſcendens. 8. Arteria pulmonalis. 9. Ductus arterioſus.

FIG. 2. *Another View of the Blood Veſſels.*

10. The umbilical vein. 11. Branches of the vena portarum in the liver. 12. Ductus venoſus. 13. Branches of the cava in the liver. 14. Vena cava.

FIG. 3. *The Inſide of the Arm diſſected, to ſhew the Courſe of the Veins, Artery, &c.*

1. Part of the biceps flexor cubiti. 2. The faſcia tendinoſa from that muſcle, which is liable to be pricked in opening the baſilic vein. 3. The humeral artery, on each ſide of which is a large vein. 4. Vena cephalica. 5. Vena mediana. 6. Vena baſilica.

FIG. 4. *Exhibits the Trunk of the Human Subject, prepared to ſhew the Lymphatic Veſſels and the Ductus Thoracicus.*

1. The neck. 2, 2. The two jugular veins. 3. The vena cava ſuperior. 4, 4, 4, 4. The ſubclavian veins. 5. The beginning of the aorta, pulled to the left ſide by means of a ligature, in order to ſhow the thoracic duct behind it. 6. The branches ariſing from the curvature of the aorta. 7, 7. The two carotid arteries. 8, 8. The firſt ribs. 9, 9. The trachea. 10, 10. The ſpine. 11, 11. The vena azygos. 12, 12. The deſcending aorta. 13. The cœliac artery, dividing into three branches. 14. The ſuperior meſenteric artery. 15. The right crus diaphragmatis. 16, 16. The two kidneys. 17. The right emulgent artery. 18, 18. The external iliac arteries. 26, 29. The muſculi pſoæ. 19. The internal iliac artery. 20. The cavity of the pelvis. 21, 21. The ſpine of the os ilium. 22, 22. The groins. 23. A lymphatic gland in the groin, into which lymphatic veſſels from the lower extremity are ſeen to enter. 24, 24. The lymphatic veſſels of the lower extremities paſſing under Poupart's ligament. 25, 25. A plexus of the lymphatic veſſels lying on each ſide of the pelvis. 26. The pſoas muſcle with lymphatic veſſels lying upon its inſide. 27. A plexus of lymphatics, which having paſſed over the brim of the pelvis at (25), having entered the cavity of the pelvis, and received the lymphatic veſſels belonging to the viſcera contained in that cavity, next aſcends, and paſſes behind the iliac artery to (29). 28. Some lymphatic veſſels of the left ſide paſſing over the upper part of the os ſacrum, to meet thoſe of the right ſide. 29. The right pſoas, with a large plexus of lymphatics lying on its inſide. 30, 30. The plexus lying on each ſide of the ſpine. 31. Spaces occupied by the lymphatic glands. 32. The trunk of the lacteals, lying on the under ſide of the ſuperior meſenteric artery. 33. The ſame dividing into two branches, one of which paſſes on each ſide of the aorta; that of the right ſide being ſeen to enter the thoracic duct at (34). 34. The thoracic duct beginning from the large lymphatics. 35. The duct paſſing under the lower part of the crus diaphragmatis, and under the right emulgent artery. 36. The thoracic duct penetrating the thorax. 37. Some lymphatic veſſels joining that duct in the thorax. 38. The thoracic duct paſſing under the curvature of the aorta to get to the left ſubclavian vein; the aorta being drawn aſide to ſhow the duct. 39. A plexus of lymphatic veſſels paſſing upon the trachea from the thyroide gland to the thoracic duct.

FIG. 5. *Nerves.*

1. The deſcending intercoſtal nerve. 2. Nerves of the neck. 3. The brachial nerves. 4. A ganglion in the deſcending intercoſtal nerve. 5. Branches from the intercoſtal nerve to the viſcera. 6. A probe paſſed under ſome of the intercoſtal nerves that paſs out between the ribs. 7. The anterior crural nerves.

FIG. 6. *A Repreſentation of the Uterus and its Appendages, the Vagina being ſlit open to ſhew the internal Parts.*

1. That ſide of the uterus which is next the gut. 2. The fallopian tubes. 3. The fimbriæ. 4. Ovaria. 5. The mouth of the uterus. 6. Ligamenta rotunda. 7. The inſide of the vagina. 8. The orifice of the meatus urinarius. 9. The glans clitoridis. 10. The external labia of the vagina. 11. The nymphæ, which are continued from the præputium clitoridis.

PART VI.

SECT. I. *Of the Kidneys, Bladder, and Urinary Paſſages.*

THE urinary parts are the kidneys with their veſſels and bladder of urine, and to theſe we may add the *glandulæ renales*.

1. The *kidneys* in the human ſubject greatly reſemble thoſe of the hog; and are in weight about twelve ounces. They are ſeated towards the upper part of the loins upon the two laſt ribs; the right under the liver, and a little lower than the other, and the left under the ſpleen. Their uſe is to ſecrete the urine from the blood, which is brought thither for that purpoſe by the emulgent arteries; and what remains after the functions of the gland have been performed, is returned by the emulgent veins, while the urine ſecreted is carried through the ureters into the bladder.

2. The *ureters* are two tubes, each of them about the bigneſs of a gooſe quill, and about a foot long. They ariſe from the indented ſide of the kidneys, and end in the bladder near its neck, running obliquely for the ſpace of an inch between its coats, by which mode of entering, their extremities form a kind of valves. The beginning of the ureters in the kidneys are the *tubuli urinarii*, which joining together form the pelvis in each kidney. Between the tubuli urinarii, authors have remarked ſmall papillæ; and the parts which are diſtinguiſhed by a clearer colour are called glandulæ.

3. The *bladder* of urine is ſeated in a duplicature of the peritonæum in the lower part of the pelvis of the abdomen. Its ſhape is orbicular, and its coats are the ſame with thoſe of the inteſtines and other hollow muſcles already deſcribed; viz. an external membranous, a middle muſcular, which is the

muſculus detruſor urinæ, and an inner membranous coat, exceedingly ſenſible, as is well known to thoſe who have the ſtone or are troubled with the gravel. The uſe of this nice ſenſe is to make it capable of that uneaſineſs which excites animals to exclude their water, when the bladder is diſtended. This ſenſe indeed is naturally ſo delicate, that no fluid but healthy urine can be long endured; even pale urine, or urine with matter in it, in a degree excites the ſymptoms of the ſtone, and forces the patient to evacuate the bladder. Some writers have ſuppoſed the exiſtence of a ſhort paſſage for fluids into the bladder, judging from the copious and ſpeedy evacuations of pale urine which ſucceed the drinking of weak intoxicating liquors, of mineral waters, &c. But the fact is, that there does not ſeem to be any other way for the urine to paſs than that by the kidneys and along the courſe of the ureters. For the bladder is, on all ſides, ſeparated from the cavity of the abdomen by the peritonæum; nor is it probable that the vapours, which either go out from the bladder, or which are derived towards it from other parts, can here find open pores through the peritonæum. The bladder may be ſo diſtended with urine as to produce death; yet, in theſe caſes, we never obſerve that the urine has found any paſſage through which it might eſcape into the pelvis. Again, when the ureters are obſtructed with ſtones, ſo that the bladder receives nothing from them, it is either quite empty, or contains a very acrimonious and thick urine, manifeſtly indicating that the water can find no other way from the kidney into the bladder. A careful attention indeed to the manner in which mineral waters are diſcharged by urine, ſufficiently demonſtrates that there is no ſuch rapidity therein as is commonly imagined; but the ſtimulus of the cold water received into the ſtomach, like the external cold applied to the ſkin, cauſes a concuſſion of the bladder and urinary parts, by which they are ſolicited to repeated diſcharges of the old urine which was before in the body, and not immediately of that which was laſt drunk. Again, the largeneſs of the renal veſſels demonſtrates, that they cannot receive much leſs than an eighth part of the blood of the whole body at a time, and conſequently above 1000 ounces of blood are conveyed through the kidneys in an hour; and it will appear but a moderate allowance for 20 or even 50 ounces of water to diſtil from that quantity of blood in the ſame time. Finally, it is certain, that both men and brute animals periſh if the ureters are obſtructed; and we then obſerve alſo that no urine paſſes to the bladder.

4. *Glandulæ renales* are two glands ſeated immediately above the kidneys, of no certain figure, nor do we know their uſe; but anatomiſts always deſcribe them along with the urinary parts, becauſe of their ſituation. In a very young fœtus they are larger than the kidneys, and in an adult but a little larger than in the fœtus. They receive a great many ſmall arteries, and return each of them one or two veins. In their inſide is a ſmall ſinus, tinctured with a ſooty-coloured liquor.

Sect. II. *Of the Parts of Generation in Males.*

The parts of generation in males are of different kinds, ſome of them being wholly contained in the abdomen, and others lying on the outſide. Theſe parts we ſhall proceed to notice in their order.

1. The *teſtes* are ſeated in a looſe external membranous bag called the *ſcrotum*. Their office is to ſeparate the ſemen from the blood. They are ſaid to have four coats, two common, and two proper. The common are the outer ſkin and a looſe membrane or muſcle immediately underneath, called *dartos*. The firſt of the proper is the *tunica vaginalis*. It is continued from the peritonæum to the teſticle, which it incloſes with all its veſſels, but is divided by an adheſion or *ſeptum* immediately above the teſticle, ſo that no fluids can paſs out of that part of this membrane, which incloſes the teſticle. The other proper coat is the *tunica albuginea*, which is very ſtrong, and which immediately inveſts the teſticles. The teſtes receive each one artery from the aorta, a little below the emulgents. Theſe, unlike all other arteries, ariſe ſmall, and dilate in their progreſs, that the velocity of the blood may be ſufficiently abated for the ſecretion of ſo viſcid a fluid as the ſemen. The right teſticle returns its vein into the cava, and the left into the emulgent vein on the ſame ſide, both becauſe it is the readieſt courſe, and becauſe, as authors ſay, this ſpermatic vein would have been obſtructed by the pulſe of the aorta, if it had croſſed that veſſel to go to the cava. On the upper part of the teſticles, are hard bodies called *epididymi*; which are evidently formed of the *vaſa deferentia*. They may without difficulty be unravelled backward, in ſingle veſſels, and then into more and ſmaller, like the excretory veſſels of ſome other glands.

2. *Vaſa deferentia* are excretory ducts to carry the ſecreted ſemen into the *veſiculæ ſeminales*. They paſs from the epididymi of the teſticles, along with the blood-veſſels, till they have entered the muſcles of the abdomen; and then they paſs under the peritonæum, directly through the pelvis, to the veſiculæ ſeminales.

3. *Veſiculæ ſeminales* are two bodies that appear like irregular veſicles. They are ſeated under the bladder near its neck. They may be each of them unfolded into one ſingle duct, which diſcharges into the urethra, by the ſides of the *caput gallinaginis*, which is an eminence in the under ſide of the urethra near the neck of the bladder. In theſe veſicles or ducts, the ſemen is depoſited preparatory to the time of coition; but in dogs there are no veſiculæ ſeminales, therefore nature has given them a large bulb in the penis, which keeps them coupled, ſeemingly againſt their inclination, till the ſeed can be ſecreted and emitted into the uterus of the female. The ſemen paſſes from theſe veſiculæ in men in time of coition, through proſtate glands into the urethra, and is thence emitted.

4. *Proſtatæ* are two glands, or rather one, about the ſize of a nutmeg. They lie between the veſiculæ ſeminales and penis, under the oſſa pubis, almoſt within the pelvis. They ſeparate a limpid glutinous humour which is carried into the urethra by ſeveral ducts, that enter near thoſe of the proſtatæ. This liquor ſeems deſigned to be mixed with the ſemen in the time of coition, in order to make it flow more eaſily through two ſhort paſſages, which open into the urethra cloſe to a little eminence called *verumontanum*.

5. The *penis* is the vehicle or active organ of procreation. It is compoſed of two columns, the *corpora cavernoſa* and *corpus ſpongioſum*. The former, which conſtitute the greateſt part of the penis, are two cylindrical ligamentous tubes compoſed of minute cells of a ſpongy texture, which communicate with each other. Theſe two bodies are of a very pliant texture, and capable of conſiderable diſtenſion; and being united laterally to each other, occaſion by this union a ſpace above and another below. The uppermoſt of theſe ſpaces is filled by the blood-veſſels, and the lower one, which is the largeſt, by the urethra and its corpus ſpongioſum. Theſe two cavernous bodies are at firſt only ſeparated by a partition of tendinous fibres, which allow them to communicate with each other; but they afterwards divaricate from each other like the branch of a tree, and diminiſhing gradually in ſize, are attached, one on each ſide, to the inferior portion of the os pubis. The *corpus ſpongioſum penis*, begins as ſoon as the urethra has paſſed the proſtate, with a thick origin almoſt like a heart, firſt under the urethra, and afterwards above it, becoming gra-

dually thinner, and ſurrounding the whole canal of the urethra, till it terminates in a conſiderable expanſion, and conſtitutes what is called the *glans penis*, which is exceedingly vaſcular, and covered with papillæ like the tongue.

The penis is inveſted by the common integuments, but the cutis is reflected back from the glans, and covering it in a relaxed ſtate, is called *prepuce*.—The prepuce is tied down to the under part of the glans by a ſmall ligament called *frænum*, which is in fact only a continuation of the cuticle and cutis.

6. The *urethra* is a membranous canal, paſſing from the bladder through the whole extent of the penis. It affords a conveyance to the ſemen, which we have obſerved is occaſionally diſcharged into it from the veſiculæ ſeminales. The direction of this canal being firſt under and then before the pubis, occaſions a winding in its courſe from the bladder to the penis, not unlike the turns of the letter *S*.

The penis has three pair of muſcles, the erectores, accelleratores, and tranſverſales. Its arteries are chiefly derived from the internal iliacs. Some of them are ſuppoſed to terminate by pabulous orifices within the corpora cavernoſa and corpus ſpongioſum; and others in veins. Its nerves are large and numerous. They ariſe from the great ſciatic nerve, and accompany the arteries in their courſe through the organ.

The penis being of a ſpongy texture, the blood is conſtantly paſſing into its cells through the ſmall branches of the arteries which open into them, and is from thence as conſtantly returned by the veins, ſo long as the corpora cavernoſa and corpus ſpongioſum continue to be in a relaxed and pliant ſtate. But when, through the influence of deſire, the erectores penis, &c. contract, the veins undergo a degree of compreſſion, and the paſſage of the blood through them is ſo much impeded, that it collects in them in a greater proportion than they are enabled to carry off. Hence the penis gradually enlarges; and being more and more forcibly drawn up againſt the os pubis, the vena magna itſelf is at length compreſſed, and the penis becomes erect.

Sect. III. *Of the Female Organs of Generation.*

Anatomical writers uſually divide the female organs of generation into *external* and *internal*. In the firſt diviſion they include the *mons veneris*, *labia pudendi*, *clitoris*, *nymphæ*, and *carunculæ myrtiformes*; and in the latter the *vagina*, with the *uterus* and the parts connected with it.

1. *Mons veneris* is that conſiderable riſing of fat which is covered with hair and ſituated above the *foſſa magna* upon the os pubis. The great doubling of the ſkin on each ſide the rima forms what are called the *labia*; and within theſe there is a leſſer doubling or fold named *nymphæ*. Theſe help to cloſe up the orifice of the vagina; and alſo anſwer certain uſeful purpoſes in parturition.

2. *Clitoris* is a ſmall ſpongy body, bearing ſome ſlight analogy and reſemblance to the penis in men; but it has no perforation. It begins with two crura from the oſſa iſchia, and uniting under the oſſa pubis, it proceeds to the upper part of the nymphæ, where it ends under a ſmall doubling of ſkin called *præputium*: the end which is thus covered is called *glans*. This part has been ſuppoſed the chief ſeat of a woman's pleaſure in coition, as the glans penis is in men, but this is ſomewhat doubtful. A little below the clitoris, juſt within the vagina, is the exit of the *meatus urinarius* which forms a ſmall riſing or nipple.

3. The *vagina* is ſeated between the bladder and rectum. The texture of it is membranous, and its orifice is contracted by muſcles which act like a ſphincter; yet the poſterior extremity of it is capacious enough to contain the penis without dilating. The inner or poſterior extremity of this great canal ſurrounds the orifice of the uterus a little obliquely, in ſuch a manner as that the upper ſide of the canal lies very near the orifice, and the lower ſide at a greater diſtance from it; and this makes the extremity of the uterus appear to advance more into the canal on the lower than on the upper part.

4. *Circulus membranoſus.* The anterior extremity of the vagina in virgins, and eſpecially before the menſes appear, is commonly bordered by circular membranous folds more or leſs ſmooth, and ſometimes ſemilunar; which, in ſome ſubjects, leaves but a very ſmall opening, in others a larger opening; and, in all, renders the external oriſice narrower than the reſt of the cavity. This fold, called *hymen*, is formed by the union of the internal membrane of the great canal with that on the inſide of the alæ, and repreſents a membranous circle of different breadths, and ſometimes uneven.

5. *Carunculæ.* This membranous circle is ruptured in coitu; quite loſt in delivery, and afterwards only ſome irregular portions of it remain; which, from their ſuppoſed reſemblance to myrtle-leaves, have been termed *carunculæ myrtiformes*.

6. *Uterus* is ſeated at the termination of the vagina. In the virgin ſtate it is about one inch thick, two broad, and large enough to contain the kernel of a hazel nut; but in women that have had children it is a little larger. Its orifice into the vagina is called *os tincæ*, from the reſemblance it bears to a tench's mouth. It has two round ligaments which go from the ſides of it to the groins through the oblique and tranſverſe muſcles of the abdomen, in the ſame manner as do the ſeminal veſſels in men. It is by this way that the gut paſſes in a hernia inteſtinalis in women. Near theſe are the *ligamenta lata*, which are nothing more than a duplicature of the peritonæum.

7. Near the ſides of the uterus, and attached to the ligaments, are two bodies called *ovaria*. Theſe are of a depreſſed oval figure, about half the ſize of men's teſticles, and have ſpermatic veſſels. They contain ſmall pellucid eggs, from which circumſtance they take their name. There are two arteries and two veins which paſs to and from theſe ovaries or teſtes, in the ſame manner that they do in men; but make many more windings, and the arteries dilate more ſuddenly, in proportion as they are ſhorter. Theſe arteries and veins detach branches into the uterus and fallopian tubes, and not only form communications between the artery and vein on one ſide and thoſe of the other, but alſo with the proper veſſels of the uterus, which are detached from the internal iliac arteries and veins. From the minute branches of theſe veſſels within the uterus, the menſtrual evacuations are performed.

8. *Tubæ Fallopianæ.* Theſe are two flaccid, conical, and vermiform canals, ſituated tranſverſely on each ſide of the uterus, between the fundus and the lateral parts of the pelvis, and included in the anterior duplicatures of the ligamenta lata. Each of them is fixed by its narrow extremities in the corner of the fundus uteri, into which it opens, though by ſo narrow a duct as hardly to admit a large briſtle. From thence their diameter augments by degrees all the way to the other extremity, where it is about one-third of an inch. The body of each tube goes in a winding courſe, and its large extremity is bent towards the ovaria. Theſe large extremities terminate by a narrow orifice, a little plaited and turned toward the ovarium, where it preſently expands in form of a membranous fringe called *fimbriæ*, whoſe office is to receive the ovum in the time of coition, and convey it into the uterus through the fallopian tubes.

It might ſeem proper in this place to ſpeak of the *fœtus in utero*; but as this ſubject will be noticed at length in the treatiſe on Midwifery, of which it muſt of neceſſity form a part,

its introduction here would be a needleſs repetition: we ſhall therefore proceed to thoſe ſubjects which are next in order.

Sect. IV. *Of the Eye.*

The general figure, ſituation, and uſe of the eyes, together with the eye-brows, eye-laſhes, and eye-lids, being well known, it is only neceſſary for us to deſcribe what is uſually ſhewn by diſſection. The *orbit* of the eye, or boney ſocket in which it is contained, is in all the vacant places filled with a looſe fat, which is a proper medium for the eye to reſt in, and ſerves as a ſocket for it to be moved in.

1. In the upper and outer part of the orbit is ſeated the *lachrymal gland*. Its uſe is to furniſh a watery ſecretion called the tears, which anſwer the end of waſhing off duſt, and keeping the outer ſurface of the eye moiſt, without which the tranſparent *cornea* would be leſs pellucid, and the rays of light diſturbed in their paſſage to the retina; and that this liquor may be rightly diſpoſed of, we are continually cloſing the eye-lids to ſpread it equally, even when we are not conſcious of doing ſo. At the inner corner of the eye, between the eye-lids, is a caruncle, which ſeems placed there to keep that corner of the eye-lids from being ſo totally cloſed as to hinder the diſcharge of tears or gummy matter from under the eye-lids during ſleep. Cloſe to this caruncle are ſituated the *puncta lachrymalia*, which are little holes, one in each eye-lid, deſigned to carry off the ſuperfluous tears into the *ductus ad naſum*.

2. The firſt membrane of the eye is called *tunica conjunctiva*. It covers ſo much of the eye as is called the white, and being reflected all round, lines the two eye-lids. Being thus returned from the eye to the inſide of the lids, it effectually hinders any extraneous bodies from getting behind the eye into the orbit, ſmooths the parts it covers, and thus renders the friction leſs between the eye and the eye-lids. This coat is very full of blood-veſſels, as appears when it happens to be attacked with inflammation.

3. *Tunica ſclerotica*, and *cornea*: theſe make together one firm and nearly globular caſe for the attachment of the other coats of the eye, and to contain its humours. The fore part of this ſtrong coat being tranſparent, and like horn, is called cornea, and the reſt ſclerotis. Under the cornea lies the *iris*, which is an opake membrane, like the tunica choroides, but of different colours in different eyes, ſuch as blue, grey, black, or hazel. The middle of the iris is perforated for the admiſſion of the rays of light, and is called the *pupil*. Immediately under the iris lie the proceſſus ciliares, like radial lines from a leſſer circle to a greater. When the iris contracts, it dilates the pupil, and by that means ſuffers more rays of light to enter into the eye; whilſt the contrary is effected by the circular fibres of the iris acting from the circumference towards the centre. But theſe changes are not made with great quickneſs, as appears from the eyes retaining the painful effects of a ſtrong light for ſome time after we come out of a dark place, and from our being unable at firſt to diſtinguiſh objects on going ſuddenly from a light place to a dark one. As the pupil always dilates in darker places, to receive more rays of light, ſo when any diſeaſe prevents the effect of thoſe rays, it dilates as in dark places to admit more light; this happens in the diſeaſe called *gutta ſerena*. In the human ſubject, the pupil is round, which enables us to ſee in every direction alike; it is alſo round in thoſe animals that are naturally the prey of other animals, both birds and beaſts. But quadrupeds of the graminivorous kind have it horizontally oblong, by which they are fitted to view a large ſpace over the earth; while animals of the cat kind, who climb trees and prey indifferently on birds or animals that hide in the earth, have their pupils oblong the contrary way, by which they can look upwards and downwards at the ſame time.

4. In the human eye, immediately under the ſclerotis, is a ſecond tunic or membrane very vaſcular, and of little firmneſs, called *choroides*. Indeed it takes its name from being furniſhed with a great number of veſſels. It has likewiſe been named *uvea*, on account of its reſemblance to a grape. Many modern anatomical writers have conſidered it as a production of the pia mater. This was likewiſe the opinion of the ancients; but the ſtrength and thickneſs of the choroides, when compared with the delicate ſtructure of the pia mater, are ſufficient proofs of their being two diſtinct membranes.

5. Immediately next to the tunica choroides, lies the *tunica retina*, which is the optic nerve expanded and co-extended with the choroides. Rays of light ſtriking upon this membrane, the ſenſation is conveyed by the optic nerves, to the common ſenſorium. Theſe nerves do not enter at the middle of the bottom of the eyes, but nearer the noſe; for thoſe rays of light being ineffectual for viſion that fall upon the entrance of the optic nerves, it is fit they ſhould ſo enter, as that the ſame object, or part of any object, ſhould not be unperceived in both eyes, as would have been the caſe, had they been otherwiſe inſerted; which appears from a common experiment of part of an object being loſt to one eye, when we are looking towards it with the other ſhut. In fiſh theſe nerves ariſe diſtinct from the oppoſite ſides of the brain, and croſs without uniting; but as theſe animals have their eyes ſo placed, as not to ſee the ſame object with both eyes at once, whilſt thoſe animals, whoſe optic nerves ſeem to unite, *do* ſee the ſame object with both eyes at once, one would ſuſpect, that in one they were joined to cauſe the object not to appear double, and that in the other they were kept diſtinct, to make the two eyes, which muſt view different objects at the ſame time, independent of each other. But yet the ſeeing objects ſingle ſeems not to depend upon any ſuch union, nor even on the circumſtance of the light ſtriking upon correſponding fibres of the nerves, as others have believed, but upon a judgment derived from actual experience; all objects appearing ſingle to both eyes in the manner we are moſt uſed to obſerve them, but in other caſes double. For though we have a diſtinct image from each eye ſent to the brain, yet while both theſe images are of an object ſeen in one and the ſame place, we conceive of them as one; ſo when one image appears to the eyes of a ſquinting perſon, in two different places, it gives the idea of two; and when two bodies are ſeen in one place, as two candles rightly placed, through one hole in a board, they appear one. Many caſes have happened greatly in favour of this opinion; and we may mention one in particular, where from a blow on the head, one eye became ſuddenly diſtorted, and the patient found every object appear double. By degrees however the moſt familiar objects became ſingle, and in time, all objects became ſo, without any amendment of the diſtortion.

6. Between the tunica choroides and retina there is interpoſed a black powdery ſubſtance called *nigrum pigmentum*. With the origin of this anatomiſts are as yet unacquainted, ſince no glandules can be diſcovered which may be thought to yield it. The uſe chiefly aſſigned it, is that of abſorbing the rays of light as they paſs through the tranſparent net-work of the retina, ſo as to render viſion more accurate. In animals that graze, this pigment is of a ſhining green colour, and probably cauſes a double impreſſion on the retina.

7. On the under ſide of the iris and within the eye, we obſerve many minute fibres, called *ciliary proceſſes*, which paſs in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are ſuppoſed to depend on the action of theſe proceſſes. Some have conſidered them as muſcular, but they are not of an irritable nature; others have ſuppoſed them to be filaments of nerves; but their real ſtructure has never yet been clearly aſcertained.

8. The inside of the eye is filled with three humours, called *aqueous*, *crystalline*, and *vitreous*. The *aqueous humour* lies foremost, and seems chiefly of use to prevent the crystalline from being easily bruised by rubbing, or a blow: and perhaps it serves for the crystalline humour to move forward in, while we view near objects, and backward for remoter objects; without which mechanism, or, in the place of it, a greater convexity in the crystalline humour in the former case, and a less convexity in the latter, it is difficult to imagine, according to the laws of optics, how we could so distinctly see objects at different distances. It has been insisted by some writers, that fish are able to draw their crystalline humour nearer to the bottom of the eye when they are out of water, and to throw it forwards when in water; because the rays of light are less refracted in passing from water through the crystalline humour than from air.

On the motions of this part in the human subject indeed, a new opinion has been advanced by Mr. Hunter, who, in the crystalline humour of the eye in many animals, but particularly in the cuttle fish, discovered a laminated and something like a muscular structure. By this kind of mechanism it is supposed, that instead of approaching or receding to accommodate itself to different distances, the crystalline possesses a power of augmenting or diminishing its convexity. But this subject as yet wants confirmation.

9. Next behind the aqueous humour lies the *crystalline*, of which we have just made mention. Its shape is that of a depressed spheroid; and it is distinctly contained in a very fine membrane or capsule called *aranea*. This humour being somewhat solid and of a convex form, has the effect of refracting the rays of light which pass through it; so that each pencil of rays from the same point of any object, may be united upon the retina, similar to what happens in a camera obscura. As transparent bodies refract the rays of light not only in proportion to their convexity but also in proportion to their different densities, whenever the crystalline humour is removed in the operation for the cataract, the aqueous possesses its place and becomes a lens; but that refracting light less than the crystalline, the patient needs a *convex* glass before he can see accurately. In some eyes, either this humour being too convex or too distant from the retina, the rays unite too soon, unless the object is held very near to the eye; and this fault is remediable only by a glass of an opposite sort, viz. by a *concave* glass, as the contrary fault, common to old persons, is by a *convex* glass. Had the eye been formed for a nearer view, the object to be viewed would often obstruct the light; if for a more distant view, light enough would not commonly be produced from the object to the eye. In fish the crystalline humour seems a perfect sphere, which is necessary for them, because light being less refracted from water through the crystalline humour than from air, that defect is compensated by a more convex lens.

10. The *vitreous humour* is a gelatinous transparent body which lies behind the crystalline, and fills up the greatest part of the globe of the eye. Its fore side is rendered concave by the impression of the crystalline, and its back side convex, in consequence of the globular shape of the organ. It serves as a medium to keep the crystalline humour and the retina at a due distance, and to transmit the rays of light which are reflected from external objects.

The eye receives its arteries from the internal carotid, through the foramina optica; and its veins pass through the foramina lacera, and empty themselves into the external jugulars. Besides the optic nerve which enters at its posterior part, the eye receives branches from the third, fourth, fifth, and sixth pair of nerves.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in such a manner as to form at the bottom of the eye a distinct image of the object we look at; and the point where these rays meet is called the *focus* of the eye. On the retina, as in a *camera obscura*, the object is painted in an inverted position; and it is only by habit that we are enabled to judge of its true situation, and likewise of its distance and magnitude. To a young gentleman who was born blind, and who was couched by Mr. Cheselden, every object (as he expressed himself) seemed to touch his eyes as what he felt did his skin; and he thought no objects so agreeable as those which were smooth and regular, although for some time he could form no judgment of their shape, or guess what it was in any of them that gave him pleasure.

To paint objects distinctly on the retina, the cornea is required to have such a degree of convexity, that the rays of light may be collected at a certain point, so as to terminate exactly on the retina.—If the cornea is too prominent, the rays, by diverging too soon, will be united before they reach the retina, as is the case with near-sighted people or *myopes*; and on the contrary, if it is not sufficiently convex, the rays will not be perfectly united when they reach the back part of the eye; and this happens to long-sighted people or *presbi*, being found constantly to take place as we approach to old age, when the eye gradually flattens. These defects are only to be supplied by glasses adapted to their particular nature. On the whole, the medium between the short and long-sighted eye is the best, by which a person can see distinctly enough objects that are both near and remote; and of this kind we reckon an eye that is able to read distinctly at the distance of one foot. But a good eye requires other necessary conditions, such as a perfect clearness of the humours; a due mobility of the eye itself, and its parts; a sensibility of the pupil, and a retina neither too prurient nor too callous.

Sect. V. *Of the Structure and Functions of the Ear.*

The figure and situation of the external ear needs no description. It is composed of cartilage, a kind of substance likely to preserve its form without being liable to break. Its use is to collect sounds, and direct them into the meatus auditorius, which is the passage that leads to the tympanum or drum. This passage is lined with a glandular membrane, in which also is some hair. The *cerumen* which is secreted by these glands is diffused over this membrane, and serves to defend it from the drying qualities of the air, and also to entangle any insect that might otherwise get into the ear, and create much uneasiness. Sometimes this wax being separated in too great quantity, fills up the passage and causes deafness; while, on the other hand, the ear is liable to great discharges of matter from the meatus auditorius. These are commonly called imposthumes, but are probably nothing else than inflammation of the membrane we have described, and which causes an increased secretion from the glands. At the farther extremity of the meatus auditorius lies the *membrana tympani*, which is extended upon a boney ridge almost circular. Its situation both in men and quadrupeds is nearly horizontal, inclined towards the meatus auditorius, which appears to be the best position for receiving sounds; as they generally are reverberated from the earth. In men it is concave outwardly, but in birds it is convex, so as to place the upper side of it nearly perpendicular to the horizon, and render them more capable of hearing each other's sounds when aloft in the air, where there can be but little reverberated sound. This membrane does not entirely close the passage, but has on one side a small aperture covered with a valve. It has been found half open in persons who in their life-time had not been deaf; and instances have been known, of men who could force the smoke of tobacco through their ears, in which case it could only go from the mouth through the eustachian tube, and

through the tympanum; yet in theſe inſtances the hearing was perfect. Experiments on animals indeed have proved that we may break the tympanum in both ears, and yet not deſtroy the hearing, and only with the temporary inconvenience of ſtrong ſounds being for ſome time heard with a degree of pain and uneaſineſs. Indeed there is a caſe upon record, in which the tympanum of a man was deſtroyed by an ulcer, and the auditory bones caſt out, and that without deſtroying the patient's hearing. From theſe, and other like caſes, it may be concluded, that the membrana tympani, though uſeful in hearing, is not the ſeat of that ſenſe; and if any diſeaſe in that membrane ſhould obſtruct the paſſage of ſounds to the internal parts of the ear, an artificial paſſage through that membrane might reſtore the ſenſe of hearing, as the removal of the opaque cryſtalline humour recovers ſight. Many years ſince, a malefactor was pardoned on condition that he ſubmitted to this experiment; but he happened to fall ill of a fever which delayed the operation, and in the mean time there was ſo great a public clamour raiſed againſt it that the attempt was forbidden. This membrane in very young children is often covered with mucus; but whether this is to be conſidered as a morbid appearance, or as neceſſary to prevent ſounds from affecting them too much, is uncertain. The father of four children born deaf, was adviſed to lay bliſters upon the heads of the next children he might have, which he did to three that were born afterwards, and every one of them heard well. It ſeems not unreaſonable to ſuppoſe, that too great a quantity of this mucus upon the drum might be the cauſe of deafneſs in the four children, and that the diſcharge made by the bliſters in the latter caſes was the cauſe of their eſcaping the like evil.

Into the middle of the tympanum is extended a ſmall bone called *malleus*, whoſe oppoſite end is articulated to a bone called *incus*, which latter bone is alſo articulated by the intervention of an exceedingly ſmall one called *orbiculare*, to a fourth bone called *ſtapes*. Theſe bones are contained in that cavity behind the tympanum, which is called the barrel of the ear; but ſome anatomiſts call the barrel only tympanum, and the membrane membrana tympani. The malleus being moved inward by the muſculus *obliquus internus*, or *trochlearis*, it extends the tympanum that it may be more ſenſibly affected by the impulſe of ſounds when they are too weak. This muſcle riſes from the cartilaginous part of the euſtachian tube, and paſſing from thence in a proper groove, it is reflected under a ſmall proceſs, and thence paſſes on, perpendicular to the tympanum, to be inſerted into the handle of the malleus, ſometimes with a double tendon.

Parallel to this muſcle lies another extenſor of the tympanum, called *obliquus externus*. It ariſes from the outer and upper part of the euſtachian tube, and paſſing through the ſame hole with the chorda tympani, which is a branch of the fifth pair of nerves, it is inſerted into a long proceſs of the malleus. This is not ſo obviouſly an extenſor as to be known to be ſo without an experiment. The muſcle which relaxes this membrane is called externus tympani. It ariſes from the upper part of the auditory paſſage, under the membrane which lines that paſſage, and is inſerted into the upper proceſs of the malleus. The relaxation of the tympanum is made by this muſcle, without our knowledge, when ſounds are too ſtrong; and as the pupil of the eye is contracted when we have too much light, and dilated when there is too little, ſo when ſounds are too low, or the ſenſe of hearing imperfect, the extenſors of the tympanum ſtretch it to make the impulſe of ſounds more effectual, juſt as in the caſe of a common drum, or the chords of any muſical inſtrument. From the cavity behind the tympanum, which is called the barrel of the ear, goes the *euſtachian tube*, or *iter ad palatum*; it ends cartilaginous behind the palate. This paſſage ſeems to be exactly of the ſame uſe with the hole in the ſide of the common drum, that is, to let the air paſs in and out from the barrel of the ear to make the membrane vibrate the better; and perhaps, in the ear, which is cloſer than a common drum, to let air in or out as it alters in denſity; and further, if any fluid ſhould be ſeparated in the barrel of the ear, to give a paſſage to that alſo. This tube when obſtructed, as ſometimes happens from the growth of a polypus behind the uvula, occaſions great difficulty of hearing. Sometimes, on the other hand, when the meatus auditorius is obſtructed, a man, by opening his mouth wide, will hear pretty well through this paſſage; which is often ſo open, that, on ſyringing water through the noſe, it ſhall paſs into the barrel of the ear, and cauſe a temporary deafneſs. To try how far he can hear this way, it is only neceſſary to ſtop the ears, and take between the teeth the end of a wire, or chord that will vibrate well, and holding the other end, ſtrike it, and the ſound that he hears will be received through this paſſage.

To the *ſtapes* there is one muſcle called *muſculus ſtapedis*; it lies in a long channel, and ending in the ſtapes, ſerves to pull the ſtapes off the *feneſtra ovalis*, which otherwiſe it covers. Beſides the feneſtra ovalis, there is near it another, ſomewhat ſmaller, called *rotunda*. Theſe two holes lead to a cavity called *veſtibulum*, which opens into other cavities aptly called *cochlea*, and three ſemicircular canals, all together named the *labyrinth*, in which are ſpread the auditory nerves, to receive and convey the impulſe of ſounds to the brain. Beſides theſe, the *chorda tympani*, which is a branch of the fifth pair of nerves, may alſo convey theſe ſenſations to the brain. The two holes, called feneſtra ovalis and rotunda, are cloſed with a fine membrane, like that called the drum, and the larger being occaſionally covered and uncovered by the ſtapes, cauſes ſound to be modulated more or leſs, as beſt ſerves the purpoſes of hearing; and this advantage being added to that of a lax or tenſe tympanum, the effect of ſounds may be greatly increaſed or leſſened upon the auditory nerves, expanded in the labyrinth. In the loudeſt ſounds, the tympanum may be lax, and the feneſtra ovalis covered; and for the loweſt, the tympanum may be tenſe, and the feneſtra uncovered. If ſounds propagated in the ear were heard leſs, we might often be in danger before we were apprized of it; and if the organs of hearing were much more perfect, unleſs our underſtandings were ſo too, we ſhould commonly hear more things at once than we could attend to.

Sect. VI. *Of the Senſe of Taſte.*

The tongue is the organ of that ſenſe called the *taſte*; and, from certain experiments, it appears that the power of taſte is exerciſed by the tongue chiefly, although it is not confined to that member alone. For, on whatever part of the mouth, palate, or cheeks, we apply a ſapid body, we do not perceive the ſenſe of pain, but of taſte; and from ſome bodies, as arum, pepper, &c. the ſenſation produced will be ſtronger and more diſtinct in theſe parts than any where elſe. That ſenſation which is ſometimes excited in the ſtomach, œſophagus, and fauces, by the regurgitation of the aliments, ſeems alſo to belong to the tongue, to which the ſapid vapours are ſent back, uncommonly acrid and penetrating; and even that ſenſe which is ſometimes occaſioned in the ſtomach, œſophagus, and fauces, from a riſing of the aliments, ſeems alſo to be owing to the tongue, to which the taſteable vapours are conveyed.

The *papillæ* of the tongue, which are larger and ſofter than thoſe of the ſkin, and perpetually moiſt, perform the office of touch more exquiſitely than the ſmall and dry cutaneous papillæ. The papillæ of the tongue being raiſed a little protuberant to perform the office of taſte, are affected in a particular manner by ſalts diſſolved in water, or ſaliva, and ap-

plied againſt their tips or ſummits; which being diſtinguiſhed by the mind, and referred to certain claſſes, are called *taſtes*, either ſour, ſweet, acerb, bitter, ſaline, urinous, ſpirituous, aromatic, or pungent and acrid, inſipid, putrid, and others reſulting partly from pure ſalts, and in part from an intermixture of the ſubtile animal, or vegetable oils, variouſly compounding and changing each other.

Does the diverſity of taſtes ariſe from the different figures which are natural in ſalts? Is the cubical figure of ſea-ſalt the reaſon of its having a different taſte from nitre that is priſmatical, or from other ſalts of a different form? we anſwer, that this does not ſeem probable; for, even taſteleſs cryſtals have their particular configurations; and the taſte ariſing from very different ſalts, and differently qualified objects of this ſenſe, are too much alike each other, and at the ſame time too inconſtant or changeable, to allow ſuch a theory; as, for example, in nitre. The mechanical reaſon, therefore, of the diverſity of taſtes, ſeems to reſide in the intrinſic fabric of the elements of ſapid bodies, which do not fall under the ſcrutiny of our ſenſes.

But the nature or diſpoſition of the covering with which the papillæ are clothed, together with that of the juices, and of the aliments lodged in the ſtomach, have a conſiderable ſhare in determining the ſenſe of taſte; inſomuch, that the ſame flavour does not equally pleaſe or affect the organ in all ages alike, nor in perſons of all temperaments; nor even in the ſame perſon at different times, and in different ſtates of health or diſeaſe. In general, whatever contains leſs ſalt than the ſaliva itſelf, ſeems inſipid.

The ſpirituous parts, more eſpecially of vegetables, either penetrate into the papillæ themſelves, or elſe are abſorbed by the adjacent villi of the tongue; as appears from the ſpeedy reſtitution of the ſtrength by vinous or aromatic liquors. For this reſtitution takes place even before they are received into the ſtomach.

Nature deſigned the differenee of taſtes to be felt by the tongue, that we might know and diſtinguiſh ſuch foods as are moſt ſalutary; for, in general, there is not any one kind of wholeſome aliment that is of a diſagreeable taſte; nor are there any ill-taſted ſubſtances that are fit for our nouriſhment. By exceſs, indeed, the moſt wholeſome food becomes prejudicial. Nature has invited us to take neceſſary food, as well by the pain called hunger, as by the pleaſure ariſing from the ſenſe of taſte. But brute animals, who have not, like us, the advantage of learning from each other by inſtruction, have the faculty of diſtinguiſhing flavours more accurately, by which they are admoniſhed cautiouſly to avoid poiſonous or unwholeſome food; and therefore it is that, in herbivorous cattle, to which a great diverſity of noxious plants is offered among their food, the tongue is of a more exquiſite texture, and furniſhed with larger and longer papillæ than in man, to whom they are leſs neceſſary.

The tongue is likewiſe one of the principal inſtruments of ſpeech, and of the articulation of the voice. It ſerves alſo to collect all the morſels which we chew; to turn them in different manners and to different parts of the mouth; and to rub off whatever ſticks to the palate; and it is uſeful in ſpitting, hacking, &c. It bears a great part in deglutition, being aſſiſted by the digaſtric muſcles; which, by contracting at the ſame time that the other muſcles preſs the lower jaw againſt the upper, raiſe the os hyoides, and fix it at a convenient height; that the ſtylo-gloſſi and hyo-gloſſi may make the baſis of the tongue bear back upon the morſel which is to be ſwallowed, and ſo force it into the pharynx, the portions of which, that are at that time immediately above the morſel, inſtantly contract, and puſh it into the œſophagus.

Sect. VII. *Of the Senſe of Smelling.*

The taſting noxious food might in many inſtances be highly dangerous. We are therefore enabled by the ſmell alone, to diſcover the noxious quality of aliments, eſpecially ſuch as are putrid, and conſequently peculiarly hurtful to the human frame; and at the ſame time that it directs us to avoid what is dangerous, it enables us to diſcern what is grateful and wholeſome. This uſe of ſmelling in chooſing food, is more obſervable in brutes than in men; yet men left to themſelves, and who are undebauched by a variety of ſcents, poſſeſs this ſagacious faculty in a very eminent degree. The powers and virtues of medicinal plants are hardly to be better known than by the ſimple teſtimony of taſting and ſmelling. Hence it is, that in all animals theſe organs are placed together; and hence the ſmelling is ſtronger, and the organs larger, in thoſe animals which are to ſeek their prey at a conſiderable diſtance, or to reject malignant plants from among thoſe that are fit for food.

The ſenſe of ſmelling is performed by means of a ſoft pulpy membrane, full of pores and ſmall veſſels, which lines the whole internal cavity of the noſtrils; it is thicker upon the ſeptum and principal convolutions, but thinner in the ſinuſes. Within this membrane are diſtributed veſſels and nerves which have been already deſcribed.

The nerves of the noſe, being almoſt naked, require a defence from the air, which is continually drawn through the noſtrils, and blown out again by reſpiration. Nature has therefore ſupplied this part, which is the organ of ſmelling, with a thick inſipid mucus, very fluid in its firſt ſeparation, but by the air condenſing into a thick, dry, and more conſiſtent cruſt. By this mucus the nerves are defended from drying and from pain. It is poured out from many ſmall arteries, and depoſited partly into numerous cylindrical ducts, and partly into round viſible criptæ or cells, ſcattered all over the noſtrils. It flows out all over the ſurface of the olfactory membrane, which is anointed with it on all ſides. This mucus is accumulated in the night time; but, in the day it either flows ſpontaneouſly, or may be more powerfully expelled by blowing the noſe. By becoming dry and harſh, it irritates the very ſenſible nerves of the membrane, whence a ſneezing is excited for its removal. The ſinuſes of this part, which abound with mucus, are evacuated through apertures deſcribed in page 164. The tears deſcend, by a channel proper to themſelves, into the cavity of the noſe, by which they moiſten and dilute the mucus.

The cartilages render the noſe movable by its proper muſcles, ſo as to be raiſed and dilated by a muſcle common to the upper lip, and to be contracted together into a narrow compaſs by the proper depreſſor and compreſſor muſcle pulling down the ſeptum. Thus the prominent organ of ſmelling is adapted to the reception of ſcents; and it is dilated in proportion to the quantity of inhaled air, and again contracted, when the air is expelled in the ſame degree.

The air, filled with the ſubtle and inviſible effluvia of bodies, conſiſting of their volatile, oily, and ſaline particles, is, by the powers of reſpiration, urged through the noſe, and applied to the almoſt naked, and conſtantly ſoft olfactory nerves, in which a kind of feeling is excited, which we call *ſmelling*; and by this ſenſe we diſtinguiſh ſeveral kinds of oils and ſalts, by different ſcents or odours, which are difficultly reducible to claſſes, and difficultly recalled to memory. The odours, however, already eſtabliſhed, are ſufficient enough for our purpoſe. This ſenſe ſerves to admoniſh us of pernicious putrefaction; of violent acrimony; or of a mild and ſoapy quality in bodies. As ſalt, joined with an oil, is the

object of taſte; and a volatile oil, added to ſalts, ſerves to excite ſmells, we may perceive the affinity of theſe two ſenſes, which affinity ſeems to be the more neceſſary on account of theſe ſenſes mutually and jointly aſſiſting each other in performing their offices. Volatile particles are chiefly diſtinguiſhed by ſmell, and fixed ones by taſte; perhaps becauſe the thick mucous cuticle, ſpread over the tongue, intercepts the action of the more ſubtle ſaline effluvia from acting upon the taſte, which yet eaſily affect the ſofter and leſs covered nerves of the internal noſe. We are ignorant of the reaſon why ſome ſmells pleaſe, and others diſpleaſe; perhaps cuſtom may have much influence in this reſpect.

The power of odours is ſtrong and quick, becauſe minute particles of matter are immediately applied to naked nerves ſituated very near the brain. Hence the force of poiſonous vapours, and hence alſo the quality certain odours poſſeſs, of recovering people from faintings, or after drowning. Hence alſo that violent ſneezing which often ariſes from acrid particles, and a diarrhœa from the ſmell of ſome medicines; hence the power of particular antipathies. Hence alſo the pernicious effects of exceſſive ſneezing, more eſpecially in producing blindneſs, which may, in ſome meaſure, alſo be more eaſily brought on by the conſent of the nerves, which are exceedingly numerous in theſe neighbouring organs. Among the various parts of the noſe, the ſeptum, and more eſpecially the os turbinatum, have a conſiderable ſhare in the organ of ſmelling, ſince theſe parts are multiplied in quick ſcented animals. In dogs, and other quadrupeds, they are prodigiouſly lengthened, and beautifully formed into ſpiral lamînæ: in fiſhes they are elegantly formed, like the teeth of a comb.

EXPLANATION OF THE ANATOMICAL SUBJECTS IN PLATE XV.

Fig. 1. *A View of the Gall-bladder and its Ducts.*—1. The gall-bladder. 2. Ductus ſiſticus. 3. Ductus hepaticus. 4. Ductus pancreaticus. 5. The entrance of the ductus communis into the duodenum.

Fig. 2. *Arteries; with a View of the Ramifications of the Meſenterica Superior.*—1. Part of the deſcending aorta. 2. Arteria cœliaca. 3. Meſenterica ſuperior. 4. Emulgentes. 5. Spermaticæ. 6. Some of the branches of the meſenterica inferior that are beſtowed upon the inteſtines.

Fig. 3. *A Specimen of the Androgynes in an Hermaphrodite, whoſe ſhape was rather female than male, but who was too young to have female breaſts or a beard like a male.*—1. The glans clitoridis. 2. Nymphæ. 3. Labia with teſticles in them, divaricated to ſhew the parts between. 4. The entrance into the vagina. 5. Furca virginis.

Anatomy *of Plants.* See Plants.

Anatomy *of Brutes.* See Comparative *Anatomy.*

ANAXAGORAS, one of the moſt celebrated philoſophers of antiquity, was born at Clazomene in Ionia, about the 70th Olympiad. He was diſciple of Anaximenes; and gave up his patrimony, to be more at leiſure for the ſtudy of philoſophy. He firſt taught eloquence at Athens; and afterwards was condemned to exile, on account of his philoſophical doctrines. He is ſaid to have made ſome predictions relative to the phenomena of nature, upon which he wrote ſeveral treatiſes.

ANAXIMANDRIANS, in the hiſtory of philoſophy, the followers of Anaximander, the moſt ancient of the philoſophical atheiſts who admitted of no other ſubſtance in nature but matter.

ANBERTKEND, in the eaſtern language, a celebrated book of the Brachmans, wherein the Indian philoſophy and religion are contained. The word in its literal ſenſe denotes the ciſtern wherein is the water of life. The Ambertkend is divided into 50 beths or diſcourſes, each of which conſiſts of 10 chapters. It has been tranſlated from the original Indian into Arabic, under the title of *Morat al Maani*, q. d. "the marrow of intelligence."

ANCARANO, a town of Italy, in the march of Ancona, ſituated in E. long. 14. 54. N. lat. 42. 48.

ANCASTER, a town of Lincolnſhire, ſituated in W. long. 30. N. lat. 52. 30.

ANCENIS, a town of France, in the department of Lower Loire, and late in the province of Bretagne. W. long. 1. 5. N. lat. 47. 15.

ANCESTORS, thoſe from whom a perſon is deſcended in a ſtraight line. The word is derived from the Latin *anceſſor*, contracted from *anteceſſor*, q. d. "goer before." Moſt nations have paid honours to their anceſtors. It was properly the departed ſouls of their forefathers that the Romans worſhipped under the denominations of *lares*, *lemures*, and *houſehold gods*. Hence the ancient tombs were a kind of temples, or rather altars, wherein oblations were made by the kindred of the deceaſed. Many European nations ſtill entertain a ridiculous veneration for their anceſtry; never reflecting, that the meaneſt beggar has in fact as *many* progenitors as the moſt pampered nobleman, though the pauper happens to be ignorant *who* his anceſtors were. In this ignorance indeed conſiſts all the difference between the two; for the queſtion whoſe anceſtors rendered the greater ſervices to mankind, or which were the moſt virtuous and honeſt, is no more adverted to by the one than the other. This political vice tends to alienate men from each other, and in the place of ſocial feeling, to ſubſtitute an imaginary ſtandard of eſtimation, which, while it ſwells the importance of the indolent great, depreſſes below the ſcale of humanity the unaſſerted pretenſions of the laborious and deſerving poor.

ANCHILOPS, from αγκυλη *contraction*, and ωψ *eye*; in ſurgery, an old term for the abſceſs which precedes or accompanies the fiſtula lachrymalis.

ANCHISES, in fabulous hiſtory, a Trojan prince, to whom Venus made love, and bore Æneas, the hero of Virgil's Æncid.

ANCHOR, a heavy, ſtrong, crooked inſtrument of iron, dropped from a ſhip into the ſhore beneath the water, to retain her in a convenient ſtation in a harbour, road, or river. The moſt ancient anchors are ſaid to have been of ſtone; and ſometimes of wood, to which a great quantity of lead was uſually fixed. In ſome places, baſkets full of ſtones, and ſacks filled with ſand, were employed for the ſame uſe. All theſe were let down by cords into the ſea, and by their weight ſtayed the courſe of the ſhip. Afterwards they were compoſed of iron, and furniſhed with teeth, which, being faſtened to the bottom of the ſea, preſerved the veſſel immoveable; whence οδοντες and *dentes* are frequently taken for anchors in the Greek and Latin poets. At firſt there was only one tooth, whence anchors were called στεροσομοι: but in a ſhort time the ſecond

was added by Eupalamus, or Anacharsis, the Scythian philosopher. The anchors with two teeth were called αμφιβολοι or αμφιγομοι: and from ancient monuments, appear to have been much the same with those used in our days, only the transverse piece of wood upon their handles (the stock) is wanting in all of them. Every ship had several anchors; one of which, surpassing all the rest in bigness and strength, was peculiarly termed ιερα or *sacra*, and was never used but in extreme danger; whence *sacram anchoram solvere*, is proverbially applied to such as are forced to their last refuge.

The anchors now made are contrived so as to sink into the ground as soon as they reach it, and to hold a great strain before they can be loosened or dislodged from their station. They are composed of a shank, a stock, a ring, and two arms with their flukes. The stock, which is a long piece of timber fixed across the shank, serves to guide the flukes in a direction perpendicular to the surface of the ground; so that one of them sinks into it by its own weight as soon as it falls, and is still preserved steadily in that position by the stock, which, together with the shank, lies flat on the bottom. In this situation it must necessarily sustain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, sometimes increased by the turbulence of the sea, and acting upon the ship so as to stretch the cable to its utmost tension, which accordingly may dislodge the anchor from its bed, especially if the ground be soft and oozy, or rocky. When the anchor is thus displaced, it is said, in the sea-phrase, to *come home*.

Every ship ought to have three principal anchors, viz. the sheet, *maitresse-ancre* (which is the *anchora sacra* of the ancients); the best bower, *second ancre;* and small bower, *ancre d'affourche*, so called from their usual situation on the ship's bows. There are besides smaller anchors, for removing a ship from place to place in a harbour or river, where there may not be room or wind for sailing; these are the stream-anchor, *ancre de toue;* the kedge and grappling, *grapin:* this last, however, is chiefly designed for boats.

In England, France, and Holland, anchors are made of forged iron, or rather of a number of small rods of very tough metal; but in Spain they are sometimes made of copper, and likewise in several parts of the South Sea. M. Bouguer, in his *Traité de Navire*, gives the following dimensions of the several parts of an anchor. The two arms generally form the arch of a circle, whose centre is three eighths of the shank from the vertex, or point where it is fixed to the shank; and each arm is equal to the same length, or the radius; so that the two arms together make an arch of 120 degrees: the flukes are half the length of the arms, and their breadth two-fifths of the said length. With respect to the thickness, the circumference at the throat, or vertex of the shank, is generally made about a fifth part of its length, and the small end two-thirds of the throat; the small end of the arms of the flukes, three-fourths of the circumference of the shank at the throat. These dimensions should be bigger when the iron is of a bad quality, especially if cast iron be used instead of forged iron.

At Anchor, the situation of a ship which rides by her anchor in a road or haven, &c.

To fish the Anchor, to draw up the flukes upon the ship's sides after it is catted. See the articles Davit and Fish.

To steer the ship to her Anchor, is to steer the ship's head towards the place where the anchor lies when they are heaving the cable into the ship; that the cable may thereby enter the hause with less resistance, and the ship advance towards the anchor with greater facility.

Anchor-*Ground* is a bottom which is neither too deep, too shallow, nor rocky; as in the first the cable bears too nearly perpendicular, and is thereby apt to jerk the anchor out of the ground; in the second, the ship's bottom is apt to strike at low water, or when the sea runs high, by which she is exposed to the danger of sinking; and in the third, the anchor is liable to hook the broken and pointed ends of rocks, and tear away its flukes, whilst the cable, from the same cause, is constantly in danger of being cut through as it rubs on their edges.

Anchor, in architecture, is a sort of carving, somewhat resembling an anchor. It is commonly placed as part of the enrichments of the boultins of capitals of the Tuscan, Doric, and Ionic orders, and also of the boultins of bed-mouldings of the Doric, Ionic, and Corinthian cornices, anchors and eggs being carved alternately through the whole building.

Anchors, in heraldry, are emblems of hope, and are taken for such in a spiritual as well as a temporal sense.

Anchorage, in law, is a duty upon ships for the use of the port or harbour where they cast anchor.

ANCHOVY, in ichthyology, the English name of the clupea encrasicolus. See Clupea.

Anchovy-*Pear*. See Grias.

ANCHUSA, Alkanet or Bugloss; a genus of the monogynia order belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifoliæ*. The *calyx* is a quinquepartite perianthium, oblong and persistent. The *corolla* is monopetalous and funnel-shaped, the throat closed with scales. The *stamina* consist of five short filaments; the antheræ oblong and covered. The *pistillum* has four germina, a filiform stylus, and obtuse stigma. There is no *pericarpium*, the calyx containing the seeds in its bosom. The *seeds* are four, oblong, gibbous, and engraven at the base. The species are, 1. The officinalis, or greater garden-bugloss. It is a native of France and of the warmer parts of Europe, yet will thrive well enough in Britain; but the roots seldom continue longer than two years in this country. 2. The angustifolia, or perennial wild borage, grows to the height of two feet when cultivated in gardens; but in those places where it grows wild is seldom more than a foot and an half high. The roots will continue two years in a poor soil. 3. The undulata, or Portugal bugloss, is a biennial plant, which grows to the height of two feet, and sends out many lateral branches. The flowers are of a bright blue colour, and grow in an imbricated spike. 4. The orientalis, or eastern bugloss, is a native of the Levant. It is a perennial plant, with long trailing branches which lie on the ground. 5. The virginiana, or puccoon; grows naturally in the woods of North America; and being an early plant, generally flowers before the new leaves come out on the trees. The flowers grow in loose spikes upon smooth stalks. 6. The sempervirens, or evergreen borage, is a very hardy perennial plant, with weak trailing branches. It grows naturally in some parts of Britain and Spain. 7. The cretica, or warted bugloss of Crete, is a low trailing annual plant, whose branches seldom extend more than six inches. The plants perish soon after their seeds are ripe. 8. The tinctoria, or true alkanet, grows naturally in the Levant, but is equally hardy with the first species. The flowers grow in long spikes, coming out *imbricatim*, like the tiles of a house. All the species of anchusa may be propagated by seeds; which should be sown, either in the spring or autumn, upon a bed of light sandy earth; and plants transplanted at two feet distance from one another. The root of the tinctoria imparts an elegant red colour to oily substances; and is therefore an ingredient in ointments, plasters, &c. As the colour is confined to the cortical part, the small roots are to be preferred, as having proportionably more bark than the large ones. The alkanet root which grows in England is greatly inferior to what comes from abroad.

ANCHYLOPS. See ANCHILOPS.

ANCHYLOSIS. See ANCYLOSIS.

ANCIENT, in a military ſenſe, denotes either the enſign or colours of a regiment, fort, &c.

ANCIENT, in ſhips of war, the ſtreamer or flag borne in the ſtern.

ANCIENT DEMESNE, in Engliſh law, is a tenure, whereby all manors belonging to the crown in William the Conqueror's and St. Edward's time were held. The numbers, names, &c. hereof were entered by the Conqueror, in a book called *Domeſday Book*, yet remaining in the Exchequer; ſo that ſuch lands as by that book appeared to have belonged to the crown at that time, are called *ancient demeſne*. The tenants in ancient demeſne are of two ſorts; one who hold their lands frankly by charter; the other by copy of court-roll, or by the verge, at the will of the lord, according to the cuſtom of the manor. The advantages of this tenure are, 1. That tenants holding by charter cannot be rightfully impleaded out of their manor; and, when they are, they may abate the writ, by pleading the tenure. 2. They are free from toll for all things relating to their livelihood and huſbandry; nor can be impannelled on any inqueſt. Theſe tenants held originally by plowing the king's land, plaſhing his hedges, and the like ſervice, for the maintenance of his houſehold; and it was on this account that ſuch liberties were given them, for which they may have writs of *monſtraverunt* to ſuch as take the duties of toll, &c. No lands are to be accounted ancient demeſne, but ſuch as are held in ſocage. Whether land be ancient demeſne or not, ſhall be tried by the book of DOMESDAY.

ANCIENTY, in ſome ancient ſtatutes, is uſed for elderſhip or ſeniority. The elder ſiſter can demand no more than her other ſiſters, beſide the chief meſne, by reaſon of her ancienty. This word is uſed in the ſtatute of Ireland, 14 Hen. III.

ANCLAM, a ſtrong town of Germany, in the circle of Upper Saxony, and duchy of Pomerania. It is ſeated on the river Pene. E. long. 14. 5. N. lat. 54. 10.

ANCLE, or ANKLE. See ANKLE.

ANCONA, a marquiſate and province in the pope's territories in Italy. It lies between the gulph of Venice and mount Appenine, which bound it on the north; Abruzzo on the eaſt; the duchy of Spoletto, and that of Urbino, on the weſt. It contains ſeveral large towns.

ANCONA, a ſea-port town of Italy, the capital of the marquiſate of that name. Its harbour is the beſt in all the pope's dominions. E. long. 15. 5. N. lat. 43. 36.

ANCONES, in architecture, the corners or quoins of walls, croſs-beams, or rafters. Vitruvius calls the *conſoles* by the ſame name.

ANCONY, in the iron-works, a piece of half-wrought iron, of about three quarters of 100 weight, and of the ſhape of a bar in the middle, but rude and unwrought at the ends. The proceſs for bringing the iron to this ſtate is this: They firſt melt off a piece from a ſow of caſt iron, of the proper ſize; this they hammer at the forge into a maſs of two feet long, and of a ſquare ſhape, which they call a *bloom*; when this is done, they ſend it to the finery; where, after two or three heats and workings, they bring it to this figure, and call it an *ancony*. The middle part beat out at the finery, is about three feet long, and of the ſhape and thickneſs the whole is to be. This is then ſent to the chafery, and there the ends are wrought to the ſhape of the middle, and the whole made into a bar.

ANCORARUM URBS, Αγκυρων Πολις, a city in the Nomos Aphroditopolites, towards the Red Sea; ſo called becauſe there was in the neighbourhood a ſtone quarry, in which they hewed ſtone anchors.

ANCRE, a ſmall town of France, in the late province of Picardy. E. long. 2. 45. N. lat. 49. 59.

ANCYLE, in antiquity, a kind of ſhield that fell, as was pretended, from heaven, in the reign of Numa Pompilius; at which time, likewiſe, a voice was heard declaring that Rome ſhould be miſtreſs of the world as long as ſhe ſhould preſerve this holy buckler.

ANCYLE, in ſurgery. See ANCYLOSIS.

ANCYLOBLEPHARON, or anchyloblepharon, from αγκυλος *bent*, and βλεφαρον *an eye-lid*; a diſeaſe of the eye, which cloſes the eye-lids. Sometimes the eye-lids, if neglected, grow to each other, and alſo to the tunica albuginea of the eye, in conſequence of inflammation. Both theſe caſes are called *ancyloblepharon* by the Greeks.

ANCYLOGLOSSUM, from αγκυλος *crooked*, and γλωσσα *the tongue*; a contraction of the ligaments of the tongue. Infants ſo affected, are ſaid to be *tongue-tied*, and are ſuppoſed incapable of ſucking properly, or when old enough, of ſpeaking. Nurſes are continually imagining this defect to exiſt; but the fact is, it hardly ever happens, and when it does is eaſily remedied by ſnipping the conſtricted part with a pair of ſciſſars. If a child can thruſt the tip of its tongue over its gums, this diſeaſe does not exiſt; and if the tongue is not greatly reſtrained, the frænulum will ſtretch by the child's ſucking and crying.

ANCYLOSIS, in ſurgery, implies a union of the extremities of two bones which before moved upon each other as a joint. Inflammation of a joint frequently terminates in ancyloſis, and in ſome inſtances it is the happy criſis of a diſeaſed ſtate of the bones which would otherwiſe require amputation.

ANCYRA, the capital of Galatia; now called *Angura*, or *Angoura*. E. long. 33°. lat. 41. 20.

ANCYSTRUM, in botany; a genus of the digynia order, belonging to the diandria claſs of plants; the eſſential characters of which are theſe: The *calyx* is a ſingle-leaved, four-toothed perianthium, four-awned, the awns terminated with croſs-barbs. The *corolla* is four-cleft; the ſtigma pencilled.

ANDABATÆ, in antiquity, a ſort of gladiators, who, mounted on horſeback or in chariots, fought hoodwinked, having a helmet that covered their eyes.

ANDALUSIA, is the moſt weſtern province of Spain, having Eſtremadura and La Mancha on the north; the kingdom of Granada, the ſtraits of Gibraltar, and the Ocean, on the eaſt and ſouth; and, on the weſt, the kingdom of Algarva in Portugal, from which it is ſeparated by the river Guadiana. It is about 182 miles long, and 150 broad, and is the moſt fruitful part of all Spain.

New ANDALUSIA, a diviſion of the province of Terra Firma in South America, whoſe boundaries cannot be well aſcertained, as the Spaniards pretend a right to countries in which they have never eſtabliſhed any ſettlements. The capital of New Andaluſia is Comana, Cumana, or New Corduba, ſituated in N. lat. 9. 55. about nine miles from the north ſea.

ANDAMAN, or ANDEMAN Iſlands, in the Eaſt Indies, ſituated about 80 leagues diſtance from Tanaſſerim on the coaſt of Siam. E. long. 92. 0. N. lat. from 10°. to 15°.

ANDANTE, in muſic, ſignifies a movement moderately ſlow, between *largo* and *allegro*.

ANDELY, a town in the department of Eure and late province of Normandy in France, parted in two by a paved cauſeway. It is 20 miles S. E. of Rouen, and 5 N. W. of Paris. E. long. 1. 30. N. lat. 49. 20.

ANDENA, in old writers, denotes the ſwath made in mowing of hay, or as much ground as a man could ſtride over at once.

ANDERAB, the moſt ſouthern city of the province of Balkh, poſſeſſed by the Uſbeck Tartars.

ANDERNACH, a city of Cologne, in the circle of the Lower Rhine. It is ſituated in a plain on the river Rhine. E. long. 7. 4. N. lat. 50. 27.

ANDERO (St.), a ſea-port town in the bay of Biſcay, in Old Caſtile, ſeated on a ſmall peninſula. W. long. 4. 30. N. lat. 43. 20.

ANDES, or CORDILLERAS, a chain of mountains in South America, running from N. to S. along the coaſt of the Pacific Ocean. They exceed in length any chain of mountains in the other parts of the globe; extending from the iſthmus of Darien to the ſtraits of Magellan, dividing the whole ſouthern part of America, and running a length of 4300 miles. Dr. Robertſon, after obſerving, that the mountains in America are much ſuperior in height to thoſe of the other diviſions of the globe, ſays: "Even the plain of Quito, which may be conſidered as the baſe of the Andes, is elevated farther above the ſea than the top of the Pyrenees. This ſtupendous ridge of the Andes, no leſs remarkable for extent than elevation, riſes, in different places, more than one third above the Pike of Teneriff, once thought to be the higheſt land in the ancient hemiſphere. The Andes may literally be ſaid to hide their heads in the clouds; the ſtorms often roll, and the thunder burſts below their ſummits, which, though expoſed to the rays of the ſun, in the centre of the torrid zone, are covered with everlaſting ſnows." From experiments made with a barometer on the mountain of Cotopaxi, it appeared that its ſummit was elevated 6252 yards above the ſurface of the ſea, ſomething more than three geographical miles. In theſe mountains are many volcanos.

ANDES, a hamlet, two miles W. of Mantua in Italy, the birth-place of Virgil; now called *Pietola*.

ANDEUSE, a city of the late province of Languedoc in France, ſituated in E. long. 3. 40. and N. lat. 43. 45.

ANDOVER, a large market-town in Hampſhire, on the London road. W. long. 0. 56. N. lat. 51. 20.

ANDRACHNE, BASTARD ORPINE; a genus of the gynandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. Characters: The male *calyx* conſiſts of five leaves; the *corolla* has five petals; and the *ſtamina*, which are alſo five in number, are inſerted into the ſtylus. The female *calyx* is divided into five leaves; there is no *corolla*; the *ſtyli* are three; and the *capſule* is trilocular, containing three ſeeds. The *Species* are, 1. The telephoides, or herbaceous trailing andrachne, a low plant, whoſe branches trail upon the ground. It is found wild in ſome parts of Italy and the Archipelago; but having no beauty, is ſeldom cultivated. 2. The fruticoſa, or ſhrubby baſtard orpine, a native of China and ſome places of America, where it riſes 12 or 14 feet high. 3. The arborea, with a tree-like ſtalk. This ſpecies grows naturally at Campeachy. It has a ſtrong woody ſtem, which riſes more than 20 feet high, and ſends out many branches on every ſide. This has not yet flowered in Britain. The firſt ſpecies may be raiſed, by ſowing the ſeeds in March, on a moderate hot-bed. The plants may be removed into ſmall pots, and plunged into another very moderate hot-bed, to bring them forward; but in mild weather they ſhould have plenty of air. In June they will produce flowers, and the ſeeds will ripen in Auguſt and September.—The other ſpecies are very tender, and therefore muſt be kept conſtantly in the bark-ſtove.

ANDRAPODISMUS, in ancient writers, the ſelling of perſons for ſlaves. Hence alſo *andrapodiſtes*, a dealer in ſlaves, more particularly a kidnapper, who ſteals men or children to ſell them; a crime for which the Theſſalians were noted.

ANDRAPODOCAPELI, in antiquity, a kind of dealers in ſlaves. The *andrapodocapeli* had a particular proceſs for taking off moles and the like diſfigurements on the faces of the ſlaves they kept for ſale, by rubbing them with bran. At Athens, ſeveral places in the forum were appointed for the ſale of ſlaves. Upon the firſt day of every month, the merchants called Ανδραποδοκαπηλοι brought them into the market, and expoſed them to ſale; the crier ſtanding upon a ſtone erected for that purpoſe, called the people together.

ANDREA (St.), a ſmall village on the Malabar coaſt in the Eaſt Indies, founded originally by the Portugueſe.

ANDREW, or *Knights of St.* ANDREW, an order of knights, more uſually called the order of the Thiſtle.

Knights of St. ANDREW, is alſo an order inſtituted by Peter the Great of Muſcovy in 1698; the badge of which is a golden medal; on one ſide whereof is repreſented St. Andrew's croſs, with theſe words, *Cazar Pierre monarque de tout le Ruſſie*. This medal, being faſtened to a blue ribbon, is ſuſpended from the right ſhoulder.

St. ANDREW's *Croſs*, one in form of the letter X. See CROSS.

St. ANDREW's *Day*, a feſtival of the Chriſtian church, celebrated on the 30th of November, in honour of St. Andrew.

ANDREW's (St.), a town of Fifeſhire in Scotland, once the metropolis of the Pictiſh kingdom, lying in W. long. 2. 25. N. lat. 56. 18. St. Andrew's was formerly the ſee of an archbiſhop. It is ſeated at the bottom of a bay, on the level top of a ſmall hill, extending eaſt and weſt, having an open proſpect of the German Ocean. The univerſity, which was founded by biſhop Wardlaw, in 1411, once conſiſted of three colleges. The cathedral, the chapel of St. Regulus (which is more ancient and entire than the cathedral), the church of St. Salvator, and the priory, have been noble Gothic ſtructures. The caſtle was the ſcene of the cruel martyrdom of George Wiſhart, and the puniſhment of his murderer Cardinal Beaton. It is 30 miles N. E. of Edinburgh.

ANDRIA, in Grecian antiquity, public entertainments firſt inſtituted by Minos of Crete, and, after his example, appointed by Lycurgus at Sparta, at which a whole city or a tribe aſſiſted. They were managed with the utmoſt frugality, and perſons of all ages were admitted, the younger ſort being obliged by the law-giver to repair thither as to ſchools of temperance and ſobriety.

ANDRIA, a city in the territory of Bari, in the kingdom of Naples. E. long. 17. 4. N. lat. 41. 15.

ANDRISCUS, a man of mean extraction, who, pretending to be the ſon of Perſeus laſt king of Macedonia, took upon him the name of *Philip*, for which reaſon he was called *Pſeudo Philippus*, the *Falſe Philip*.

ANDROAS, or ANDRODAMAS, among ancient naturaliſts, a kind of pyritæ, to which they attributed certain magical virtues.

ANDROGYNES, in natural hiſtory, a name given to thoſe living creatures which, by a monſtrous formation of their generative parts, have outwardly the appearance of uniting in themſelves the two ſexes, that of the male and of the female. This *luſus naturæ*, this monſtrous production of nature, is diverſified in four different ways; of which three appear in thoſe who moſt reſemble males and one in females. In men, the female pudendum, clothed with hair, ſometimes appears contiguous to the perinæum; at other times, it is placed in the middle of the ſcrotum: at other times, which conſtitutes the third diverſity, through that part which in the midſt of the ſcrotum exhibits the form of a pudendum, urine is emitted. Near that part which is the teſt of puberty, and above the pudendum, even in females, the maſculine genitals appear in ſome, conſpicuous in all their three forms, one reſembling the penis, the other like the two teſticles. But for the moſt part it happens, that, of the two inſtruments of ge-

neration, one is feeble and inert; and it is extremely rare that both are found ſufficiently valid and proper for coition. Nay, in a great many, both theſe members are deficient and impotent, ſo that they can perform the office neither of a male nor of a female. It appears, however, from a collation of all the circumſtances which have been obſerved by naturaliſts worthy of credit, that there is no ſuch thing as a perfect *androgyne*, or real hermaphrodite; that is to ſay, a living creature which, by its unnatural, or rather preternatural ſtructure, poſſeſſes the genuine powers of both ſexes, in ſuch a manner as to be qualified for performing the functions of either with ſucceſs. The irregularity of their fabrication almoſt always conſiſts in ſomething ſuperfluous added to one of the two ſexes, which gives it the appearance of the other, without beſtowing the real and characteriſtical diſtinction. See HERMAPHRODITE.

Mr. Cheſelden has given the deſcription of two beings of the hermaphrodite form. One of them was a negro, in ſhape perfectly male, and 26 years old. The moſt conſpicuous part in the form of the genitals was a clitoris, which when erected was nearly as large as a penis, and like it was furniſhed with a glans. The labia were a kind of divided ſcrotum containing perfect teſticles with all their veſſels. There alſo exiſted nymphæ and a vagina; at the entrance into which, were carunculæ myrtiformes. He has omitted to inform us by what paſſage the urine was in this ſubject diſcharged. The other inſtance is that of a perſon whoſe ſhape was rather female than male; though too young to have either female breaſts or a beard. A repreſentation of the parts will be ſeen in Pl. 15; and for the explanation ſee Treatiſe on ANATOMY, laſt page.

ANDROGYNES, in ancient mythology, creatures of whom, according to the fable, each individual poſſeſſed the powers and characters of both ſexes, having two heads, four arms, and two feet. The word itſelf is compounded of two Greek radical words; ανηρ, in genitive ανδρος, a *male*; and γυνη, a *female*. Many of the rabbinical writers pretend, that Adam was created double, one body being male, the other female, which in their origin not being eſſentially joined, God afterwards did nothing but ſeparate them.

ANDROGYNOUS, in zoology, an appellation given to animals which have both the male and female ſex in the ſame individual.—In botany, the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROIDES, in mechanics, a human figure, which, by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living animal. The motions of the human body are more complicated, and conſequently more difficult to be imitated, than thoſe of any other creature; whence the conſtruction of an *androides*, in ſuch a manner as to imitate any of theſe actions with tolerable exactneſs, is juſtly ſuppoſed to indicate a greater ſkill in mechanics than any other piece of workmanſhip whatever.

A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute-player, and was capable of performing many different pieces of muſic on the German flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated motions of the fingers, muſt appear truly wonderful.—This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year.

But if the conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhow exquiſite ſkill; what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, nevertheleſs, has been done. M. de Kempelen, a gentleman of Preſburg in Hungary, excited by the performances of M. de Vaucanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!—Every one who is in the leaſt acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment and rational faculties than is ſufficient to accompliſh many matters of greater importance. An attempt, therefore, to make a wooden cheſs-player, muſt appear as ridiculous as to make a wooden preacher or counſellor of ſtate. That this machine really was made, however, the public have had ocular demonſtration. The inventor came over to Britain in 1783, where he remained above a year with his automaton.

It is a figure as large as life, in a Turkiſh dreſs, ſitting behind a table, with doors of three feet and a half in length, two in depth, and two and a half in height. The chair on which it ſits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe: with this hand it plays after the pipe is removed. A cheſs-board of 18 inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders, and other pieces of mechaniſm; all which are publicly diſplayed. The veſtments of the automaton are then lifted over its head, and the body is ſeen full of ſimilar wheels and levers. There is a little door in its thigh, which is likewiſe opened; and with this, and the table alſo open, and the automaton uncovered, the whole is wheeled about the room. The doors are then ſhut, and the automaton is ready to play; and it always takes the firſt move.

At every motion the wheels are heard; the image moves its head, and looks over every part of the cheſs-board. When it checks the queen, it ſhakes its head twice, and thrice in giving check to the king. It likewiſe ſhakes its head when a falſe move is made, replaces the piece, and makes its own move; by which means the adverſary loſes one. Mr. de Kempelen remarks as the moſt ſurpriſing circumſtance attending his automaton, that it had been exhibited at Preſburg, Vienna, Paris, and London, to thouſands, many of whom were mathematicians and cheſs-players, and yet the ſecret by which he governed the motion of its arm was never diſcovered. He prided himſelf ſolely on the conſtruction of the mechanical powers, by which the arm could perform ten or twelve moves. It then required to be wound up like a watch, after which it was capable of continuing the ſame number of motions.

The automaton could not play unleſs Mr. de Kempelen or his ſubſtitute was near it to direct its moves. A ſmall ſquare box, during the game, was frequently conſulted by the exhibitor; and herein conſiſted the ſecret, which he ſaid he could in a moment communicate. He who could beat Mr. de Kempelen was, of courſe, certain of conquering the automaton. His own account of it was: "C'eſt une bagatelle qui n'eſt pas ſans merite du côté du mechaniſme, mais les effets n'en paroiſſent ſi merveilleux que par la hardieſſe de l'idée, & par l'heureux choix des moyens employés pour faire illuſion." In order to counteract the ſuppoſition that the machine was directed by a concealed magnet, the ſtrongeſt and beſt-armed loadſtone was allowed to be placed on it by any of the ſpectators. Many other curious imitations of the human body, as well as of other animals, have been exhibited, though none of them equal to this cheſs-player.

ANDROLEPSY, in Grecian antiquity, an action allowed by the Athenians againſt ſuch as protected perſons guilty of murder. The relations of the deceaſed were empowered to ſeize three men in the city or houſe whither the malefactor had

fled, till he were either furrendered, or fatisfaction made fome way or other for the murder.

ANDROMACHE, wife of the valiant Hector, mother of Aftyanax, and daughter of Eton king of Thebes in Cilicia.

ANDROMEDA, in aftronomy, a northern conftellation, behind Pegafus, Caffiopeia, and Perfeus. It repreſents the figure of a woman chained. The ſtars in the conſtellation Andromeda in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, in Mr. Flamſted's no leſs than 84.

ANDROMEDA, the name of a celebrated tragedy of Euripides, admired by the ancients above all the other compoſitions of that poet, but now loſt.

ANDROMEDA, or *Marſh Cyſtus*; a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The *calyx* is a quinquepartite perianthium, ſmall, coloured, and perſiſtent. The *corolla* is monopetalous, campanulated, and quinquefid, with reflected diviſions. The *ſtamina* conſiſt of ten ſubulated filaments, ſhorter than the corolla; the antheræ two-horned and nodding. The *piſtillum* has a roundiſh germen; a cylindric ſtylus larger than the ſtamina, and perſiſtent; and an obtuſe ſtigma. The *pericarpium* is a roundiſh five-cornered capſule, with five cells and five valves. The *ſeeds* are very numerous, roundiſh, and gloſſy. The *Species* are, 1. The polifolia, a low plant, growing naturally in bogs in the northern countries. It is with difficulty preſerved, and is a plant of no great beauty. 2. The mariana, a native of North America, is a low ſhrub, ſending out many woody ſtalks from the root, which are garniſhed with oval leaves placed alternately; the flowers appear in June and July. 3. The paniculata (ſee Pl. 5.) is a native of Virginia and Carolina, growing in moiſt places. The plants uſually arrive at the height of ten feet, with thin leaves ſet alternately, and having their edges finely ſerrated. The flowers are tubulous, ſmall, and of a greeniſh white, cloſely ſet horizontally on one ſide of the ſlender ſtalks. Theſe flowers are ſucceeded by berries, which open when ripe; and divide into five ſections, incloſing many ſmall ſeeds. 4. The arborea, a native of the ſame countries, where it is called the *ſorrel tree*. It grows to the height of 20 feet, with a trunk uſually five or ſix inches thick. 5. The caliculata, a native of Siberia, and likewiſe of North America. It grows on moſſy land, and is therefore very difficult to keep in gardens. There are ten other ſpecies, which, as well as the foregoing, are hardy plants. The fourth ſpecies requires to be ſheltered from froſt in winter, but in the ſummer ſhould be frequently watered.

The five ſpecies deſcribed above, ſucceed beſt upon boggy and moiſt grounds. The ſeeds ſhould be got from the places where they grow naturally; a year before which the moſt boggy and moiſt part of a garden ſhould be dug, and properly prepared for their reception. Another method of propagating theſe ſhrubs is by layers or ſuckers, which, planted in a boggy ſituation, thrive very well and throw out ſuckers in prodigious plenty. Theſe ſhould be taken off, and planted where they are to remain.

ANDRON, in Grecian antiquity, denotes the apartment in houſes deſigned for the uſe of men; in which ſenſe it ſtands oppoſed to *Gynæceum*.—The Greeks alſo gave their dining-rooms the title of *andron*, becauſe the women had no admittance to feaſts with the men.

ANDRONA, in ancient writers, denotes a ſtreet, or public place, where people met and converſed together. In ſome writers *androna* is more expreſsly uſed for the ſpace between two houſes; in which ſenſe, the Greeks alſo uſe the term ἀνδρῶνες, for the way or paſſage between two apartments.

ANDRONA is alſo uſed, in eccleſiaſtical writers, for that part in churches deſtined for the men. Anciently it was the cuſtom for the men and women to have ſeparate apartments in places of worſhip, where they performed their devotions aſunder; which method is ſtill religiouſly obſerved in the Greek church. The ἀνδρῶν, or *androna*, was in the ſouthern ſide of the church, and the women's apartment on the northern.

ANDROPHAGI, in ancient hiſtory, the name of a nation whoſe country, according to Herodotus, was adjacent to Scythia. Their name, compounded of two Greek words, ſignifies *man-eaters*. See ANTHROPOPHAGI.

ANDROPOGON, or MAN'S-BEARD, in botany; a genus of the monœcia order, belonging to the polygamia claſs; and in the natural method ranking under the 4th order, *Gramina*. The *hermaphrodite* calyx is a one-flowered bivalved glume. The *corolla* is a bivalved glume awn'd at the baſe. The *ſtamina* conſiſt of three capillary filaments; the antheræ are oblong and bifurcated. The *piſtillum* has an oval germen; with two capillary ſtyli coaleſced, and villous ſtigmata. There is no *pericarpium*. The *ſeed* is one, ſolitary and covered. The *male* calyx, corolla, and ſtamina, the ſame with the hermaphrodite; but the corolla without the awn.—There are 18 ſpecies or more. Of theſe the moſt remarkable is the nardus, which produces the Indian nard or ſpikenard of the ſhops. The ſpikenard, as brought from the Eaſt Indies, is a congeries of ſmall fibres iſſuing from one head, and matted cloſe together, ſo as to form a bunch about the ſize of the finger, with ſome ſmall ſtrings at the oppoſite end of the head. The matted fibres, which are the parts choſen for medicinal purpoſes, are ſuppoſed by ſome to be the head or ſpike of the plant, by others the root; but they ſeem rather to be the remains of the withered ſtalks, or the ribs of the leaves. Sometimes entire leaves and pieces of ſtalks are found among them. We likewiſe now and then meet with a number of theſe bunches iſſuing from one root Spikenard has a warm, pungent, bitteriſh taſte; and a ſtrong, not very agreeable ſmell. It was once in conſiderable repute as a ſtomachic, carminative, and emmenagogue; but it is now diſuſed.

ANDROS, one of the ancient Cyclades, lying between Tenedos and Eubœa. The ancients gave it various names, viz. Cauros, Laſia, Nonagria, Epagris, Antandros, and Hydruſia. E. long. 25. 30. N. lat. 37 50.

ANDROSACE; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ*. The eſſential characters are, the *male* calyx five-leaved; the corolla five-petalled; the ſtamina five, inſerted on the rudiment of the ſtylus. The *female* calyx is five-leaved; the corolla is wanting; the ſtyli are three; the capſule is trilocular; the ſeeds are two. Of this genus Linnæus reckons ſix ſpecies. 1. The maxima, which grows naturally in Auſtria and Bohemia, among the corn. It has broad leaves, which ſpread near the ground; from the centre of theſe the footſtalks ariſe, which are terminated by an umbel of white flowers like thoſe of the auricula. 2. The ſeptentrionalis, villoſa, carnea, and lactea, grow naturally on the Alps and Helvetian mountains, as alſo in Siberia. They are much ſmaller than the former, ſeldom growing more than three inches high. Of the other ſpecies, called the *elongata*, we have no particular deſcription. Theſe plants are propagated by ſeeds, which ſhould be ſown ſoon after they are ripe, otherwiſe they ſeldom come up the ſame year.

ANDRUM, a kind of hydrocele, to which the people of Malabar are very ſubject.—Its origin is thought to be derived from the vitious quality of the country waters, which are impregnated with muriatic ſalts. It begins with an eryſipelas of the ſcrotum, which ſoon becomes œdematous. The lymphatics of the part are alſo inflamed and obſtructed, and the cellular membrane of the ſcrotum becomes thickened. The andrum is incurable, for thoſe once ſeized with it have it for life: but

it is not dangerous, nor very troubleſome to thoſe who are uſed to it; though ſometimes it degenerates into an hydroſarcocele. They have only a palliative cure for this diſeaſe, which is by inciſion, or tapping, to draw off the water from the ſcrotum occaſionally.

ANDRYALA, DOWNY SOW-THISTLE: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ ſemifloſculus*. The eſſential characters are theſe: The receptacle is villous; the calyx is many-parted, ſubequal, and rounded; and the pappus is ſimple and ſeſſile. The ſpecies are, 1. The integrifolia, an annual plant, growing naturally in the ſouth of France, Spain, and Italy, and riſing to the height of a foot and an half, with woolly branching ſtalks. The flowers are yellow, and like thoſe of the ſow-thiſtle. 2. The raguſina, a native of the Cape of Good Hope. 3. The lanata, a native of Sicily and of the country round Montpellier. This ſeldom riſes more than a foot high, ſupporting a few yellow flowers at top. 4. The ſinuata grows in Spain and Portugal; and the leaves are broader, longer, and more downy, than either of the other ſorts; the flower-ſtalks riſing more than a foot high. All theſe plants are eaſily propagated by ſeed, which ſhould be ſown in autumn, where they are to remain.

ANDUXAR, a city in the province of Andaluſia, in Spain, ſeated on the Guadalquiver. W. long. 4. 2. N. lat. 37. 45.

ANECDOTE, ANECDOTA, a term uſed by ſome authors for the titles of *Secret Hiſtories*; but it more properly denotes a relation of detached and intereſting particulars. The word is Greek, ανεκδοτα, q. d. *things not yet known* or *hitherto kept ſecret*. Procopius gives this title to a book which he publiſhed againſt Juſtinian and his wife Theodora; and he ſeems to be the only perſon among the ancients who has repreſented princes ſuch as they are in their domeſtic relation.—Varillas has publiſhed Anecdotes of the Houſe of Medicis.

ANECDOTES is alſo an appellation given to ſuch works of the ancients as have not yet been publiſhed. In which ſenſe, M. Muratori gives the name *Anecdota Græca* to ſeveral writings of the Greek fathers.

ANEE, in commerce, a meaſure for grain, uſed in ſome provinces of France. At Lyons, it ſignifies alſo a certain quantity of wine, which is the load an aſs can carry at once: which is fixed at 80 Engliſh quarts, wine-meaſure.

ANEMOMETER, in mechanics, implies a machine for meaſuring the force and velocity of the wind. (See pl. 5.) Various machines of this kind have been invented at different times, and by different perſons. The following has been found to anſwer the intention very completely. An open frame of wood, ABCDEFGHI, is ſupported by the ſhaft or arbor I. In the two croſs-pieces H K, L M, is moved a horizontal axis Q M, by means of the four ſails, *ah*, *cm*, *of*, *gb*, expoſed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO; upon which, as the ſails move round, a weight R, or S, is raiſed by a ſtring round its ſuperficies, proceeding from the ſmaller to the larger end N O. Upon this larger end or baſe of the cone, is fixed a rocket wheel *k*, in whoſe teeth the click X falls, to prevent any retrograde motion from the depending weight.

The ſtructure of this machine ſufficiently ſhows that it may be accommodated to eſtimate the variable force of the wind; becauſe the force of the weight will continually increaſe as the ſtring advances on the conical ſurface, by acting at a greater diſtance from the axis of motion; conſequently, if ſuch a weight be added on the ſmaller part M, as will juſt keep the machine in equilibrio in the weakeſt wind, the weight to be raiſed, as the wind becomes ſtronger, will be increaſed in proportion, and the diameter of the cone N O may be ſo large in compariſon to that of the ſmaller end at M, that the ſtrongeſt wind ſhall but juſt raiſe the weight at the greater end.

If, for example, the diameter of the axis be to that of the baſe of the cone N O as 1 to 28; then, if S be a weight of one pound at M on the axis, it will be equivalent to 28 pounds when raiſed to the greater end. If therefore, when the wind is weakeſt, it ſupports one pound on the axis, it muſt be 28 times as ſtrong to raiſe the weight to the baſe of the cone. If therefore a line of ſcale of 28 equal parts be drawn on the ſide of the cone, the ſtrength of the wind will be indicated by that number on which the ſtring reſts.

ANEMONE, WIND-FLOWER; a genus of the polygynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, *Multiſiliquæ*. It has its name from the Greek ανεμος, ſignifying the *wind*; becauſe the flower is ſuppoſed not to open unleſs the wind blows.—The characters are theſe: There is no *calyx*: The *corolla* conſiſts of petals of two or three orders, three in each ſeries, oblongiſh. The ſtamina conſiſt of numerous capillary filaments; the antheræ didymous and erect. The *piſtillum* has numerous germina collected into a head; the ſtyli are pointed; the ſtigmata obtuſe. There is no *pericarpium*; the receptaculum is globular. The *ſeeds* are very numerous. Of this genus Linnæus enumerates 21 ſpecies; but thoſe valuable on account of the beauty of their flowers are only the following: 1. The nemoroſa, which grows wild in the woods in Britain, where it flowers in April and May. The flowers are white, purple, or reddiſh purple. 2. The appennina is likewiſe a native of Britain, growing in woods. The flowers of this ſpecies, like the laſt, are ſometimes double; and their colours white, blue, or violet. 3. The coronaria. 4. The hortenſis. Theſe two are natives of the Levant, particularly of the Archipelago iſlands, where they become large and double, and are a great ornament to the garden. Their principal colours are red, white, purple, and blue; with many intermediate ſhades. The firſt and ſecond ſorts may be propagated by taking up their roots when the leaves decay, and tranſplanting them in wilderneſſes where they will thrive and increaſe greatly, if they are not diſturbed. But the two laſt ſorts require a good deal of care in the culture.

Sea-ANEMONE. See ANIMAL-*Flower*.

ANEMOSCOPE, a machine that ſhows either the courſe or velocity of the wind. The beſt machine of this ſort was invented by the late Mr. Pickering, and publiſhed in the *Philoſophical Tranſactions*, N° 473. His anemoſcope is a machine four feet and a quarter high, conſiſting of a broad and weighty pedeſtal, a pillar faſtened into it, and an iron axis of about half an inch diameter faſtened into the pillar. Upon this axis turns a wooden tube; at the top of which is placed a vane, of the ſame materials, 21 inches long, conſiſting of a quadrant, graduated, and ſhod with an iron rim, notched to each degree; and a counterpoiſe of wood, as in the figure, on the other. Through the centre of the quadrant runs an iron pin, upon which are faſtened two ſmall round pieces of wood, which ſerve as moveable radii to deſcribe the degrees upon the quadrant, and as handles to a velum or ſail, whoſe pane is one foot ſquare, made of canvas, ſtretched upon four battens, and painted. On the upper batten, next to the ſhod rim of the quadrant, is a ſmall ſpring which catches at every notch correſponding to each degree, as the wind ſhall, by preſſing againſt the ſail, raiſe it up; and prevents the falling back of the ſail, upon leſſening of the force of the wind. At the bottom of the wooden tube is an iron index, which moves round a circular piece of wood faſtened to the top of the pillar on the pedeſtal, on which are deſcribed the 32 points of the compaſs. For the figure of this machine ſee Pl. 5. where *a* is the pedeſtal; *b*, the pillar on which the iron axis is fitted; *c*, the circle of wood,

on which are described the 32 points of the compass; *c*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpoise of the vane. The adjoining figure represents the velum, which takes off: *a* is the plane of the velum; *b*, the spring; *c*, the wooden radii; *d d*, the holes through which the pin in the centre of the quadrant goes. Its uses are the following: 1. Having a circular motion round the iron axis, and being furnished with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, described on the round piece of wood on the pillar, to the same quarters of the heavens, it gives a faithful account of that quarter from which the wind blows. 2. By having a velum or sail elevated by the wind along the arch of the quadrant to an height proportionable to the power of the column of wind pressing against it, the relative force of the wind, and its comparative power, at any two times of examination, may be accurately taken. 3. By having a spring fitted to the notches of the iron with which the quadrant is shod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the highest blast, since the last time of examination, without the trouble of watching it.—In one of the turrets of the Queen's palace is an anemoscope of a construction different from the foregoing, and which answers the purpose exceedingly well.

ANETHUM, DILL and FENNEL; a genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. These are its essential characters: The fruit is oval, compressed, striated; and the petals (five) are involute, entire, and very short. The species are, 1. The graveolens, or dill, an annual plant; the root long, slender, and white; the leaves divided into a multitude of fine, long, narrow segments like those of fennel, but of a bluish green colour, and less strong smell. The stalk is round and firm, growing to the height of four feet, with yellow flowers in moderately large umbels. 2. The fenículum, or fennel; of which there are two varieties, the common and the sweet. The sweet is smaller in all its parts than the common, except the seeds, which are considerably larger. Both sorts are cultivated in our gardens. The common is a perennial: the sweet fennel perishes after it has given seed; nor do its seeds come to such perfection in this climate as those which we receive from Germany. The *medicinal uses* of *dill* are confined to its seeds, which are warm and pungent, and on that account have been administered for the relief of flatulent colics. Of *fennel* both the seeds and roots are used in medicine. The seeds of both the fennels have an aromatic smell, and a warm pungent taste. Those of the sweet fennel are in flavour most agreeable, and have also a considerable degree of sweetness; hence our colleges have directed the use of these only in the different officinal compositions. The root is far less warm, but has more of a sweetish taste, than the seeds. Boerhaave says, that this root agrees in taste, smell, and medical qualities, with the celebrated *genseng* of the Chinese; from which, on examination however, it appears to be very considerably different.

ANEURISM, in surgery, a throbbing tumor, distended with blood, and formed by the dilatation of the coats of an artery. See SURGERY.

ANGARI, or ANGARII, in antiquity, were public couriers, appointed for the carrying of messages. The ancient Persians, Budæus observes, had their αγγαρειον δρομημα; which were a set of couriers on horseback, posted at certain stages or distances, always in readiness to receive the dispatches from one, and forward them to another, with wonderful celerity, answering to what the moderns call *posts*, q. d. *positi*, as being posted at certain places or stages.—The angari were also called by the Persians *astaudæ*; by the Greeks ἡμεροδρομοὶ, on account of the long journeys they made in one day.

ANGARIA, in Roman antiquity, a kind of public service imposed on the provincials, which consisted in providing horses and carriages for the conveyance of military stores, and other public burdens. It is sometimes also used for a guard of soldiers, posted for the defence of a place. In a more general sense, it is used for any kind of oppression or services performed through compulsion.

ANGAZYA, one of the Comorra islands, lying between the north end of Madagascar and the coast of Zanguebar in Africa, from lat. 10. to 15. S.

ANGEIOTOMY, in surgery, implies the opening a vein or artery, as in bleeding; and consequently includes both arteriotomy and phlebotomy.

ANGEL, a spiritual intelligent substance, the first in rank and dignity among created beings. The word *Angel* is Greek, and signifies a *Messenger*; the Hebrew מלאך signifies the same thing. The angels are in Daniel (chap. iv. ver. 13, &c.) called עירים, or *Watchers*, from their vigilance: for the same reason they are, in the remains we have of the prophecy attributed to Enoch, named *Egregori*; which word imports the same in Greek.—*Angels*, therefore, in the proper signification of the word, do not import the nature of any being, but only the office, to which they are appointed, especially by way of message, or intercourse between God and his creatures; in which sense they are called the *ministers of God*, who do his pleasure, and *ministering spirits* sent forth to minister for them who shall be heirs of salvation. That there are such beings as we call *angels*, that is, certain permanent substances, invisible, and imperceptible to our senses, endued with understanding and power superior to that of human nature, created by God, and subject to him as the supreme Being; ministering to his divine providence in the government of the world by his appointment, and more especially attending the affairs of mankind; is a truth so fully attested by Scripture, that it cannot be doubted. Nay, the existence of such invisible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons*; and the Romans *genii*, or *lares*. Epicurus seems to have been the only one among the old philosophers who absolutely rejected them. Indeed, the belief of middle intelligences influencing the affairs of the world, and serving as ministers or interpreters between God and man, is as extensive as the belief of a God; having never, so far as we know, been called in question by those who had any religion at all.

ANGEL is likewise a title given to bishops of several churches. In this sense is St. Paul understood by some authors, where he says, *Women ought to be covered in the church, because of the angels*. The bishops of the seven churches of Asia were, by a name borrowed from the synagogue, called the *angels* of those churches.

ANGEL, in commerce, the name of a gold coin formerly current in England. It had its name from the figure of an angel represented upon it, weighed four pennyweights, and was twenty-three and a half carats fine. It had different values in different reigns; but at length became an imaginary sum, or money of account, implying ten shillings.

ANGEL *Fish*, in ichthyology, a species of squalus. See SQUALUS.

ANGELIC *Garment*, *Angelica vestis*, among our ancestors, was a monkish garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks. It was from them called *angelical*, because they were called *angeli* who by these prayers *animæ saluti succurrebant*. Hence, where we read the phrase *monachus ad succurren-*

dum in our old books, it muſt be underſtood of one who had put on the habit when he was at the point of death.

ANGELICA; a genus of the digynia order, belonging to the pentandria claſs of plants, and in the natural method ranking under the 45th order, *Umbellatæ*. The eſſential characters are theſe: The fruit is roundiſh, angled, ſolid, with reflected ſtyli; the corollæ are equal, and the petals incurvated. The *ſpecies* are, 1. The ſativa, or common angelica, cultivated for medicinal uſe, and likewiſe for a ſweetmeat, grows naturally in the northern countries. The root of this ſpecies is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, compoſed of pinnated foliola, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the ſtalk is round, ſtriated, and as thick as a child's arm. The umbels are very large, and of a globoſe figure; the flowers very ſmall, and greeniſh. 2. The arch angelica is a native of Hungary and Germany. The leaves are much larger than thoſe of the former, and the flowers yellow. 3. The ſylveſtris grows naturally in moiſt places in many parts of Britain. 4. The atrc-purpurea canadenſis; and 5. The lucida canadenſis; theſe are natives of North America, but have neither beauty nor uſe. The common angelica, if planted on the ſides of ditches or pools of water, about three feet diſtance, thrive exceedingly.

All the parts of angelica, eſpecially the root, have a fragrant aromatic ſmell, and a pleaſant bitteriſh warm taſte, glowing upon the lips and palate for a long time after they have been chewed. The freſh root, wounded early in the ſpring, yields an odorous, yellow juice, which, ſlowly exſiccated, proves an elegant gum reſin, very rich in the properties of the angelica, which however are of no great value in medicine.

ANGELICS, Angelici, in church-hiſtory, an ancient ſect of heretics, ſuppoſed by ſome to have got this appellation from their exceſſive veneration of angels; and by others, from their maintaining that the world was created by angels.

Angelics is alſo the name of an order of knights, inſtituted in 1191, by Angelus Flavius Commenus emperor of Conſtantinople.

Angelics is alſo a congregation of nuns, founded at Milan in 1534, by Louiſa Torelli, countefs of Guaſtalla. They obſerve the rule of St. Auguſtine.

ANGELITES, in eccleſiaſtical hiſtory, a ſect of Chriſtian heretics, in the reign of the emperor Anaſtaſius, and the pontificate of Symmachus, about the year 494, ſo called from Angelium, a place in the city of Alexandria, where they held their firſt meetings. They were called likewiſe *Severites*, from one Severus, who was the head of their ſect; as alſo *Theodoſians*, from one among them named Theodoſius, whom they made pope at Alexandria. They held that the perſons of the Trinity are not the ſame; that none of them exiſts of himſelf, and of his own nature; but that there is a common god or deity exiſting in them all, and that each is God, by a participation of this deity.

ANGELO (Michael). There were five celebrated Italian painters of this name, who flouriſhed in the 16th and 17th centuries; but the moſt diſtinguiſhed was Michael Angelo Buonarroti, who was a moſt incomparable painter, ſculptor, and architect, born in 1474, in the territory of Arezzi in Tuſcany. He was the diſciple of Dominico Ghirlandaio; and erected an academy of painting and ſculpture in Florence, under the protection of Lorenzo di Medicis; which upon the troubles of that houſe, was obliged to remove to Bologna. About this time he made an image of Cupid, which he carried to Rome, broke off one of its arms, and buried the image in a place he knew would ſoon be dug up, keeping the arm by him. It was accordingly found, and ſold to Cardinal St. Gregory for an antique; until Michael, to their confuſion and his own credit, diſcovered his artifice, and confirmed it by the deficient arm which he produced. It is rather unuſual for the manufacturers of antiques to be ſo ingenuous. His reputation was ſo great at Rome, that he was employed by pope Sixtus to paint his chapel; and by the command of Pope Paul III executed his moſt celebrated piece *The laſt judgment*. He has the character of being the greateſt deſigner that ever lived; and it is univerſally allowed that no painter ever underſtood anatomy ſo well. He died immenſely rich at Rome, in 1564.—Michael Angelo de Caravaggio was alſo a painter of great note. It was obſerved of Michael Angelo Buonarroti, that he was incomparable in deſigning, but knew little of colouring; and of Caravaggio, that he had as good a goût in colouring as he had a bad one in deſigning. There is one picture painted by the latter in the Dominican church at Antwerp, which Rubens uſed to call his maſter. Caravaggio died in 1609.

ANGELO (St.), a ſmall but ſtrong town of Italy, in the Capitanata. There are ſeveral other towns and caſtles of the ſame name in Italy, and particularly the caſtle of St. Angelo at Rome. E. long. 15. 56. N. lat. 41. 43.

ANGELOS (Los), a province of Mexico, the ancient republic of Tlaſcala, of which a city called *Tlaſcala* was once the capital. That city is now reduced to an inconſiderable village, and has given place to another called *Puebla des los Angelos*, or the city of Angels. It is ſituated in W. long. 103. 12. and N. lat. 19. 13.

ANGELOT, an ancient Engliſh gold coin, ſtruck at Paris while under ſubjection to the Engliſh. It exhibited the figure of an angel ſupporting the arms of England and France. There was a ſimilar coin ſtruck under Philip de Valois.

Angelot is alſo uſed in commerce to denote a ſmall, fat rich ſort of cheeſe, brought from Normandy. It is made chiefly in the Pays de Bray, whence it is alſo called *angelot de Bray*. It is commonly made in vats, either ſquare or ſhaped like a heart.

ANGER, a violent paſſion of the mind, conſiſting in a propenſity to take vengeance on the author of ſome real or ſuppoſed injury done the offended party. Anger is either *deliberative* or *inſtinctive*; and the latter kind is raſh and ungovernable, becauſe it operates blindly, without affording time for deliberation or foreſight. Biſhop Butler very juſtly obſerves, that anger is far from being at all times a ſelfiſh paſſion, ſince it is naturally excited by injuries offered to others as well as to ourſelves; and was deſigned by the Author of nature not only to excite us to act vigorouſly in defending ourſelves from evil, but to intereſt us in the defence or reſcue of the injured and helpleſs, and to raiſe us above the fear of the proud and mighty oppreſſor. Hence therefore the precept, "Be ye angry and ſin not." Anger becomes ſinful, however, and contradicts the rule of ſcripture, when it is conceived upon ſlight and inadequate provocations, when its motives are low and ſelfiſh, or when it continues long. It is then contrary to the amiable ſpirit of charity, which "ſuffereth long, and is not eaſily provoked." Hence theſe other precepts, "Let every man be ſlow to anger;" and, Let not the ſun go down upon your wrath."

Theſe precepts, and all reaſoning indeed upon the ſubject, ſuppoſe the paſſion of anger to be within our power; and this power conſiſts not ſo much in any faculty we have of appeaſing our wrath at the time (for we are paſſive under the ſmart which an injury or affront occaſions, and all we can then do is to prevent its breaking out into action), as in ſo mollifying our minds by habits of juſt reflection, as to be leſs irritated by impreſſions of injury, and to be ſooner pacified. The reflections proper for this purpoſe, and which may be called the *ſedatives* of anger, are admirably ſuggeſted by Archdeacon Paley, in his excellent treatiſe of *Moral and Political Philoſophy*.

Phyſicians and naturaliſts have recorded many inſtances of very extraordinary effects produced by the paſſion of anger. Borrichius cured a woman of an inveterate tertian ague, which had baffled the art of phyſic, by putting the patient in a furious fit of anger. Valeriola made uſe of the ſame means, with the like ſucceſs, in a quartan ague. The ſame paſſion has been equally ſalutary to paralytic, gouty, and even dumb perſons; to which laſt it has ſometimes given the uſe of ſpeech. Etmuller gives divers inſtances of very ſingular cures wrought by anger; among others, he mentions a perſon laid up in the gout, who, being provoked by his phyſician, flew upon him, and was cured. It is true, the remedy is ſomewhat dangerous in the application, when a patient does not know how to uſe it with moderation. We meet with ſeveral inſtances of princes to whom it has proved ſuddenly mortal. There are alſo inſtances wherein it has produced the epilepſy, jaundice, cholera morbus, diarrhœa, &c. In fact, this paſſion throws the whole nervous ſyſtem into preternatural commotions, and ſurpriſingly augments the ſyſtole of the heart and contiguous veſſels. It alſo injures the tone of the whole machine. By the ſpaſmodic effect it produces on the ſtomach and inteſtines very dangerous conſequences are liable to enſue. Its effect on the biliary and hepatic ducts is alſo very ſurpriſing; ſince by an intenſe conſtriction of theſe parts a ſudden and univerſal jaundice has frequently been produced. The liver is ſometimes alſo rendered ſchirrous, and ſtones are generated in the gall-bladder and biliary ducts, in conſequence of an obſtruction to the bile. Beſides theſe effects, it is evident from experience, that anger has a great tendency to excite enormous hæmorrhages, either from the noſe, the lungs, the veins of the anus; or in women, from the uterus, eſpecially in thoſe previouſly diſpoſed to ſuch evacuations.

ANGEREMANIA, a province of the kingdom of Sweden, bounded on the N. by Lapland and Bothnia, on the E. by the gulph of Bothnia and Medelpadia, and on the W. by Jemti and Herndel.

ANGERMOND, a town in the duchy of Berg, in Germany, on the E. ſide of the Rhine. E. long. 6. 20. N. lat. 51. 10.

ANGERONA, in mythology, the name of a Pagan deity whom the Romans prayed to for the cure of the *angina*.

ANGERONALIA, in antiquity, ſolemn feaſts held by the Romans the 21ſt of December, in honour of Angerona.

ANGERS, an ancient town of France in the late province of Anjou, and the epiſcopal town of the department of Maine and Loire. It is ſeated near the place where the Sarte and the Loire loſe themſelves in the Maine. W. long. 0. 30. N. lat. 47. 28.

ANGHIERA, a town of Italy, in the duchy of Milan; ſeated on the E. ſide of the lake Maggiore, in E. long. 9. 5. N. lat. 45. 42.

ANGINA, in medicine, a violent inflammation of the throat, otherwiſe called *quinſey*. See MEDICINE.

ANGINA *Pectoris*. See MEDICINE.

ANGIOSPERMIA, in the Linnæan ſyſtem of botany, the ſecond order in the claſs Didynamia. It conſiſts of thoſe plants, of that claſs, whoſe ſeeds are incloſed in a pericarpium. In this order the ſtigma is generally obtuſe. Theſe are the *perſonati* of Tournefort.

ANGLE, the inclination of two lines meeting one another in a point. See GEOMETRY.

ANGLE *of Incidence*, in optics, the angle which a ray of light makes with a perpendicular to that point of the ſurface of any medium on which it falls; though it is ſometimes underſtood of the angle which it makes with the ſurface itſelf.

ANGLE *of Refraction* now generally means the angle which a ray of light, refracted by any medium, makes with a perpendicular to that point of the ſurface on which it was incident; but has ſometimes been underſtood of the angle which it makes with the ſurface of the refracting medium itſelf.

ANGLER, a perſon who practiſes the art of angling, whether as diverſion or otherwiſe. See ANGLING.

ANGLER, in ichthyology, the Engliſh name of a ſpecies of lophus. See LOPHUS.

ANGLES, an ancient German nation, originally a branch of the Suevi; who, after various migrations, ſettled in that part of Denmark, and duchy of Sleſwick, which to this day is called *Angel*, and of which the city of Flenſburgh is the capital. Here they were known, even in the time of Tacitus, by the name of *Angli*. The origin of this name is variouſly accounted for. To this nation the Britiſh ambaſſadors are ſaid to have applied when ſoliciting ſuccours againſt the Scots and Picts. The Angles, therefore, came over in greater numbers than any other Saxon nation; and accordingly had the honour of giving the name of *Anglia* to England.

ANGLESEY (Iſle of) is the moſt weſtern county of North Wales. It is 24 miles in length, 18 in breadth, and ſends one member to parliament. It is ſeparated from Caernarvonſhire by a ſtrait called *Menai*, and on every other ſide is ſurrounded by the ſea. In ancient times this iſland was called *Mon*, *Mona*, or *Moneg*; and was the great nurſery of the religion of the Druids.

ANGLING, among ſportſmen, the art of fiſhing with a rod, to which are fitted a line, hook, and bait. See FISHING-*Rod*, FISHING-*Hook*, FISHING-*Fly*.

The angler's firſt buſineſs is to attract the fiſh to the place intended for angling. The method of doing this, in ſtanding waters, by throwing in grains, chopped worms, and the like, is well known: but the chief difficulty is in running rivers and brooks. The method, in this caſe, is to prepare a tin-box capable of holding ſome hundred of worms, bored on all ſides, and full of holes of ſuch a ſize as they may be juſt able to crawl out at. There muſt be a plummet faſtened to this box to ſink it, and a line to draw it back at pleaſure; in this caſe it is to be thrown into the water in a proper place, above which the angler may ſtand under cover. The worms will ſlowly and gradually crawl out of this box, and the fiſh will be gathered about to feed on them; the baited hook is then to be thrown in higher up and carried down by the ſtream.

When the angler takes his ſtand, he is to ſhelter himſelf under ſome tree or buſh, or ſtand ſo far from the brink of the water that he can only diſcern his float. When paſtes are uſed for bait, it is proper to mix a little tow and honey with them; and laſtly, a ſmall anointing with butter is of great uſe to keep the paſte from being waſhed off the hook. The right way of angling with the *fly* is down the river, and not up; neither need the angler ever make above half a dozen trials in one place, either with fly or ground bait, when he angles for trout; for by that time the fiſh will either offer to take or will refuſe the bait and not ſtir at all.

In a pond, the beſt place for the angler to take his ſtand is uſually that where the cattle go in to water. In rivers, if breams are fiſhed for, it ſhould be in the deepeſt and moſt quiet places; if eels, under the banks of rivers that hang over. Perch are to be expected in clean places, where the ſtream is ſwift; and chub in deep ſhaded holes. Roach are moſtly found where the perch are, and trout only in ſwift and clear ſtreams. Places where there are many weeds, or old ſtumps of trees, harbour fiſh in great numbers, and they uſually bite freely there; but there is danger of entangling the line, or faſtening the hook to the weeds. In caſe of this accident, recourſe is to be had to a ring of lead, of about ſix inches round, faſtened to a ſmall packthread: this ring is to be thruſt over the rod, and let fall

into the water. It will deſcend to the place where the hook is entangled; and then, by pulling the packthread gently, the hook will be ſoon diſengaged, or at the worſt it can only be broke off near the end of the line; whereas, when this is not employed, the rod itſelf is ſometimes broken, or the line nearer its upper end.

Deep waters are beſt for angling in, for the fiſh do not love to be diſturbed by wind and weather. The openings of ſluices and mill-dams always bring fiſh up the current to ſeek for the food which is brought with the ſtream; and angling in theſe places is uſually ſucceſsful. The beſt ſeaſon is from April to October; for, in very cold ſtormy weather fiſh will not bite. The beſt times of the day are from three till nine in the morning, and from three in the afternoon till ſun-ſet. In an eaſterly wind, there is never much ſport for the angler; but ſoutherly winds are favourable to his purpoſe, and a warm but lowering day is moſt of all to be choſen. A gentle wind, after a ſudden ſhower, to diſturb the water, affords a very good opportunity for the angler. The cooler the weather in the hotteſt months, the better; but in winter, on the contrary, the warmer the day the better. A cloudy day, after a bright moon-light night, is always a good day for ſport; for the fiſh do not care for going after prey in the bright moonſhine, and are therefore hungry the next morning.

Thoſe who are fond of angling might ſave themſelves ſome fruitleſs trouble by obſerving when ſmall fiſh in a jar take or refuſe food. (See Fish.) The ſeveral methods of angling for ſalmon, trout, carp, &c. &c. may be ſeen under the article Fishing.

ANGLO-Calvinists, a name given by ſome writers to the members of the church of England, as agreeing with the other Calviniſts in moſt points except church-government.

Anglo-*Saxon*, an appellation given to the language ſpoken by the Engliſh Saxons; in contradiſtinction from the true Saxon, as well as from the modern Engliſh.

ANGOL, a city of Chili in South America, ſituated in W. long. 78. and S. Lat. 38.

ANGOLA, a kingdom on the weſtern coaſt of Africa, lying, according to the moſt probable accounts, between lat. 8. 30. and 16. 21. South, forming a coaſt of upwards of 480 miles; but how far it extends from weſt to eaſt, has never been exactly determined. It produces Indian corn, beans, oranges, lemons, and ſeveral other fruits. The inhabitants are very lazy, generally idolaters, and take as many wives as they think fit. The country is divided among ſeveral petty princes, and the Portugueſe have ſeveral ſettlements on the coaſt. However, the Engliſh and Dutch traffic with the natives, and purchaſe a great number of ſlaves. Theſe are the moſt lazy and ungovernable of any on the coaſt of Guinea, becauſe they are generally brought from inland countries, where they have not the leaſt knowledge of the reſt of the world. They go almoſt naked, and are very fond of dog's fleſh, though they have plenty of other proviſions. All the males are circumciſed, but for what reaſon they cannot tell.

Angola *Pea*, or *Pigeon-pea*. See Cytisus.

ANGON, in the ancient military art, a kind of javelin uſed by the French. They darted it at a conſiderable diſtance. The iron head of this weapon reſembled a flower-de-luce. It is the opinion of ſome writers, that the arms of France are not flowers-de-luce, but the iron point of the angon or javelin of the ancient French.

ANGOR, among ancient phyſicians, a term uſed to ſignify a concentration of the natural heat; the conſequence of which they ſuppoſed to be pain of the head, palpitation, and low ſpirits.

ANGOT, a province or kingdom of Abyſſinia, formerly rich and fertile, but almoſt ruined by the Gallas, a wandering nation in the internal parts of Africa, who diſpoſſeſſed the Abyſſinian monarchs of all that was worth poſſeſſing.

ANGOULESME, a town of France, in the department of Charente, and late duchy of Angoumois. E. lon. 0. 10 N. lat. 45. 39.

ANGOUMOIS, late a province of France, bounded on the north by Poitou, on the E. by Limouſin and March, on the S. by Perigord, and on the W. by Saintonge. It is now included in the department of Charente.

ANGOURA, Angora, or Angori, a city of Aſia, in Anatolia, formerly called *Ancyra*, and ſtill full of magnificent remains of antiquity. E. long. 32. 5. N. lat. 39. 30.

ANGOY, a kingdom of Loango in Africa, bounded on the N. by Cacongo, and on the S. by Congo; from the former of which it is ſeparated by the river Cabinda, and from the latter by the river Zaire.

ANGRA, a city of Tercera, one of the Azores; the capital, not only of that iſland, but of all the reſt, and the reſidence of the governor. It is ſeated on the S. ſide, near the middle of the longeſt diameter of the iſland, cloſe to the ſea.

ANGUILLA, one of the Weſt-India or Carribbee iſlands, lying in about 15° N. lat.

ANGUINA. See Tricosanthes.

ANGUILLIFORM, an appellation given by zoologiſts, not only to the different ſpecies of eels, but to other animals reſembling them in ſhape.

ANGUINUM ovum, a fabulous kind of egg, ſaid to be produced by the ſaliva of a cluſter of ſerpents, and poſſeſſed of certain magical virtues. The ſuperſtition in reſpect to theſe was very prevalent among the ancient Britons; and there ſtill remains a ſtrong tradition of it in Wales. This wondrous egg ſeems to have been nothing more than a bead of glaſs, uſed by the Druids as a charm to impoſe on the vulgar, whom they taught to believe, that the poſſeſſor would be fortunate in all his attempts, and that it would gain him the favour of the great.

On this ſubject Mr. Pennant remarks, that "Our modern Druideſſes give much the ſame account of the *ovum anguinum*, *glain neidr*, as the Welch call it, or the *adder gem*, as Pliny does; but ſeem not to have ſo exalted an opinion of its powers, uſing it only to aſſiſt children in cutting their teeth, or to cure the chincough, or to drive away an ague." Theſe beads are of a very rich blue colour; ſome plain, others ſtreaked. See Plate 30.

ANGUIS, or Snake, in zoology, a genus belonging to the order of amphibia ſerpentes. The characters of the anguis are theſe. They are ſquamous or ſcaly in the belly and under the tail; without any ſcuta. (See Plates 1 and 5). There are 15 ſpecies of the anguis, viz. 1. The *eryx*, a native of Britain and likewiſe of America, about a ſpan in length, and about the thickneſs of a man's finger. One from Aberdeenſhire, deſcribed by Mr. Pennant, was 15 inches long; the tongue broad and forked; noſtrils ſmall, round, and placed near the tip of the noſe; eyes lodged in oblong fiſſures above the angle of the mouth; belly of a blueiſh lead colour, marked with ſmall white ſpots irregularly diſpoſed. The reſt of the body was of a greyiſh brown, with three longitudinal duſky lines; one extending from the head along the back to the point of the tail; the others broader, and extending the whole length of the ſides. It was entirely covered with ſmall ſcales; largeſt on the upper part of the head. 2. The *fragilis*, blind-worm, or ſlow-worm, grows to about a foot in length, and to the thickneſs of a man's little finger. The iris is red; the head ſmall; the neck ſtill more ſlender; from that part the body grows ſuddenly, and continues of an equal bulk to the tail, which ends quite blunt. The colour of the back is cinereous, marked with very ſmall lines compoſed of minute black ſpecks: the ſides are of a red-

diſh caſt; the belly duſky; both marked like the back. The tongue is broad and forky; the teeth minute, but numerous; the ſcales ſmall. The motion of this ſerpent is ſlow, from which, and from the ſmallneſs of the eyes, are derived its name. It reſembles the viper in producing its young, which are put forth alive. It is frequent with us in gardens and paſtures, where it lives principally under ground feeding on worms. Like others of the genus, they lie torpid during winter, and are ſometimes found in vaſt quantities twiſted together. 3. The *ventralis*, or glaſs-ſnake of Cateſby, (Pl. 5.) has 127 ſquamæ on the belly, and 223 on the tail. The head is very ſmall, and the tongue of a ſingular form. The upper part of the body is of a blended colour brown and green, moſt regularly and elegantly ſpotted with yellow, the undermoſt part being the brighteſt. The ſkin is very ſmooth, and ſhining with ſmall ſcales, more cloſely connected, and of a different ſtructure from thoſe of other ſerpents. A ſmall blow with a ſtick will cauſe the body to ſeparate, not only at the place ſtruck, but at two or three other places, the muſcles being articulated in a ſingular manner quite through to the vertebræ. They appear earlier in the ſpring than any other ſerpent, and are numerous in the ſandy woods of Virginia and Carolina. They are generally ſaid to be harmleſs. 4. The *jaculus*, or dart-ſnake, is about three hands-breadth long, and about the thickneſs of one's little finger. Its colour is a milky grey on the back, variegated with ſmall black ſpots like ſo many eyes; and on the belly it is perfectly white. The neck is wholly black; and from that, two milk-white ſtreaks run all the way along the back to the tail: the black ſpots alſo are each ſurrounded with a ſmall circle of white. It has its name from its vibrating its body in the manner of a dart. It is a native of Egypt, Libya, and the iſlands of the Mediterranean. 5. The *quadrupes*. The body of this ſpecies is cylindrical, with 14 or 15 longitudinal aſh coloured ſtreaks; the teeth are extremely ſmall, and it has no ears. The feet are at a great diſtance from each other, very ſhort, with five toes and ſmall nails; but the toes are ſo minute, that they can hardly be numbered. It is a native of Java. 6. The *bipes*, a native of the Indies. It has two ſhort feet, with two toes, near the anus. In every ſcale of the bipes there is a brown point. 7. The *meleagris*, is likewiſe a native of the Indies; it has ſmall teeth, but no ears. This ſpecies has a great reſemblance to the former. 8. The *colubrina*, an inhabitant of Egypt, is beautifully variegated with pale and yellow colours. 9. The *maculata*, (Pl. 1.) a native of America, is yellow, and interſperſed with aſh-coloured lines on the back: the head is ſmall in proportion to the body. 10. The *reticulata*, a native of America, has browniſh ſcales, with a white margin. 11. The *ceraſtes*, with 200 ſquamæ on the belly and 15 on the tail, is a native of Egypt. 12. The *lumbricalis*, a native of America, has 230 ſquamæ on the belly and 7 on the tail; its colour is a yellowiſh white. 13. The *platura*. The head is oblong and without teeth; the body is about a foot and a half long, black above and white below; the tail is about one-ninth of the length of the animal, much compreſſed or flatted, and varicgated with black and white; the ſcales are roundiſh, ſmall, not imbricated, but they cannot be numbered. 14. The *laticauda*, a native of Surinam. The tail is compreſſed, acute, and pale, with browniſh belts. 15. The *ſcytale*, a native of the Indies, with 220 ſquamæ on the belly, and 13 on the tail. The head is ſmall and oval, and the eyes are little. The body is cylindrical, about a foot and a half long, covered with oval obtuſe ſcales. The tail is thick and obtuſe like the head; its colour is white, interſperſed with browniſh rings; the margins of the ſcales are of an iron colour; and the top of the head is blue. According to Linnæus, none of this genus are poiſonous.

ANGURIA, the WATER MELON; a genus of the diandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. The eſſential characters are theſe: The *male* calyx is quinquefid, and the corolla quinquepetalous. The *female* calyx and corolla the ſame. The pericarpium is a pome beneath, with two cells. The ſeeds are numerous. Of this genus, Linnæus reckons three ſpecies, the trilobata, pedata, aud trifoliata; but only one is known in this country, by the name of *Citrul*. The fruit is cultivated in Spain, Portugal, Italy, and other warm countries of Europe; as alſo in Africa, Aſia, and America; where it is eſteemed on account of its wholeſome cooling quality; but in Britain it is held in little eſtimation. To have this fruit good, ſome ſeeds muſt be procured of three or four years old; new ſeeds being apt to produce vigorous plants, which are ſeldom ſo fruitful as thoſe of a moderate ſtrength. Theſe are to be ſown in the hot-bed for early cucumbers. On the whole, their management differs very little from that of the muſk-melon, only they muſt frequently have freſh air; and when the nights are cold, the glaſſes muſt be covered with mats.

ANGUS, a diſtrict of the county of Forfar in Scotland, and once an earldom in the family of Douglas.

ANGUSTICLAVIA, in Roman antiquity, a tunica embroidered with little purple ſtuds. It was worn by the Roman knights, as the laticlavia was by the ſenators.

ANHALT, an iſland of Denmark, in North Jutland, lying in the Categut, 8 miles from the coaſt of Jutland, 10 from Zealand, and 7 from Holland.

ANHALT, a principality of Germany, in the circle of Upper Saxony, is a long narrow tract, ſituated for the moſt part betwixt the rivers Elbe and Saal, about 90 miles in length from eaſt to weſt, but of unequal breadth, the greateſt being on the eaſt ſide, which is but 35 miles. It is bounded on the S. by the county of Manſfield, on the W. by the duchy of Halberſtadt, on the E. by the duchy of Saxony, and on the N. by the duchy of Magdeburg.

ANHELATIO, or ANHELITUS, a term uſed by the old phyſicians for a ſhortneſs of breath.

ANIAN, the name of a barren ſandy deſert lying on the eaſt coaſt of Africa.

ANJENGO, a ſmall town and factory, with a fort, on the coaſt of Malabar, in the peninſula on this ſide the Ganges, belonging to the Eaſt India Company. E. long. 76. 1. N. lat. 7. 0.

ANIL, in botany, a ſynonyme of a ſpecies of indigofera. See INDIGOFERA.

ANIMA, among divines and naturaliſts, denotes the ſoul, or principle of life, in animals. See SOUL.

ANIMA, among the old chemiſts, denoted the volatile or ſpirituous parts of bodies.

ANIMA *Hepatis*, is an obſolete name for the *ferrum vitriolatum* or *ſalt of iron*, on account of its ſuppoſed efficacy in diſeaſes of the liver.

ANIMA *Mundi*, a certain pure ethereal ſubſtance or ſpirit, diffuſed, according to many of the ancient philoſophers, through the maſs of the world, informing, actuating, and uniting the divers parts thereof into one great, perfect, organical, and vital body or animal. They add, that this *anima mundi*, which more immediately reſides in the celeſtial regions as its proper ſeat, moves and governs the heavens in ſuch manner, as that the heavens themſelves firſt received their exiſtence from the fecundity of the ſame ſpirit; for that this *anima*, being the primary ſource of life, every where breathed a ſpirit like itſelf, by virtue whereof various kinds of things were framed conformable to the divine ideas.

ANIMA *Saturni*, a white powder obtained by pouring diſtilled vinegar on litharge, of conſiderable uſe in enamelling. See ENAMEL.

ANIMAL, in natural hiſtory, an organized and living body, which is alſo endowed with ſenſation: thus, minerals are ſaid to grow or increaſe, plants to grow and live, but animals alone to have ſenſation.

It is this property of ſenſation alone that can be deemed the eſſential characteriſtic of an animal; and by which the animal and vegetable kingdoms ſeem to be ſo eſſentially ſeparated, that we cannot even imagine the leaſt approximation of the one to the other. Thoſe naturaliſts, indeed, who have ſuppoſed the diſtinction between animals and vegetables to conſiſt in any thing elſe than what we have already mentioned, have found themſelves greatly embarraſſed; and have generally agreed, that it was extremely difficult, if not impoſſible, to ſettle the boundaries between the animal and vegetable kingdoms. But this difficulty will be eaſily ſeen to ariſe from their taking the characteriſtic marks of the animal kingdom, from ſomething that was evidently common to both. Thus Boerhaave attempted to diſtinguiſh an animal from a vegetable, by the former having a mouth, which the latter has not: but here, as the mouth of an animal is only the inſtrument by which nouriſhment is conveyed to its body, it is evident that this can be no eſſential diſtinction, becauſe vegetables alſo require nouriſhment, and have inſtruments proper for conveying it into their bodies: and where the end is the ſame, a difference in the means can never be eſſential. The fixing the difference in an animal's having a gula, ſtomach, and inteſtines, as is done by Dr. Tyſon, is as little to the purpoſe.

The power of moving from one place to another, hath by many been thought to conſtitute their difference; and indeed, in moſt caſes, it is the obvious mark by which we diſtinguiſh an animal from a vegetable: but lord Kames has given ſeveral very curious inſtances of the locomotive power of plants; ſome of which, as he ſays, would do honour to an animal. "Upon the ſlighteſt touch, the ſenſitive plant ſhrinks back and folds up its leaves, ſimilar to a ſnail; which on the ſlighteſt touch retires within its ſhell. A new ſpecies of the ſenſitive plant has been lately diſcovered. See DIONÆA. If a fly perch upon one of its flower-leaves, it cloſes inſtantly, and cruſhes the inſect to death. There is not an article in botany more admirable than a contrivance, viſible in many plants, to take advantage of good weather, and to protect themſelves againſt bad. They open and cloſe their flowers and leaves in different circumſtances; ſome cloſe before ſunſet, ſome after: ſome open to receive rain, ſome cloſe to avoid it. The petals of many flowers expand in the ſun; but contract at night, or on the approach of rain. After the ſeeds are fecundated, the petals no longer contract. All the trefoils may ſerve as a barometer to the huſbandman; they always contract their leaves on an impending ſtorm. Some plants follow the ſun, others turn from it. Many plants, on the ſun's receſs, vary the poſition of their leaves, which is ſtyled the *ſleep of plants*. A ſingular plant, a ſpecies of the *Hedyſarum*, was lately diſcovered in Bengal. Its leaves are in continual motion all day long: but when night approaches, they fall down from an erect poſture to reſt."

By comparing theſe and other inſtances of ſeeming voluntary motion in plants, with that ſhare of life wherewith ſome of the inferior kinds of animals are endowed, we can ſcarce heſitate at aſcribing the ſuperiority to the former; that is, putting ſenſation out of the queſtion. Muſcles, for inſtance, are fixed to one place as much as plants are; nor have they any power of motion, beſides that of opening and ſhutting their ſhells: and in this reſpect they have no ſuperiority over the motion of the ſenſitive plant: nor does their action diſcover more ſagacity, or even ſo much, as the roots of the plane-tree, of which lord Kames relates many very curious particulars.

Mr. Buffon, who ſeems to be deſirous of confounding the animal and vegetable kingdoms, denies ſenſation to be any eſſential diſtinction. "Senſation (ſays he) more eſſentially diſtinguiſhes animals from vegetables: but ſenſation is a complex idea, and requires ſome explication. For if ſenſation implied no more than motion conſequent upon a ſtroke or an impulſe, the ſenſitive plant enjoys this power. But if, by ſenſation, we mean the faculty of perceiving and comparing ideas, it is uncertain whether brute animals are endowed with it. If it ſhould be allowed to dogs, elephants, &c. whoſe actions ſeem to proceed from motives ſimilar to thoſe by which men are actuated, it muſt be denied to many ſpecies of animals, particularly to thoſe which appear not to poſſeſs the faculty of progreſſive motion. If the ſenſation of an oyſter, for example, differed only in degree from that of a dog; why do we not aſcribe the ſame ſenſation to vegetables, though in a degree ſtill inferior? This diſtinction, therefore, between the animal and vegetable, is neither ſufficiently general nor determined. From this inveſtigation, we are led to conclude, that there is no abſolute and eſſential diſtinction between the animal and vegetable kingdoms; but that nature proceeds, by imperceptible degrees, from the moſt perfect to the moſt imperfect animal, and from that to the vegetables; and the freſh-water polypus may be regarded as the laſt of animals and the firſt of plants."

It were to be wiſhed, that philoſophers would on ſome occaſions conſider, that a ſubject may be dark as well on account of their inability to ſee, as when it really affords no light. Our author boldly concludes, that there is no eſſential difference between a plant and an animal, becauſe we aſcribe ſenſation to an oyſter, and none to the ſenſitive plant; but we ought to remember, that though we cannot perceive a diſtinction, it may nevertheleſs exiſt. Before Mr. Buffon, therefore, had concluded in this manner, he ought to have proved that ſome vegetables were endowed with ſenſation.

It is evidently, however, as much incumbent on thoſe who take the contrary ſide of the queſtion, to prove that vegetables are not endowed with ſenſation, as it was incumbent on Mr. Buffon to have proved that they are. But a little attention will ſhow us, that the difficulty here proceeds entirely from our inability to ſee the principle of ſenſation. We perceive this principle in ourſelves, but no man can perceive it in another. Why then does every individual of mankind conclude, that his neighbour has the ſame ſenſations with himſelf? It can only be from analogy. Every man perceives his neighbour formed in a manner ſimilar to himſelf; he acts in a ſimilar manner on ſimilar occaſions, &c. Juſt ſo it is with brute animals. It is no more doubtful that they have ſenſations, than that we have them ourſelves. There are beſides, ſenſations eſſentially diſtinct from one another; and in proportion as an animal is endowed with more or fewer of theſe different ſpecies, it is more or leſs perfect as an animal: but ſo long as one of them remains, it makes not the leaſt approach to the vegetable kingdom; and, when they are all taken away, is ſo far from becoming a vegetable, that it is only a maſs of dead matter. The ſenſes of a perfect animal, for inſtance, are five in number. Take away one of them, ſuppoſe ſight, he becomes then a leſs perfect animal; but is as unlike a vegetable as before. Suppoſe him next deprived of hearing, his reſemblance to a vegetable would be as little as before; becauſe a vegetable can neither feel, taſte, nor ſmell; and we ſuppoſe him ſtill to enjoy theſe three ſenſes. Let us, laſtly, ſuppoſe him endowed only with the ſenſe of feeling, which, however, ſeems to include that of taſte, and he is no more a vegetable than formerly, but only an imperfect animal. If this ſenſe is then taken away, we connect him not with the vegetable kingdom, but with what Mr. Buffon calls *brute-matter*. It is to this kingdom, and not to the vegetable, that animals plainly approximate as they deſcend.

Indeed, to ſuppoſe an approximation between the vegetable and animal kingdoms, is very abſurd: for, at that rate, the moſt imperfect animal ought to be the moſt perfect plant; but we obſerve no ſuch thing. All animals, from the higheſt to the loweſt, are poſſeſſed of vegetable life; and that as far as we can perceive, in an equal degree, whether the animal life is perfect or imperfect: nor does there ſeem to be the ſmalleſt connection between the higheſt degree of vegetation and the loweſt degree of ſenſation. Though all animals, therefore, are poſſeſſed of vegetable life, theſe two ſeem to be as perfectly diſtinct and incommenſurate to one another as any two things we can poſſibly imagine.

But there is no need of arguments drawn from the inferior creation. We ourſelves are poſſeſſed both of the animal and vegetable life, and certainly muſt know whether there is any connection between vegetation and ſenſation or not.—We are conſcious that we exiſt; that we hear, ſee, &c. but of our vegetation we are abſolutely inconſcious. We feel a pleaſure, for inſtance, in gratifying the calls of hunger and thirſt; but of the proceſs by which our aliment is formed into chyle, the chyle mixed with the blood, the circulation of that fluid, and the ſeparation of all the humours from it, we are altogether ignorant. If we, then, who are more perfect than other vegetables, are utterly inſenſible of our own vegetable life, why ſhould we imagine that the leſs perfect vegetables are ſenſible of it?

Thus we may eaſily give Mr. Buffon a reaſon why we aſcribe ſenſation to an oyſter, and none to a vegetable; namely, becauſe we perceive the vegetable do nothing but what is alſo performed in our own bodies, without our having the leaſt ſenſation of it; whereas an oyſter puts itſelf in a defenſive poſture on the approach of danger; and this being an action ſimilar to our own upon a like occaſion, we conclude that it proceeds from the ſame principle of ſenſation. Here it may alſo be obſerved, that though the inferior animals are deficient in the number, they are by no means ſo in the acuteneſs of their ſenſations; on the contrary, though a muſcle or an oyſter is probably endowed with no other ſenſe than that of feeling, yet this ſenſe is ſo exquiſite, that it will contract upon the lighteſt touch, ſuch as we ſhould be altogether inſenſible of.

The deſcription and claſſing of animals make a conſiderable part of Natural Hiſtory, known by the name of *Zoology*. See the article ZOOLOGY. For particulars relating to different animals, their analogous ſtructure, ſagacity, inſtinct, peculiarities, &c. ſee the different titles under which they fall.

ANIMAL-*Flower*, in zoology, a name given to ſeveral ſpecies of animals belonging to the genus of ACTINIA of Linnæus. They have likewiſe been diſtinguiſhed by the names of *Urtica Marina*, or *Sea-nettle*, from their ſuppoſed property of ſtinging; and *Sea-anemone*, from their claws or tenticles being diſpoſed in regular circles, and tinged with a variety of bright lively colours, reſembling the petals of ſome of our moſt beautiful flowers. As to one ſpecies particularly mentioned by Abbé Dicquemaire, the pureſt white, carmine, and ultramarine, are ſaid to be ſcarcely ſufficient to expreſs their brilliancy. The bodies of ſome of them are hemiſpherical, of others cylindrical, and of others ſhaped like a fig. Their ſubſtance likewiſe differs; ſome are ſtiff and gelatinous, others fleſhy and muſcular; but all of them are capable of altering their figure when they extend their bodies and claws in ſearch of food. They are found on many of the rocky coaſts of the Weſt India iſlands, and likewiſe on ſome parts of the coaſt of England. They fix themſelves to the rocks at their lower extremity, but they are capable alſo of a ſmall degree of progreſſive motion.

They have only one opening, which is in the centre of the uppermoſt part of the animal; round this are placed rows of fleſhy claws: this opening is the mouth of the animal, and is capable of great extenſion. The animals themſelves, though exceedingly voracious, will bear long faſting. They may be preſerved alive a whole year, or perhaps longer, in a veſſel of ſea-water without any viſible food; but, when food is preſented, one of them will ſucceſſively devour two muſcles in their ſhells, or even ſwallow a whole crab as large as a hen's egg. In a day or two the crab-ſhell is voided at the mouth, perfectly cleared of all the meat. The muſcle-ſhells are likewiſe diſcharged whole, with the two ſhells joined together, but entirely empty, ſo that not the leaſt particle of fiſh is to be perceived on opening them. An anemone of one ſpecies will even ſwallow an individual of another ſpecies; but after retaining it ten or twelve hours, will throw it up alive and uninjured. Through this opening alſo it produces its young ones alive, already furniſhed with little claws, which, as ſoon as they fix themſelves, they begin to extend in ſearch of food.

A particular ſpecies called the *actinia ſociata* or *cluſter* animal-flower has been found in ſome of the iſlands ceded to Britain at the laſt treaty of peace with France. An account of them is publiſhed in the Philoſophical Tranſactions, vol. 57. by Mr. Ellis. This compound animal, which is of a tender fleſhy ſubſtance, conſiſts of many tubular bodies, ſwelling gently towards the upper part, and ending like a bulb or very ſmall onion. On the top of each is its mouth, ſurrounded by one or two rows of tenticles, or claws, which when contracted look like circles of beads. The lower part of all theſe bodies has a communication with a firm fleſhy wrinkled tube, which ſticks faſt to the rocks, and ſends forth other fleſhy tubes, that creep along them in various directions. Theſe are full of different ſizes of theſe remarkable animals, which riſe up irregularly in groups near to one another. Mr. Ellis farther obſerves,

"When we view the inſide of this animal diſſected lengthwiſe, we find like a little tube leading from the mouth to the ſtomach, from whence there ariſe eight wrinkled ſmall guts in a circular order, with a yelloviſh ſoft ſubſtance in them; theſe bend over in the form of arches towards the lower part of the bulb, from whence they may be traced downwards, to the narrow part of the upright tube, till they come to the fleſhy adhering tube, where ſome of them may be perceived entering into the papilla, or the beginning of an animal of the like kind, moſt probably to convey it nouriſhment till it is provided with claws; the remaining parts of theſe ſlender guts are continued on in the fleſhy tube, without doubt for the ſame purpoſe of producing and ſupporting more young ones from the ſame common parent. The many longitudinal fibres that we diſcover lying parallel to each other, on the inſide of the ſemi-tranſparent ſkin, are all inſerted in the ſeveral claws round the animal's mouth, and are plainly the tendons of the muſcles for moving and directing the claws at the will of the animal: theſe may be likewiſe traced down to the adhering tube."

The Abbe Dicquemarre, by many curious, though cruel, experiments (Phil. Tranſ. 1773), has ſhewn that theſe animals poſſeſs, in a moſt extraordinary degree, the power of reproduction; ſo that ſcarce any thing more is neceſſary to produce as many ſea-anemonies as we pleaſe, than to cut a ſingle one into as many pieces. A ſea-anemone being cut in two by a ſection through the body, that part, where the limbs and mouth are placed, ate a piece of a muſcle offered to it ſoon after the operation, and continued to feed and grow daily for three months after. The food ſometimes paſſed through the animal; but was generally thrown up again, conſiderably changed, as in the perfect ſea-anemone. In about two months, two rows of limbs were perceived growing out of the part where the inciſion was made. On offering food to this new mouth, it was laid hold of and eaten; and the

limbs continually increaſing, the animal gradually became as perfect as thoſe which had never been cut.

In Hughes's Natural Hiſtory of Barbadoes an account is alſo given of ſeveral ſpecies of animal flowers whoſe reproductive power is prodigious. Many people coming to ſee them, and occaſioning ſome inconvenience to a perſon through whoſe grounds they were obliged to paſs, he reſolved to deſtroy the objects of their curioſity; and, that he might do ſo effectually, cauſed all the holes out of which they appeared, to be carefully bored and drilled with an iron inſtrument, ſo that we cannot ſuppoſe but their bodies muſt have been entirely cruſhed to a pulp: nevertheleſs, they again appeared in a few weeks from the very ſame places.

Plate 2. fig. 1. repreſents the *actinia ſociata* or cluſtered animal flower, deſcribed by Mr. Ellis, with its radical tube adhering to a rock: the talleſt of them appears to be ſtretching out its claws. Fig. 2. A perpendicular diſſection of one of the bodies, to ſhow the gullet, inteſtines, ſtomach, and fibres or tendons that move the claws: at its tail or root, a young one is ariſing out of the adhering tube. Fig. 3. The *actinia aſter*, or animal-flower of the newly ceded iſlands. Fig. 4. The *actinia anemone*, or ſea-anemone from the ſame place. Fig. 5. The under part of the ſame by which it adheres to the rocks. Fig. 6. The *actinia helianthus*, or the ſea ſun-flower from ditto. Fig. 7. The under part of the ſame. Fig. 8. The *actinia dianthus*, or ſea-carnation, from the rocks at Haſtings in Suſſex. This animal adheres by its tail, or ſucker, to the under part of the projecting rocks oppoſite to the town; and, when the tide is out, has the appearance of a long white fig: this is the form of it when put into a glaſs of ſea-water. It is introduced here as a new variety of this animal not yet deſcribed by naturaliſts.

ANIMAL-*Food*. See FOOD.

ANIMAL-*Oeconomy*, the firſt branch of the theory of medicine; or that which explains the parts of the human body, their ſtructure and uſe; the nature and cauſes of life and health, and the effects or phenomena ariſing from them. This is otherwiſe called *phyſiology*; and its objects juſt enumerated are called the *naturals*, or *res ſecundum naturam*. See ANATOMY.

ANIMAL-*Magnetiſm*. See MAGNETISM.

ANIMAL-*Spirits*. See NERVOUS *Fluid*.

ANIMAL-*Syſtem* denotes the whole claſs of beings that are endowed with animal life, otherwiſe called the *Animal* KINGDOM.

ANIMALS, *the preparations of, for collections or muſeums*. See QUADRUPEDS, BIRDS, REPTILES, &c.

ANIMALCULE, a term applied to ſuch animals as are of a ſize ſo diminutive, that their true figure cannot be diſcerned without the aſſiſtance of magnifying glaſſes; more eſpecially ſuch as are altogether inviſible to the naked eye.

By the help of magnifying glaſſes, we are brought into a kind of new world; and numberleſs animals are diſcovered, which from their minuteneſs muſt otherwiſe for ever have eſcaped our obſervation: and how many kinds of theſe inviſibles there may be, is ſtill unknown; as they are diſcerned of all ſizes, from thoſe which are barely inviſible to the naked eye, to ſuch as reſiſt the action of the microſcope, as the fixed ſtars do that of the teleſcope, and with the beſt magnifiers hitherto invented, appear only as ſo many moving points. The ſmalleſt living creatures our inſtruments can ſhow are thoſe that inhabit the waters: for though poſſibly animalcules equally minute, or perhaps more ſo, may fly in the air, or creep upon the earth, it is ſcarce poſſible to bring ſuch under our examination; but water being tranſparent, and confining the creatures in it, we are able, by applying a drop of it to our glaſſes, to diſcover, to a certain degree of ſmallneſs, all that it contains.—Some of the moſt curious of theſe animalcules, as deſcribed by microſcopical obſervers, we ſhall here give an account of.

The Hair-like Inſect, is ſo called on account of its ſhape; being extremely ſlender, and frequently an hundred and fifty times as long as broad. The body or middle part, which is nearly ſtraight, appears, in ſome, compoſed of ſuch rings as the windpipe of land-animals is made up of; but in others, ſeems rather ſcaled, or made up of rings that obliquely croſs one another. Its two ends are hooked or bent, pretty nearly in the ſame degree, but in an oppoſite direction; and as no eyes can be diſcerned, it is difficult to judge which is the head or tail. Its progreſſive motion is performed by turning upon one end as a centre, and deſcribing almoſt a quarter of a circle with the other, as repreſented in Plate 1*ſ*. fig. 1. Its motions are very ſlow, and require much patience and attention in the obſerver. Theſe creatures are ſo ſmall, that millions of millions of them might be contained in an inch ſquare. When viewed ſingly, they are exceedingly tranſparent, and of a beautiful green colour; but when numbers of them are brought together, they become opaque, loſe their green colour, and ſeem entirely black.

Notwithſtanding the extreme minuteneſs of theſe animalcules, they ſeem to be fond of ſociety; for, after viewing for ſome time a parcel of them taken up at random, they will be ſeen diſpoſing themſelves in a kind of regular order. If a multitude of them are put into a jar of water, they will form themſelves into a regular body, and perform a variety of movements and evolutions like thoſe of an army. This animalcule was firſt diſcovered in a ditch at Norwich by Mr. Baker.

Eels in paſte, (fig. 2.) When paſte is become ſour, numberleſs animalcules may be diſcerned in it by the naked eye; and though their form cannot be perfectly diſtinguiſhed, their motion is very perceptible. The moſt remarkable property of theſe inſects is, that they are viviparous. If one of them is cut through near the middle, ſeveral oval bodies of different ſizes will be ſeen to iſſue forth. Theſe are young anguillæ, each coiled up and incloſed in its proper membrane, which is ſo exquiſitely fine, as ſcarce to be diſcernible by the greateſt magnifier, while it incloſes the embryo animal. The largeſt and moſt forward immediately break through this covering, unfold themſelves, and wriggle about in the water nimbly; others get out, uncoil, and move themſelves about more ſlowly; and the leaſt mature continue oval entirely without motion. The *uterus*, or veſſel that contains all theſe bodies, is compoſed of many ringlets, not unlike the aſpera arteria of land-animals, and ſeems to be conſiderably elaſtic; for as ſoon as the animalcule is cut in two, the oval bodies are thruſt out with ſome degree of violence, from the ſpringing back or action of this bowel. An hundred and upwards of the young ones have been ſeen to iſſue from the body of one ſingle eel, whereby the prodigious increaſe of them may be accounted for; as probably ſeveral ſuch numerous generations are produced in a ſhort time. Theſe eels being viviparous renders it highly improbable that they ever become flies. Animalcules of a ſimilar kind are likewiſe found in vinegar; and in the ſoft fibrous matter of thoſe grains of blighted wheat that appear black as if ſcorched.

The Proteus, (fig. 3.) This animalcule was ſo named by Mr. Baker from its aſſuming a great number of different ſhapes, ſo as ſcarcely to be known as the ſame animal; and indeed, unleſs it be carefully watched while paſſing from one ſhape to another, it will often become ſuddenly inviſible.

When water, wherein any ſort of vegetable has been infuſed, or animals preſerved, has ſtood quietly for ſome days, or weeks

in any glaſs or other veſſel, a ſlimy ſubſtance will be collected about the ſides; ſome of which being taken up with the point of a penknife, placed on a ſlip of glaſs in a drop of water, and looked at through the microſcope, will be found to harbour ſeveral kinds of little animals that are ſeldom found ſwimming about at large; among which the proteus is one. Its ſhape may be better underſtood from the figure, than from deſcription. Its ſubſtance and colour reſemble that of a ſnail; and its general ſhape ſeems that of a ſwan. It ſwims to and fro with great vivacity; but will now and then ſtop for a minute or two; during which time its long neck is uſually employed as far as it can reach, forwards, and on every ſide, with a ſomewhat ſlow, but equable motion, like that of a ſnake, frequently extending thrice the length of its body, ſeemingly in ſearch of food. It has no eyes, nor any mouth that can be diſcerned; but its actions plainly prove that it can ſee; for though multitudes of different animalcules ſwim about in the ſame water, and its own progreſſive motion is very ſwift, it never ſtrikes any of them, but directs its courſe between them with great dexterity.

When alarmed, it ſuddenly draws in its long neck, repreſented at fig. 1, and transforms itſelf into the ſhape repreſented at 2, when it becomes more opaque, and moves about very ſlowly, with the large end foremoſt. It will then perhaps, inſtead of the head and neck it had formerly, put forth a new one, with a kind of wheel-machinery, repreſented at 3, the motions of which draw a current of water to it from a conſiderable diſtance. Having often pulled in and thruſt out this ſhort head, ſometimes with and ſometimes without the wheel-work, the creature, as if weary, will remain motionleſs for a while; then its head and long neck will be very ſlowly protruded, as at 4, and it then reſumes its former agility. Sometimes it diſpoſes of its neck and head, as repreſented at fig. 5.

The Vorticella, or *Wheel-animal*, (Pl. 15.) This wonderful animalcule is found in rain water that has ſtood ſome days in leaden gutters, or in hollows of lead on the tops of houſes, or in the ſlime or ſediment left by ſuch water. Though it diſcovers no ſigns of life except when in the water, yet it is capable of continuing alive for many months though kept in a dry ſtate. In this ſtate it is of a globular ſhape, exceeds not the bigneſs of a grain of ſand, and no ſigns of life appear: but, being put into water, in the ſpace of half an hour a languid motion begins, the globule turns itſelf about, lengthens itſelf by ſlow degrees, aſſumes the form of a lively maggot, and moſt commonly in a few minutes afterwards, puts out its wheels; ſwimming vigorouſly through the water, as if in ſearch of food; or elſe, fixing itſelf by the tail, works the wheels in ſuch a manner as to bring its food to it.

Fig. 1 and 2 ſhow the wheel-animal in its maggot ſtate; and fig. 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12, ſhow the different appearances of its wheels, and alſo its various intermediate changes between the globular and maggot ſtate. The moſt remarkable thing in the ſtructure of this animalcule is its wheel-work; which conſiſts of a couple of ſemicircular inſtruments, round the edges of which many little fibrillæ move themſelves very briſkly, ſometimes with a ſeeming rotation, and ſometimes in a trembling or vibrating manner. At the leaſt touch or motion in the water, they inſtantly draw in theſe wheels, which Mr. Baker conjectures contain their eyes; becauſe, while in the maggot ſtate, its motions are ſlow and blundering; but, after the wheels are protruded, they are performed with great regularity and ſwiftneſs. The tranſparency of its body allows its internal parts to be ſeen: *a*, fig. 5, is the appearance of the head; and though it is every where tranſparent, a ring or circle, more particularly remarkable for its clearneſs, is commonly perceived about the middle of the forehead, a little above the mouth. This, Mr. Baker thinks, is the ſeat of the brain. The thorax, *b*, is joined to the head by a very ſhort neck, *c*, and appears to be about the ſixth part of the whole length of the animal. In the middle of the thorax is placed the heart, *d*, where its ſyſtole and diaſtole are plainly viſible through the back of the inſect. The blood or circulating fluid of the wheel-animal is ſo abſolutely colourleſs, that the current of it is indiſtinguiſhable by glaſſes. A ſort of irregular agitation of ſome fluid is indeed perceived, which is perhaps a compound motion of currents running different ways, and forming ſuch an appearance, though no ſingle current is any where diſtinctly viſible. From the under part of the thorax proceeds a ſmall tranſparent horn, repreſented at *a*, fig. 1 and 2. This is never viſible but when the animal turns on its back or ſide. Immediately below the thorax is another annular diviſion, *e*, joining the thorax to the abdomen, *f*, which is by much the largeſt part of the animal, and contains the ſtomach and inteſtines. When the inſect is full of food, theſe bowels appear opaque and of a blood red colour, extending quite through the belly and great part of the tail, and exhibiting a variety of contractions and dilatations. The belly is capable of ſtretching out greatly in length, or being ſhortened very much, and widening its diameter. It aſſumes many ſhapes, and becomes occaſionally a caſe for all the other parts of the body.

There are found in ſtagnant waters ſeveral other ſpecies of animalcules furniſhed with wheels, ſome of which appear to have a rotatory, and others a vibratory, motion. Some kinds of wheel-animals are alſo covered with ſhells; the body of this ſpecies conſiſting of three parts. Theſe occaſionally draw themſelves entirely within their ſhells; and the ſhell then appears terminated by ſix ſhort ſpikes on one ſide and two on the other. The young ones of this ſpecies are carried in oval ſacculi, or integuments, faſtened externally to the lower part of their ſhells ſomewhere about the tail. When a young one is about to burſt its integuments, the parent aſſiſts it greatly, by wagging its tail, and ſtriking the oval bag, ſo that the young one's head becomes as it were forced into the water, though the tail cannot be ſo diſengaged. In this condition the young one ſets its wheel a-going, (ſee *a*, fig. 13.) and exerts all its endeavours to free itſelf from its confinement. When it has got clear, it ſwims away, wagging its tail as the old one does, and leaving the integument adhering to the ſhell of the parent, who uſes a number of efforts to get rid of it. This kind of wheel-animal is a great tormentor of the water-flea, *Pulex aquaticus arboreſcens* of Swammerdam, of which ſee a repreſentation at fig. 14, which ſhows it magnified, and with one of the wheel-animals adhering to it.

The Bell-flower Animal or Plumed Polype. Theſe animalcules dwell in colonies together, from ten to fifteen, in a ſlimy kind of mucilaginous or gelatinous caſe; which, out of the water, has no determined form, appearing like a little lump of ſlime; but, when expanded therein, has ſome reſemblance to the figure of a bell with its mouth upwards; and is uſually about half an inch long, and a quarter of an inch in diameter. Theſe bells or colonies are to be found adhering to the large leaves of duckweed, and other aquatic plants. They may be moſt eaſily diſcovered, by letting a quantity of water, with duckweed in it, ſtand quietly for three or four hours in glaſs veſſels in a window, or other place whence a ſtrong light comes: for then, if any are about the duckweed, they will be found, on careful inſpection, extending themſelves out of their caſes, and making an elegant appearance.

The bell, or caſe, which theſe animals inhabit, being very tranſparent, all the motions of its inhabitants may be diſcerned through it diſtinctly. It ſeems divided internally into ſeveral ſmall ſacculi, in each of which is one of theſe animals. The openings at the tops of theſe ſacculi, are but juſt ſuffi-

cient to admit the creature's head and a ſmall part of its body to be thruſt out beyond them, the reſt remaining always in the caſe. It can, however, occaſionally retire into its caſe altogether; and never fails to do ſo when alarmed by any ſudden motion of the water.

Beſides the particular and ſeparate motion which each of theſe creatures is able to exert within its own caſe, and independent of the reſt; the whole colony together has a power of altering the poſition of the bell, or even of removing it from one place to another; and hence this bell is ſometimes found ſtanding perfectly upright, as in fig. 15, and 17; and ſometimes bending the upper part downwards, as in fig. 16. As theſe animalcules ſeem not to chooſe to ſtay together in ſocieties whoſe number exceeds 15, when the colony happens to increaſe in number, the bell may be obſerved to ſplit gradually, beginning from about the middle of the upper or anterior extremity, and proceeding downwards towards the bottom, as in fig. 18, till they at laſt ſeparate entirely, and become two complete colonies, one of which ſometimes removes to another part of the veſſel.

The arms of each individual of this colony are ſet round the head, to the number of 40, having each the figure of an Italic *ſ*, one of whoſe hooked ends is faſtened to the head; and altogether, when expanded, compoſe a figure ſhaped ſomewhat like a horſe's ſhoe, convex on one ſide next the body, but gradually opening and turning outwards, ſo as to leave a conſiderable area within the outer extremities of the arms. When the arms are thus extended, the creature, by giving them a vibrating motion, can produce a current in the water, which brings the animalcules, or whatever other minute bodies are within the ſphere of its action, with great velocity to its mouth, ſituated between the arms; where they are taken in if liked, or driven away by a contrary motion. The body conſiſts of three diviſions; in the uppermoſt of which are contained the inteſtines. The other two are probably fixed to the bell, and of no other uſe than to give the creature a power of contraction and extenſion. Though their general appearance, when expanded, is that of a cup whoſe baſe and top are of an horſe-ſhoe form, they ſometimes ſeparate into four parts, and range themſelves as in fig. 19, ſo as to reſemble four ſeparate plumes of feathers. Though their eyes cannot be diſcovered, yet when kept in the dark, they remain contracted; but on being expoſed to the light of the ſun, or of a candle, they conſtantly extend their arms, and ſhow evident ſigns of pleaſure. Fig. 15. repreſents one complete colony or bell ſtanding erect, with all the animals out and their arms extended. 16. ſhows all the creatures withdrawn into their cells, and the end of the bell hanging downwards. 17. ſhows the bell erect, with only one of the animals coming out, in order to ſhow its connection with the bell. 18. ſhows the head and arms of a ſingle polype cloſing together, and diſpoſing themſelves in order to be drawn into the bell. 19. ſhows one complete animal greatly magnified, to ſhow his ſeveral parts more diſtinctly; viz. *a*, the head, reſembling a horſe-ſhoe; *b b*, the arms ſeen from one ſide; *c*, the narrow neck; *d*, the œſophagus; *e*, the ſtomach; *f*, the gut or laſt inteſtine through which the food paſſes after being digeſted in the ſtomach; *g*, the anus, where the fæces are diſcharged in little pellets; *h i*, that part of the bell which ſurrounds the body of the animal, and cloſes upon it when it retires down.

The Pipe-animal. Theſe creatures are found on the coaſt of Norfolk, living in ſmall tubes or caſes of ſandy matter, in ſuch multitudes as to compoſe a maſs ſometimes of three feet in length. Fig. 20. ſhows a piece of ſuch a congeries broken off, where *a a a a* repreſent the mouths or openings of the pipes wherein the little animals abide. Fig. 21. ſhows one ſingle pipe, with its inhabitant, ſeparated from the reſt, and magnified nine or ten times. The pipe or caſe *b* is made of ſand, intermixed here and there with minute ſhells, and all cemented together by a glutinous ſlime, probably iſſuing from the animal's own body *c*, which is compoſed of muſcular ringlets like thoſe of a worm, capable of great extenſion or contraction. The anterior end or head, *d*, is exceedingly beautiful, having round it a double row of little arms diſpoſed in a very regular order, and probably capable of extenſion, in order to catch its food, and bring it to its mouth. Some of theſe tubes are found petrified, and conſtitute one ſpecies of ſyringoides.

An Inſect with net-like arms. The properties and ſhape of this little animal are very extraordinary. It is found only in caſcades, where the water runs very ſwift. There theſe inſects are found in cluſters, ſtanding erect on their tails; and reſembling, when all together, the combs of bees at the time they are filled with their aureliæ. On being taken out of the water, they ſpin threads, by which they hang exactly in the ſame manner as the garden-ſpider. Fig. 1. Pl. 16. ſhows one of theſe inſects magnified. Its body appears curiouſly turned as in a lathe; and at the tail are three ſharp ſpines, on which it raiſes itſelf, and ſtands upright in the water. But the moſt curious apparatus is about its head, where it is furniſhed with two inſtruments like fans or nets, which ſerve to provide its food. Theſe it frequently ſpreads out and draws in again; and when drawn up they are folded together with the utmoſt nicety and exactneſs, ſo as to be indiſcernible when brought cloſe to the body. At the bottom of theſe fans a couple of claws are faſtened to the lower part of the head, which, every time the nets are drawn in, conduct to the mouth of the animal whatever is taken in them. When the creature does not employ its nets, it thruſts out a pair of ſharp horns, as in fig. 2. where the inſect is ſhown magnified about 400 times.

Some of theſe creatures being kept with water in a vial, moſt of them died in two days; and the reſt, having ſpun themſelves tranſparent caſes (which were faſtened either to the ſides of the glaſs, or to pieces of graſs put into it), ſeemed to be changed into a kind of chryſalis. But before taking this form, they appeared as in fig. 3. which ſhape they likewiſe aſſumed when weary with catching their food, or when lying in wait for it. None of them lived above three days; and though freſh water was given them two or three times a-day, yet in a few hours it would ſtink to a degree ſcarcely conceivable; which makes it probable, that it is neceſſary they ſhould live in a rapid ſtream leſt they ſhould be poiſoned by the effluvia from their own bodies.

Spermatic Animals. According to Lewenhoek, animalcules are found in the ſemen maſculinum of every animal. Their general appearance is very much the ſame, nor does their ſize differ in proportion to the bulk of the animal to which they belong. The bodies of all ſeem to be of an oblong oval form, with long tapering ſlender tails iſſuing from them; and as by this ſhape they reſemble *tadpoles*, they have been frequently called by that name; though the tails of them, in proportion to their bodies, are much longer than the tails of tadpoles are: and it is obſervable, that the animalcules in the ſemen of fiſhes have tails much longer and more ſlender than the tails of thoſe in other animals; inſomuch, that the extremity of them is not to be diſcerned without the beſt glaſſes, and the utmoſt attention. In Pl. 16. will be found repreſentations of animalcules diſcovered in the ſemen of the human ſubject, the dog, rabbit, &c. according to Mr. Lewenhoek.

The numbers of theſe animalcula are inconceivable. On viewing with a microſcope the milt or ſemen maſculinum of a living cod-fiſh, innumerable multitudes of animalcules were found therein, of ſuch a diminutive ſize, that he ſuppoſed at leaſt 10,000 of them capable of being contained in the bulk

of a grain of ſand; whence he concludes, that the milt of this ſingle fiſh contained more living animalcules than there are to be found people living in the whole world. To find the comparative ſize of theſe animalcules, Mr. Lewenhoek placed an hair of his head near them; which hair, through his microſcope, appeared an inch in breadth; and he was ſatisfied, that at leaſt 60 ſuch animalcules could eaſily lie within that diameter; whence, their bodies being ſpherical, it follows, that two hundred and ſixteen thouſand of them are but equal to a globe whoſe diameter is the breadth of a hair, a calculation which almoſt exceeds belief.

Theſe animalcules appear to be very vigorous, and tenacious of life; for they may be obſerved to move, long after the animal from which they are taken is dead. They have this peculiarity alſo, that they are continually in motion, without the leaſt reſt or intermiſſion, provided there is fluid ſufficient for them to ſwim about in. Theſe animalcula are peculiar to the ſemen; nothing that has the leaſt token of life being diſcovered, by the beſt glaſſes, either in the blood, ſpittle, urine, bile, or chyle. Great numbers, however, are to be found in the whitiſh matter that ſticks between the teeth; ſome of which are of an oval figure, and others reſemble eels.

Animalcula Infuſoria, take their name from their being found in all kinds either of vegetable or animal infuſions. Indeed there is ſcarcely any kind of water that will not diſcover living creatures. Mr. Lewenhoek ſays, that at firſt he could diſcern no living creatures in rain water; but after ſtanding ſome days, he diſcovered innumerable animalcules, many thouſands of times leſs than a grain of ſand, and in proportion to a mite as a bee is to a horſe. In other rain-water, which had likewiſe ſtood ſome time, he found the ſmalleſt ſort he had ever ſeen; and in a few days more, met with others eight times as big as theſe, and almoſt round. In another quantity of rain-water, that had been expoſed like the former, he diſcovered a kind of animalcules with two little horns in continual motion. The ſpace between the horns was flat, though the body was roundiſh, but tapering a little towards the end; where a tail appeared, four times as long as the body, and the thickneſs of a ſpider's web. He obſerved ſeveral hundreds of theſe within the ſpace a grain of ſand would occupy. If they happened on the leaſt filament or ſtring, they were entangled in it; and then would extend their bodies into an oblong round, and ſtruggle hard to diſengage their tails. He obſerved a ſecond ſort of an oval figure, and imagined the head to ſtand at the ſharpeſt end. The body was flat, with ſeveral ſmall feet moving exceedingly quick, but not diſcernible without a great deal of attention. Sometimes they changed their ſhape into a perfect round, eſpecially when the water began to dry away. He met alſo with a third ſort, twice as long as broad, and eight times ſmaller than the firſt: yet in theſe he diſcerned little feet, whereby they moved very nimbly. He perceived likewiſe a fourth ſort, a thouſand times ſmaller than a louſe's eye, and which exceeded all the reſt in briſkneſs: he found theſe turning themſelves round, as it were upon a point, with the celerity of a top. And he ſays, there were ſeveral other ſorts.

Animalcula of various uncommon ſhapes may be produced by the mixture of different ſubſtances with water and many other fluids. The common black pepper and water, hay keeped and ſuffered to become putrid in water, the water from a dunghill, or that in which flowers have remained till it is become putrid, will all afford animalcules in aſtoniſhing numbers. Of theſe ſome repreſentations are given in Pl. 16. The circumſtances attending the production of *animalcula infuſoria* are alſo very ſurpriſing. In the ſpace of four hours, an infuſion of cantharides has produced animalcula leſs than even the tails of the ſpermatic animals we have already deſcribed. Neither do they ſeem to be ſubject to the fate of other animals; but, ſeveral kinds of them at leaſt, by dividing themſelves in two, to enjoy a ſort of immortality. Nor do the common methods by which other animals are deſtroyed, ſeem to be effectual for deſtroying their vital principle. Hot mutton-gravy, ſecured in a phial with a cork, and afterwards ſet among hot aſhes to deſtroy as effectually as poſſible every living creature that could be ſuppoſed to exiſt in it, has nevertheleſs been found ſwarming with animalcules after ſtanding a few days. In the Philoſophical Tranſactions, vol. xix. we have a curious account, by Mr. Ellis, of animalcules produced from an infuſion of potatoes and of hempſeed.

To the foregoing account of ſome of the moſt extraordinary animalcula, we ſhall proceed to annex Mr. Buffon's experiments on the human ſemen. Having procured the ſeminal veſſels of a man who died a violent death, he extracted all the liquor from them while they were ſtill warm; and having examined a drop of it with a double microſcope, it had the appearance, fig. 1. Pl. 16. Large filaments appeared, which in ſome places ſpread out into branches, and in others intermingled with one another. Theſe filaments clearly appeared to be agitated by an internal undulatory motion, like hollow tubes, which contained ſome moving ſubſtance. He ſaw diſtinctly this appearance changed for that fig. 2. Two of theſe filaments, which were joined longitudinally, gradually ſeparated from each other in the middle, alternately approaching and receding, like two tenſe cords fixed by the ends, and drawn aſunder in the middle. Theſe filaments were compoſed of globules that touched one another, and reſembled a chaplet of beads. After this, he obſerved the filaments ſwelled in ſeveral places, and perceived ſmall globular bodies iſſue from the ſwelled parts, which had a vibratory motion like a pendulum. Theſe ſmall bodies were attached to the filaments by ſmall threads, which gradually lengthened as the bodies moved. At laſt, the ſmall bodies detached themſelves entirely from the filaments, drawing after them the ſmall thread, which looked like a tail. When a drop of the ſeminal liquor was diluted, theſe ſmall bodies moved in all directions very briſkly; and had he not ſeen them ſeparate themſelves from the filaments, he would, he ſays, have thought them to be animals. The ſeminal matter was at firſt too thick, but gradually became more fluid; and, in proportion as its fluidity increaſed, the filaments diſappeared, but the ſmall bodies became exceedingly numerous. Each of them had a long thread or tail attached to it, from which it evidently endeavoured to get free. Their progreſſive motion was extremely ſlow, during which they vibrated to the right and left, and at each vibration they had a rolling unſteady motion in a vertical direction.

At the end of two or three hours, the ſeminal matter becoming ſtill more fluid, a greater number of theſe moving bodies appeared. They were then more free of incumbrances, their tails were ſhorter; their progreſſive motion was more direct, and their horizontal motion greatly diminiſhed. In five or ſix hours, the liquor had acquired almoſt all the fluidity it could acquire, without being decompoſed. Moſt of the ſmall bodies were now diſengaged from their threads; their figure was oval. They moved forward with conſiderable quickneſs, and, by their irregular motions backward and forward, they had now more than ever the appearance of animals. Thoſe that had tails adhering to them, ſeemed to have leſs vivacity than the others: and of thoſe that had no tails, ſome altered both their figure and their ſize. In twelve hours, the liquor had depoſited at the bottom of the vial a kind of aſh-coloured gelatinous ſubſtance, and the fluid at top was almoſt as tranſparent as water. The little bodies being now entirely freed from their threads, moved with great agility, and ſome

of them turned round their centres. They alſo often changed their figures, from oval becoming round, and often breaking into ſmaller ones. Their activity always increaſed as their ſize diminiſhed. In 24 hours, the liquor had depoſited a greater quantity of gelatinous matter, which, being with ſome difficulty diluted in water, exhibited an appearance ſomewhat reſembling lace. In the clear ſemen itſelf only a few ſmall bodies were now ſeen moving; next day, theſe were ſtill farther diminiſhed; and after this, nothing was to be ſeen but globules without the leaſt appearance of motion. Moſt of the abovementioned appearances are ſhown fig. 2, 3, 4, 5, 6, 7, 8. Fig. 9, and 10. repreſent an appearance of the globules in another experiment, in which they arranged themſelves in troops, and paſſed very quickly over the field of the microſcope. In this experiment they were found to proceed from a ſmall quantity of gelatinous mucilage.

From theſe experiments, M. Buffon concludes, that what have been called ſpermatic animals, are not creatures really endowed with life, but ſomething proper to compoſe a living creature; and he diſtinguiſhes them by the name of *organic particles*. The ſame individual kinds of animals he declares he has found in the fluids ſeparated from the ovaria of females. He alſo brings an additional proof of his doctrine from Mr. Needham's obſervations on the milt of the *calmar* (a ſpecies of cuttle-fiſh), which, according to that gentleman's account, contains no animalcules; and therefore we may from analogy conclude, that the ſmall moving bodies which are to be ſeen in the ſemen of other animals, are not really creatures endowed with life. M. Buffon extends the analogy ſtill further; and concludes, that all the moving bodies which are to be found in the infuſions either of animal or vegetable ſubſtances are of a ſimilar nature. "To diſcover (ſays he) whether all the parts of animals, and all the ſeeds of plants, contained moving organic particles, I made infuſions of the fleſh of different animals, and of the ſeeds of more than 20 different ſpecies of vegetables; and after remaining ſome days in cloſe glaſſes, I had the pleaſure of ſeeing organic moving particles in all of them. In ſome they appeared ſooner, in others later: ſome preſerved their motion for months, and others ſoon loſt it. Some at firſt produced large moving globules reſembling animals, which changed their figures, ſplit, and became gradually ſmaller. Others produced only ſmall globules, whoſe motions were extremely rapid; and others produced filaments, which grew longer, ſeemed to vegetate, and then ſwelled, and poured forth torrents of moving globules."

Neither is M. Buffon content with denying life only to thoſe beings where the ſigns of it are the moſt equivocal; he alſo includes in the ſame rank of organic particles, almoſt every animal too ſmall to be diſcovered by the naked eye, and even ſome of thoſe whoſe motions are evidently perceptible to the eye. "Almoſt all microſcopic animals," ſays he, "are of the ſame nature with the moving bodies in the ſeminal fluids and infuſions of animal and vegetable ſubſtances. The eels in paſte, in vinegar, &c. are all of the ſame nature, and derived from the ſame origin. There are, perhaps, as many beings that either live or vegetate, produced by a fortuitous aſſemblage of organic particles, as by a conſtant and ſucceſſive generation. Some of them, as thoſe of the calmar, are only a kind of machines, which, though exceedingly ſimple, are very active. Others, as the ſpermatic animalcules, ſeem to imitate the movements of animals. Others reſemble vegetables in their manner of growth and extenſion. There are others, as thoſe of blighted wheat, which at pleaſure can be made alternately either to live or die, and it is difficult to know to what they ſhould be compared. There are ſtill others, and in great numbers, which are at firſt a kind of animals, then become a ſpecies of vegetables, and again return alternately to their vegetable ſtate. The eels in paſte have no other origin than the union of the organic particles of the moſt eſſential part of the grain. The firſt eels that appear are certainly not produced by other eels; but though they are not propagated themſelves, they fail not to engender other living eels. By cutting them with the point of a lancet, we diſcover ſmaller eels iſſuing in great numbers out of their bodies. The body of this animal ſeems to be only a ſheath or ſac, containing a multitude of ſmaller animals, which perhaps are other ſheaths of the ſame kind, in which the organic matter is aſſimilated into the form of eels."

Upon the whole, however, though philoſophers are not yet able to diſcover how theſe minute creatures are produced; yet, that there really are animals much ſmaller than what we can diſcern with our naked eye, ſeems to be indiſputable. The ſubject, indeed, is ſtill exceedingly obſcure, and will no doubt require the utmoſt attention of philoſophers, as well as further improvement in the conſtruction of our microſcopes, fully to inveſtigate it.

Animalcula are ſaid to be the cauſe of various diſorders. The itch (ſee Pl. 16.), from ſeveral experiments, is affirmed to be a diſorder ariſing from the irritations of a ſpecies of animalcula found in the puſtules of that diſeaſe; whence the communication of it by contact from one to another is eaſily conceived, as alſo the reaſon of the cure being effected by cutaneous applications. On this foundation, ſome have attributed the ſmall-pox, meaſles, and other infectious diſeaſes; and others the epilepſy, &c. to animalcules. Languis goes farther, and pretends to reduce all diſeaſes in general to the ſame principle. A late writer at Paris, who aſſumed the title of an Engliſh phyſician, has done more. He not only accounts for all diſeaſes, but for the operations of all medicines, from the hypotheſis of animalcules. He had peculiar animals for every diſeaſe; ſcorbutic animalcules, podagrical animalcules, variolous animalcules, &c. all at his ſervice. Journ. des Sçav. tom. lxxxii. p. 535, &c. But as moſt diſcoveries in natural philoſophy have laid a foundation for the warm imaginations of ſome men to form viſionary theories, to the great prejudice of real knowledge; ſo thoſe relating to animalcula have been drawn in, however improperly, to ſupport the moſt whimſical and chimerical ſyſtems.

ANIMATED, or ANIMATE, in a general ſenſe, denotes ſomething endowed with animal-life. It alſo imports a thing to be impregnated with vermin or animalcules.

ANIMATED *Horſe-hairs*. See HORSE-*hairs*.

ANIMATION ſignifies the informing an animal body with a ſoul.—The different hypotheſes of phyſicians and philoſophers, concerning the time of animation, have had their influence on the penal laws made againſt artificial abortions: it having been made capital to procure miſcarriage in the one ſtate, while in the other it was only deemed a venial crime. The emperor Charles V. by a conſtitution publiſhed in 1532, put the matter on another footing. Inſtead of the diſtinction of an animated and unanimated fœtus, he introduced that of a vital and non-vital fœtus, as a thing of more obvious and eaſy deciſion, and not depending on any ſyſtem either of creation, traduction, or infuſion. Accordingly a fœtus is ſaid, in a legal ſenſe, to be animated, when it is perceived to ſtir in the womb; which uſually happens about the middle of the term of geſtation.

ANIME, in heraldry, a term uſed when the eyes of a rapacious creature are borne of a different tincture from the creature itſelf.

ANIME, a reſin exſuding from the trunk of a large American tree, called by Piſo *jutaiba*, by the Indians *courbaril*, a ſpecies of HYMENÆA. This reſin is of a tranſparent amber colour, a light agreeable ſmell, and little or no taſte. It diſ-

ſolves entirely, but not very readily, in rectified ſpirit of wine. The Brazilians are ſaid to employ anime in fumigations for pains and aches, but with us it is rarely if ever uſed in medicine.

ANIMETTA, among eccleſiaſtical writers, denotes the cloth wherewith the cup of the euchariſt is covered.

ANINGA, in commerce, a root which grows in the Antilles iſlands, and is pretty much like the China plant. It is uſed by ſugar-bakers for refining ſugar.

ANJOU, a late province of France, bounded on the N. by Maine, on the W. by Bretagne, on the S. by Poitou, and on the E. by Touraine. It formerly belonged to the ſovereigns of England. It now forms, with the late provinces of Maine and Touraine, the four departments of Maine and Loire, Indre and Loire, Maine, and Sarte.

ANISUM, or ANISE. See PIMPINELLA.

ANKER, a liquid meaſure at Amſterdam. It contains about 32 gallons Engliſh meaſure.

ANKLE, or ANCLE, the joint which connects the foot to the leg. See ANATOMY.

ANNA, one of the three principalities into which Arabia Deſerta is divided. ANNA is alſo one of the chief cities of the above principality, and formerly a famed mart-town; ſituated in lat. 33. 57. and E. long. 42. 10. on the river Euphrates.

ANNABON, or ANNOBON, a ſmall iſland of Africa, lying in E. long. 5. 10. S. lat. 1. 50.

ANNALE, in the church of Rome, a term applied to the maſſes celebrated for the dead during a whole year.

ANNALIS CLAVUS, the nail which the Prætor, Conſul, or Dictator, drove into the wall of Jupiter's temple annually upon the Ides of September, to ſhow the number of years; but this cuſtom was ſuperſeded by reckoning years by conſulſhips. The ceremony was ſometimes performed to avert the plague, &c.

ANNALS, in matters of literature, a ſpecies of hiſtory, which relates events in the chronological order wherein they happened. They differ from perfect hiſtory in this, that annals are but a bare relation of what paſſes every year, as a journal is of what paſſes every day; whereas hiſtory relates not only the tranſactions themſelves, but alſo the cauſes, motives, and ſprings of actions. Annals require nothing but brevity; hiſtory demands ornament.

ANNAN, the capital of Annandale, a diviſion of Dumfries-ſhire in Scotland; W. long. 3. N. lat. 54. 40.

ANNANO, a ſtrong fort of Italy, in the duchy of Milan, ſeated on the river Tanaro, in E. long. 8. 30. N. lat. 44. 40.

ANNAPOLIS, the chief town in Maryland, in North America; W. long. 78. 10. N. lat. 29. 25.

ANNAPOLIS ROYAL, a town of Nova Scotia, is ſeated in the bay of Fundy; W. long. 64. 5. N. lat. 45. 10.

ANNATES, among eccleſiaſtical writers, a year's income of a ſpiritual living. Theſe were, in ancient times, given to the pope through all Chriſtendom, upon the deceaſe of any biſhop, abbot, or pariſh-clerk, and were paid by his ſucceſſor. At the Reformation they were taken from the pope, and veſted in the king; and, finally, Queen Anne reſtored them to the church, by appropriating them to the augmentation of poor livings.

ANNEALING, by the workmen called *nealing*, is particularly uſed in making glaſs. It conſiſts in placing the bottles, &c. whilſt hot, in a kind of oven or furnace, where they are ſuffered to cool gradually; they would otherwiſe be too brittle for uſe.—Metals are rendered hard and brittle by hammering: they are therefore made red hot, in order to recover their malleability; and this is called *nealing*.

The difference between unannealed and annealed glaſs, with reſpect to brittleneſs, is very remarkable. When an unannealed glaſs-veſſel is broken, it often flies into a ſmall powder, with a violence ſeemingly very unproportioned to the ſtroke it has received. In general, it is in greater danger of breaking from a very ſlight ſtroke than from one of ſome conſiderable force. One of thoſe veſſels will often reſiſt the effects of a piſtol-bullet dropt into it from the height of two or three feet; yet a grain of ſand falling into it will make it burſt into ſmall fragments. This takes place ſometimes immediately on dropping the ſand into it: but often the veſſel will ſtand for ſeveral minutes after, ſeemingly ſecure; and then, without any new injury, it will fly to pieces. If the veſſel be very thin, it does not break in this manner, but ſeems to poſſeſs all the properties of annealed glaſs.

The ſame phenomena are ſtill more ſtrikingly ſeen in glaſs drops or tears. They are globular at one end, and taper to a ſmall tail at the other. They are the drops which fall from the melted maſs of glaſs on the rods on which the bottles are made. They drop into the tubs of water which are uſed in the work; and the greater part of them burſt immediately in the water. When thoſe that remain entire are examined, they diſcover all the properties of unannealed glaſs in the higheſt degree. They will bear a ſmart ſtroke on the thick end without breaking; but if the ſmall tail be broken, they burſt into ſmall powder with a loud exploſion. They appear to burſt with more violence, and the powder is ſmaller in an exhauſted receiver than in the open air. When they are annealed, they loſe theſe properties.

Some attempt to account for this phenomenon, by ſuppoſing that the ſudden cold applied to the ſurface forms a ſtrong coat by which the particles within are prevented from expanding as glaſs naturally does in paſſing from a fluid to a ſolid ſtate. On the breaking of any part of this hard caſe the particles are ſuppoſed to be ſet at liberty and thus produce an exploſion. This theory however will not bear examination, though it muſt be confeſſed philoſophy does not furniſh us with any that is better.

A proceſs ſimilar to what is practiſed with glaſs is now uſed for rendering kettles and other veſſels of caſt-iron leſs brittle: of it the ſame explanation may be given. The greater number of metals diminiſh in bulk when they paſs from a fluid to a ſolid ſtate; but iron, on the contrary, expands. Forged iron has long been procured, by placing a maſs of caſt-iron under large hammers, and making it undergo violent and repeated compreſſion. A proceſs is now uſed for converting caſt-iron into forged, by heat alone. The caſt-iron is placed in an air-furnace, and kept for ſeveral hours in a degree of heat, by which it is brought near to a fluid ſtate. It is then allowed to cool gradually, and is found to be converted into a ſubſtance ſimilar to forged iron. This proceſs is conducted under a patent; although, if Reaumur's experiments upon caſt-iron be conſulted, it will appear not to be a new diſcovery. By theſe experiments it is aſcertained, that if caſt-iron be expoſed for any length of time to a heat conſiderably below its melting point, the texture and properties are not changed: but if it be kept in a heat near the melting point, the ſurface ſoon becomes lamellated like forged iron; and the lamellated ſtructure extends farther into the maſs in proportion to the length of time in which it is expoſed to that degree of heat. When it is continued for a ſufficient time, and then allowed to cool gradually, it is found to poſſeſs the lamellated ſtructure throughout.

Caſt iron, like glaſs, is brittle, becauſe it has not had the opportunity of cryſtallizing regularly. When it is expoſed to cold while fluid, the ſurface becoming ſolid, prevents the inner parts from expanding and arranging themſelves into regular flakes. But when caſt-iron is brought near to the melting point, and continued for a ſufficient length of time in that degree of heat, the particles have an opportunity of arranging themſelves into that form by which forged-iron is diſtinguiſhed, and by which it poſſeſſes cohesion and all its other properties.

That this explanation of the annealing of iron is probable, appears alſo from the well known fact of forged iron being incomparably more difficult of fuſion than caſt-iron. A piece of forged iron requires a very violent heat to melt it; but when it is reduced to a ſmall powder, it melts in a much lower degree of heat. Iron diminiſhes in bulk when it paſſes into a fluid ſtate, while moſt other metals increaſe in volume. The expanſion which heat occaſions in bringing them to their melting-point, will be favourable to their fluidity, by gradually bringing the particles to the ſame ſtate of ſeparation in which they are when the maſs is fluid; but the expanſion of iron by heat removes it farther from that ſtate, and keeps it in the ſtate which is favourable to the continuance of it in a cryſtallized form. It will not melt till the heat expand it ſo much that the coheſion of cryſtallization be overcome. When it is reduced to a minute powder before it be expoſed to the heat, it melts ſooner. The cryſtals having been deſtroyed, that coheſion has no effect in preventing it from paſſing into a ſtate of fluidity. Perhaps, upon the ſame principles may be explained the almoſt peculiar property of welding poſſeſſed by iron, and the converſion of forged-iron into ſteel.

ANNE, Queen of Great Britain, daughter of James II. when duke of York, was born in 1664, and married to Prince George of Denmark in 1683, by whom ſhe had ſeveral children, but ſurvived them all. Upon the death of William III. March 8, 1702, ſhe ſucceeded to the throne, and to a war with France, which was proſecuted under her reign by the great duke of Marlborough, with more glory than profit to this nation. She effected the long wiſhed-for union between England and Scotland, which took place May 1ſt, 1707; and dying Auguſt 1, 1714, was ſucceeded by George Lewis Auguſtus Elector of Hanover, as the direct deſcendant from James I. by his daughter Elizabeth queen of Bohemia.

St. ANNE's *Day*, a feſtival of the Chriſtian church, celebrated by the Latins on the 26th of July, but by the Greeks on the 9th of December, in honour of Anne, or Anna, mother of the Virgin Mary.

ANNECY, a city of Savoy, ſeated between Chambery and Geneva, on a lake of the ſame name, which is about nine miles long and four broad. E. long. 6. 12. N. lat. 45. 53.

ANNEXATION, in law, a term uſed to imply the uniting of lands or rents to the crown.

ANNIHILATION, the act of reducing any created being into nothing.—Chriſtians, Heathens, Jews, Siameſe, Perſians, divines, philoſophers, &c. have their peculiar ſyſtems, ſentiments, conjectures, not to ſay dreams, concerning annihilation; and we find great diſputes among them about the reality, the poſſibility, the means, meaſures, prevention, ends, &c. of annihilation.

The firſt notions of the production of a thing from, or reduction of it to, nothing, Dr. Burnet ſhows, aroſe from the Chriſtian theology; the words *creation* and *annihilation*, in the ſenſe now given to them, having been equally unknown to the Hebrews, the Greeks, and the Latins.—The ancient philoſophers in effect denied all annihilation as well as creation, reſolving all the changes in the world into new modifications, without ſuppoſing the production of any thing new, or deſtruction of the old. By daily experience, they ſaw compounds diſſolved; and that in their diſſolution nothing periſhed but their union or connection of parts. When in death the body and ſoul were ſeparated, the man they held was gone, but that the ſpirit remained in its original, the great ſoul of the world, and the body in its earth from whence it came; theſe were again wrought by nature into new compoſitions, and entered new ſtates of being which had no relation to the former.

ANNI NUBILES, in law, denotes the marriageable age of a woman, viz. after ſhe has arrived at twelve years.

ANNIVERSARY, the annual return of any remarkable day. Anniverſary days, in old times, more particularly denoted thoſe days in which an office was yearly performed for the ſouls of the deceaſed, or the martyrdom of the ſaints was yearly celebrated in the church.

ANNOBON, a ſmall iſland of Africa, on the coaſt of Loango, belonging to the Portugueſe; E. long. 5. 10. S. lat. 1. 50.

ANNO DOMINI, i. e. the year of our Lord; the computation of time from our Saviour's incarnation.

ANNOMINATION, in rhetoric, the ſame with what is otherwiſe called *paronomaſia*. See PARONOMASIA.

ANNONA, in Roman antiquity, denotes proviſion for a year of all ſorts, as of fleſh, wine, &c. but eſpecially of corn. Annona is likewiſe the allowance of oil, ſalt, bread, fleſh, corn, wine, hay, and ſtraw, which was annually provided by the contractors for the maintenance of an army.

ANNONA, the *Cuſtard Apple*; a genus of the polygynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 52d order, *Coadunatæ*. The characters are theſe: The *calyx* is a triphyllous perianthium. The *corolla* conſiſts of ſix heart ſhaped petals. The *ſtamina* have ſcarcely any filaments; the antheræ are numerous, ſitting on the receptaculum. The *piſtillum* has a roundiſh germen; no ſtyli; the ſtigmata obtuſe and numerous. The *pericarpium* is a large roundiſh unilocular berry, covered with a ſcaly bark. The *ſeeds* are numerous. The *ſpecies* are, 1. The reticulata or cuſtard-apple, a native of the Weſt Indies, where it grows to the height of 25 feet, and is well furniſhed with branches on every ſide. 2. The muricata, or ſour-ſop, rarely riſes above 20 feet, and is not ſo well furniſhed with branches as the other. 3. The ſquamoſa, or ſweet ſop, ſeldom riſes higher than 15 feet, and is well furniſhed with branches on every ſide. The leaves have an agreeable ſcent when rubbed; the fruit is roundiſh and ſcaly, and when ripe turns of a purple colour, and has a ſweet pulp. 4. The paluſtris, or water-apple, grows to the height of 30 or 40 feet in moiſt places in all the Weſt-India iſlands. 5. The cherimola, with oblong ſcaly fruit, is a native of Peru, where it is much cultivated for the fruit. 6. The Africana, with ſmooth blueiſh fruit. 7. The Aſiatica, or purple apple, which grows in ſome of the French iſlands, and alſo in Cuba. 8. The triloba, or North-American annona, called by the inhabitants *papaw*, a native of the Bahama iſlands, Virginia, and Carolina. The trunks of the trees are ſeldom bigger than the ſmall of a man's leg, and are about 10 or 12 feet high, having a ſmooth greeniſh-brown bark. Theſe trees grow in low ſhady ſwamps, and in a very fat ſoil.—The laſt ſort will thrive in the open air in Britain, if placed in a warm and ſheltered ſituation; but the plants ſhould be trained up in pots, and ſheltered in winter for two or three years. All the other ſorts require to be kept in a warm ſtove.

ANNONÆ PREFECTUS, in antiquity, an extraordinary magiſtrate, whoſe buſineſs it was to prevent a ſcarcity of proviſion, and to regulate the weight and fineneſs of bread.

ANNONAY, a town of France in the department of Ardeche and late province of Dauphiny, ſeated on the confluence of the rivers Cances and Deumes, 12 miles S. W. of Vienne. E. long. 4. 52. N. lat. 45. 15.

ANNOT, a ſmall city in the mountains of Provence in France. E. long. 7. 0. N. lat. 44. 4.

ANNOTATION, in matters of literature, a brief commentary, or remark, upon a book or writing, in order to clear up ſome paſſage, or draw ſome concluſion from it.

ANNOTTA. See ANOTTA.

ANNUAL *Motion of the Earth*. See ASTRONOMY.

ANNUAL *Leaves*, are ſuch leaves as come up afreſh in the ſpring, and periſh in winter. Theſe ſtand oppoſed to *Evergreens*.

ANNUAL *Plants*, called alſo ſimply *annuals*, are ſuch as only live their year, *i. e.* come up in the ſpring and die again in the autumn; and accordingly are to be recruited every year.

ANNUEL OF NORWAY, of which mention is made in the acts of parliament of king James III. was an annual payment of an hundred marks ſterling, which the kings of Scotland were obliged to pay to the kings of Norway, in ſatisfaction for ſome pretenſions which the latter had to the Scottiſh kingdom, by virtue of a conveyance made thereof by Malcolm Kenmore, who uſurped the crown after his brother's deceaſe. This annuel was firſt eſtabliſhed in 1266; in conſideration whereof the Norwegians renounced all title to the ſucceſſion to the iſles of Scotland. It was paid till the year 1468, when the annuel, with all its arrears, was renounced in the contract of marriage between king James III. and Margaret daughter of Chriſtian I. king of Norway, Denmark, and Sweden.

ANNUITIES, a term implying any periodical income, ariſing from money lent, or from houſes, lands, ſalaries, penſions, &c. payable from time to time, either annually, or at other intervals of time. Annuities may be divided into ſuch as are *certain*, and ſuch as depend on ſome *contingency*, as the continuance of a life, &c. Annuities are alſo divided into annuities in *poſſeſſion*, and annuities in *reverſion*; the former meaning ſuch as have commenced; and the latter ſuch as will not commence till ſome particular event has happened, or till ſome given period of time has elapſed. *Annuities* may be farther conſidered as payable either *yearly*, or *half-yearly*, or *quarterly*, &c.

The *preſent value* of an annuity, is that ſum, which, being improved at intereſt, will be ſufficient to pay the annuity. The *preſent value* of an *annuity certain*, payable yearly, is calculated in the following manner.—Let the annuity be 1, and let r denote the amount of 1*l.* for a year, or 1*l.* increaſed by its intereſt for one year. Then, 1 being the preſent value of the ſum r, and having to find the preſent value of the ſum 1, it will be, by proportion thus, $r : 1 :: 1 : \frac{1}{r}$ the preſent value of 1*l.* due a year hence. In like manner $\frac{1}{r^2}$ will be the preſent value of 1*l.* due 2 years hence; for $r : 1 :: \frac{1}{r} : \frac{1}{r^2}$. In like manner $\frac{1}{r^3}$, $\frac{1}{r^4}$, $\frac{1}{r^5}$, &c. will be the preſent value of 1*l.* due at the end of 3, 4, 5, &c. years reſpectively; and in general, $\frac{1}{r^n}$ will be the value of 1*l.* to be received after the expiration of n years. Conſequently the ſum of all theſe, or $\frac{1}{r} + \frac{1}{r^2} + \frac{1}{r^3} + \frac{1}{r^4}$ + &c. continued to n terms, will be the preſent value of all the n years annuities. And the value of the perpetuity, is the ſum of the ſeries continued *ad infinitum*.

But this ſeries, it is evident, is a geometrical progreſſion, whoſe firſt term and common ratio are each $\frac{1}{r}$, and the number of its terms n; and therefore the ſum s of all the terms, or the preſent value of all the annual payments, will be $s = \frac{1}{r-1} - \frac{1}{r-1} \times \frac{1}{r^n}$.

When the annuity is a perpetuity, it is plain that the laſt term $\frac{1}{r^n}$ vaniſhes, and therefore $\frac{1}{r-1} \times \frac{1}{r^n}$ alſo vaniſhes; and conſequently the expreſſion becomes barely $s = \frac{1}{r-1}$; that is, any annuity divided by its intereſt for one year, is the value of the perpetuity. So, if the rate of intereſt be 5 per cent; then $\frac{100}{5} = 20$ is the value of the perpetuity at 5 per cent. Alſo $\frac{100}{4} = 25$ is the value of the perpetuity at 4 per cent. And $\frac{100}{3} = 33\frac{1}{3}$ is the value of the perpetuity at 3 per cent intereſt. And ſo on.

If the annuity is not to be entered on immediately, but after a certain number of years, as m years; then the preſent value of the reverſion is equal to the difference between two preſent values, the one for the firſt term of m years, and the other for the end of the laſt term n: that is, equal to the difference between $\frac{1}{r-1} - \frac{1}{r-1} \times \frac{1}{r^n}$ and $\frac{1}{r-1} - \frac{1}{r-1} \times \frac{1}{r^m}$, or $= \frac{1}{r-1} \times \frac{1}{r^m} - \frac{1}{r^n}$.

Annuities certain differ in value, as they are made payable *yearly*, *half-yearly*, or *quarterly*. And by proceeding as above, uſing the intereſt or amount of a half year, or a quarter, as thoſe for the whole year were uſed, the following ſet of theorems will ariſe; where r denotes, as before, the amount of 1*l.* and its intereſt for a year, and n the number of years, during which any annuity is to be paid; alſo P denotes the perpetuity $\frac{1}{r-1}$, Y denotes $\frac{1}{r-1} - \frac{1}{r-1} \times \frac{1}{r^n}$ the value of the annuity ſuppoſed payable yearly, H the value of the ſame when it is payable half-yearly, and Q the value when payable quarterly; or univerſally, M the value when it is payable every m part of a year.

THEOR. 1. $Y = P - P \times (\frac{1}{r})^n$.

THEOR. 2. $H = P - P \times (\frac{2}{r+1})^{2n}$.

THEOR. 3. $Q = P - P \times (\frac{4}{r+3})^{4n}$.

THEOR. 4. $M = P - P \times (\frac{m}{r+m-1})^{mn}$.

Example 1.

Let the rate of intereſt be 4 per cent, and the term 5 years; and conſequently $r = 1{\cdot}04$, $n = 5$, $P = 25$; alſo let $m = 12$, or the intereſt payable monthly in theorem 4: then the preſent value of ſuch annuity of 1*l.* a year, for 5 years, according as it is ſuppoſed payable 1*l.* yearly, or $\frac{1}{2}$*l.* every half year, or $\frac{1}{4}$*l.* every quarter, or $\frac{1}{12}$*l.* every month, or $\frac{1}{12}$th part of a year, will be as follows:

$Y = 25 - 25 \times {\cdot}821928 = 4{\cdot}4518$
$H = 25 - 25 \times {\cdot}820348 = 4{\cdot}4913$
$Q = 25 - 25 \times {\cdot}819543 = 4{\cdot}5114$
$M = 25 - 25 \times {\cdot}818996 = 4{\cdot}5251$.

Example 2. Supposing the annuity to continue 25 years, the rate of interest and every thing else being as before; then the values of the annuities for 25 years will be

$$Y = 25 - 25 \times .375118 = 15.6221$$
$$H = 25 - 25 \times .371527 = 15.7118$$
$$Q = 25 - 25 \times .369709 = 15.7573$$
$$M = 25 - 25 \times .368477 = 15.7881$$

Example 3. And if the term be 50 years, the values will be

$$Y = 25 - 25 \times .140713 = 21.4822$$
$$H = 25 - 25 \times .138032 = 21.5492$$
$$Q = 25 - 25 \times .136685 = 21.5829$$
$$M = 25 - 25 \times .135775 = 21.6056$$

Example 4. Also if the term be 100 years, the values will be

$$Y = 25 - 25 \times .019800 = 24.5050$$
$$H = 25 - 25 \times .019053 = 24.5237$$
$$Q = 25 - 25 \times .018683 = 24.5329$$
$$M = 25 - 25 \times .018435 = 24.5391$$

Hence the difference in the value by making periods of payments smaller, for any given term of years, is the more as the intervals are smaller, or the periods more frequent. The same difference is also variable, both as the rate of interest varies, and also as the whole term of years n varies; and, for any given rate of interest, it is evident that the difference, for any periods m of payments, first increases from nothing as the term n increases, when n is 0, to some certain finite term or value of n, when the difference D is the greatest or a maximum; and that afterwards, as n increases more, that difference will continually decrease to nothing again, and vanish when n is infinite: also the term or value of n, for the maximum of the difference, will be different according to the periods of payment, or value of m. And the general value of n, when the difference is a maximum between the yearly payments and the payments of m times in a year, is expressed by this formula, viz,

$$n = \frac{l.\ \frac{m.\ \frac{m+r-1}{m}}{l.\ r}}{ml.\ \frac{m+r-1}{m} - l.\ r},$$

where $l.$ denotes the logarithm of the quantity following it. Hence, taking the different values of m, viz. 2 for half years, 4 for quarters, 12 for monthly payments, &c. and substituting in the general formula, the term or value of n for each case, when the difference in the present worths of the annuities, will be as follows, reckoning interest at 4 per cent, viz.

$$n = \frac{l.\ \frac{2l.\ \frac{r+1}{2}}{l.\ r}}{2l.\ \frac{r+1}{2} - l.\ r} \text{ Years} = 25.3777 \text{ for half-yearly payments.}$$

$$n = \frac{l.\ \frac{4l.\ \frac{r+3}{4}}{l.\ r}}{4l.\ \frac{r+3}{4} - l.\ r} = 25.3200 \text{ for quarterly payments.}$$

$$n = \frac{l.\ \frac{12l.\ \frac{r+11}{12}}{l.\ r}}{12l.\ \frac{r+11}{12} - l.\ r} = 25.2643 \text{ for monthly payments.}$$

TABLE I.

The Amount of an Annuity of 1l. at Comp. Interest.

Yrs.	at 3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	2.03000	2.03500	2.04000	2.04500	2.05000	2.06000
3	3.09090	3.10623	3.12160	3.13703	3.15250	3.18360
4	4.18363	4.21494	4.24646	4.27819	4.31013	4.37462
5	5.30914	5.36247	5.41632	5.47071	5.52563	5.63709
6	6.46841	6.55015	6.63298	6.71689	6.80191	6.97532
7	7.66246	7.77941	7.89829	8.01915	8.14201	8.39384
8	8.89234	9.05169	9.21423	9.38001	9.54911	9.89747
9	10.15911	10.36850	10.58280	10.80211	11.02656	11.49132
10	11.46388	11.73139	12.00611	12.28821	12.57789	13.18079
11	12.80780	13.14199	13.48635	13.84118	14.20679	14.97164
12	14.19203	14.60196	15.02581	15.46403	15.91713	16.86994
13	15.61779	16.11303	16.62684	17.15991	17.71298	18.88214
14	17.08632	17.67699	18.29191	18.93211	19.59863	21.01507
15	18.59891	19.29568	20.02359	20.78405	21.57856	23.27597
16	20.15688	20.97103	21.82453	22.71934	23.65749	25.67253
17	21.76159	22.70502	23.69751	24.74171	25.84037	28.21288
18	23.41444	24.49969	25.64541	26.85508	28.13238	30.90565
19	25.11687	26.35718	27.67123	29.06356	30.53900	33.75999
20	26.87037	28.27968	29.77808	31.37142	33.06595	36.78559
21	28.67649	30.26947	31.96920	33.78314	35.71725	39.99273
22	30.53678	32.32890	34.24797	36.30338	38.50521	43.39229
23	32.45288	34.46041	36.61789	38.93703	41.43048	46.99583
24	34.42647	36.66653	39.08260	41.68920	44.50200	50.81558
25	36.45926	38.94986	41.64591	44.56521	47.72710	54.86451
26	38.55304	41.31310	44.31174	47.57064	51.11345	59.15638
27	40.70963	43.75906	47.08421	50.71132	54.66913	63.70577
28	42.93092	46.29063	49.96758	53.99333	58.40258	68.52811
29	45.21885	48.91080	52.96629	57.42303	62.32271	73.63980
30	47.57542	51.62268	56.08494	61.00707	66.43885	79.05819
31	50.00268	54.42947	59.32834	64.75239	70.76079	84.80168
32	52.50276	57.33450	62.70147	68.66625	75.29883	90.88978
33	55.07784	60.34121	66.20953	72.75623	80.06377	97.34316
34	57.73018	63.45315	69.85791	77.03026	85.06696	104.18375
35	60.46208	66.67401	73.65222	81.49662	90.32031	111.43478
36	63.27594	70.00760	77.59831	86.16397	95.83632	119.12087
37	66.17422	73.45787	81.70225	91.04134	101.62814	127.26812
38	69.15945	77.02889	85.97034	96.13820	107.70955	135.90421
39	72.23423	80.72491	90.40915	101.46442	114.09502	145.05846
40	75.40126	84.55028	95.02552	107.03032	120.79977	154.76197
41	78.66330	88.50954	99.82654	112.84669	127.83976	165.04768
42	82.02320	92.60737	104.81960	118.92479	135.23175	175.95054
43	85.48389	96.84863	110.01238	125.27640	142.99334	187.50758
44	89.04841	101.23833	115.41288	131.91384	151.14301	199.75803
45	92.71986	105.78167	121.02939	138.84997	159.70016	212.74351
46	96.50146	110.48403	126.87057	146.09821	168.68516	226.50812
47	100.39650	115.35097	132.94539	153.67263	178.11942	241.09861
48	104.40840	120.38826	139.26321	161.58790	188.02539	256.56453
49	108.54065	125.60185	145.83373	169.85936	198.42666	272.95840
50	112.79687	130.99791	152.66708	178.50303	209.34800	290.33590
51	117.18077	136.58284	159.77377	187.53566	220.81540	308.75606
52	121.69620	142.36324	167.16472	196.97477	232.85617	328.28142
53	126.34708	148.34595	174.81131	206.83863	245.49897	348.97831
54	131.13750	154.53806	182.84536	217.14637	258.77392	370.91701

Before the introduction of this table indeed, we should have observed, that Annuities may be considered as in arrears, or as forborne for any number of years; in which case each payment is to be considered as a sum put out to interest for the remainder of the term after the time it becomes due. And as 1*l.* due at the

end of 1 year amounts to r at the end of another year, and to r^2 at the end of the third year, and to r^3 at the end of the 4th year, and so on; therefore, by adding always the laſt year's annuity, or 1, to the amounts of all the former years, the ſum of all the annuities and their intereſts will be the ſum of the following geometrical ſeries, $1 + r + r^2 + r^3 + r^4 - - - - - -$ to r^{n-1}, continued till the laſt term be $r^n - 1$, or till the number of terms be n, the number of years the annuity is forborn. But the ſum of this geometrical progreſſion is $\frac{r^n - 1}{r - 1}$ which therefore is the amount of 1*l.* annuity forborn for n years. And this quantity being multiplied by any other annuity a, inſtead of 1, will produce the amount for that other annuity.

TABLE II.

The preſent Value of an Annuity of 1l.

Yrs.	at 3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	0·97087	0·96618	0·96154	0·95694	0·95238	0·94340
2	1·91347	1·89969	1·88610	1·87267	1·85941	1·83339
3	2·82861	2·80164	2·77509	2·74896	2·72325	2·67301
4	3·71710	3·67308	3·62990	3·58753	3·54595	3·46511
5	4·57971	4·51505	4·45182	4·38998	4·32948	4·21236
6	5·41719	5·32855	5·24214	5·15787	5·07569	4·91732
7	6·23028	6·11454	6·00205	5·89270	5·78637	5·58238
8	7·01969	6·87396	6·73274	6·59589	6·46321	6·20979
9	7·78611	7·60769	7·43533	7·26879	7·10782	6·80169
10	8·53020	8·31661	8·11090	7·91272	7·72173	7·36009
11	9·25262	9·00155	8·76048	8·52892	8·30541	7·88687
12	9·95400	9·66333	9·38507	9·11858	8·86325	8·38384
13	10·63496	10·30274	9·98565	9·68285	9·39357	8·85268
14	11·29607	10·92052	10·56312	10·22283	9·89864	9·29498
15	11·93794	11·51741	11·11839	10·73955	10·37966	9·71225
16	12·56110	12·09412	11·65230	11·23402	10·83777	10·10590
17	13·16612	12·65132	12·16567	11·70719	11·27407	10·47726
18	13·75351	13·18968	12·65930	12·15999	11·68959	10·82760
19	14·32380	13·70984	13·13394	12·59329	12·08532	11·15812
20	14·87747	14·21240	13·59033	13·00794	12·46221	11·46992
21	15·41502	14·69797	14·02916	13·40472	12·82115	11·76408
22	15·93692	15·16712	14·45112	13·78442	13·16300	12·04158
23	16·44361	15·62041	14·85684	14·14777	13·48857	12·30338
24	16·93554	16·05837	15·24696	14·49548	13·79864	12·55036
25	17·41315	16·48151	15·62208	14·82821	14·09394	12·78336
26	17·87684	16·89035	15·98277	15·14661	14·37519	13·00317
27	18·32703	17·28536	16·32959	15·45130	14·64303	13·21053
28	18·76411	17·66702	16·66306	15·74287	14·89813	13·40616
29	19·18845	18·03577	16·98371	16·02189	15·14107	13·59072
30	19·60044	18·39205	17·29203	16·28889	15·37245	13·76483
31	20·00043	18·73628	17·58849	16·54439	15·59281	13·92909
32	20·38877	19·06887	17·87355	16·78889	15·80268	14·08404
33	20·76579	19·39021	18·14765	17·02286	16·00255	14·23023
34	21·13184	19·70068	18·41120	17·24676	16·19290	14·36814
35	21·48722	20·00066	18·66461	17·46101	16·37419	14·49825
36	21·83225	20·29049	18·90828	17·66604	16·54685	14·62099
37	22·16724	20·57053	19·14258	17·86224	16·71129	14·73678
38	22·49246	20·84109	19·36786	18·04999	16·86789	14·84602
39	22·80822	21·10250	19·58448	18·22966	17·01704	14·94907
40	23·11477	21·35507	19·79277	18·40158	17·15909	15·04630
41	23·41240	21·59910	19·99305	18·56611	17·29437	15·13802
42	23·70136	21·83488	20·18563	18·72355	17·42321	15·22454
43	23·98190	22·06269	20·37079	18·87421	17·54591	15·30617
44	24·25427	22·28279	20·54884	19·01838	17·66277	15·38318
45	24·51871	22·49545	20·72004	19·15635	17·77407	15·45583
46	24·77545	22·70092	20·88465	19·28837	17·88007	15·52437
47	25·02471	22·89944	21·04294	19·41471	17·98102	15·58903
48	25·26671	23·09124	21·19513	19·53561	18·07716	15·65003
49	25·50166	23·27656	21·34147	19·65130	18·16872	15·70757
50	25·72976	23·45562	21·48218	19·76201	18·25593	15·76186
51	25·95123	23·62862	21·61749	19·86795	18·33898	15·81308
52	26·16624	23·79576	21·74758	19·96933	18·41807	15·86139
53	26·37499	23·95726	21·87267	20·06634	18·49340	15·90697
54	26·57766	24·11330	21·99296	20·15918	18·56515	15·94998

The Use of Table I.

To find the amount of an Annuity forborn any number of years. Take out the amount from the 1ſt table, for the propoſed years and rate of intereſt; then multiply it by the annuity in queſtion; and the product will be its amount for the ſame number of years, and rate of intereſt.

And the converſe to find the rate or time.

Exam. 1. To find how much an annuity of 50l. will amount to in 20 years at 3½ per cent. compound intereſt.—On the line of 20 years, and in the column of 3½ per cent. ſtands 28·27968, which is the amount of an annuity of 1l. for the 20 years; and therefore 28·27968 multiplied by 50, gives 1413·984l. or 1413l. 19s. 8d. for the anſwer.

Exam. 2. In what time will an annuity of 20l. amount to 1000l. at 4 per cent. compound intereſt?—Here the amount of 1000l. divided by 20l. the annuity, gives 50, the amount of 1l. annuity for the ſame time and rate. Then, the neareſt tabular number in the column of 4 per cent. is 49·96758, which ſtanding on the line of 28, ſhews that 28 years is the anſwer.

Exam. 3. If it be required to find at what rate of intereſt an annuity of 20l. will amount to 1000l. forborn for 28 years. Here 1000 divided by 20 gives 50 as before. Then looking along the line of 28 years, for the neareſt to this number 50, I find 49·96758 in the column of 4 per cent, which is therefore the rate of intereſt required.

The Use of Table II.

Exam. 1. To find the preſent value of an annuity of 50l. which is to continue 20 years, at 3½ per cent.—By the table, the preſent value of 1l. for the ſame rate and time, is 14·21240; therefore $14{\cdot}2124 \times 50 = 710{\cdot}62$l. or 710l. 12s. 4d. is the preſent value ſought.

Exam. 2. To find the preſent value of an annuity of 20l. to commence 10 years hence, and then to continue for 40 years, or to terminate 50 years hence, at 4 per cent. intereſt.—In ſuch caſes as this, it is plain we have to find the difference between the preſent values of two equal annuities, for the two given times; which therefore will be effected by ſubtracting the tabular value of the one term from that of the other, and multiplying by the annuity. Thus,

tabular value for 50 years	21·48218
tabular value for 10 years	8·11090
the difference	13·37128
mult. by -	20
gives -	267·4256
or -	267l. 8s. 6d. the anſwer.

The foregoing obſervations, rules, and tables, contain all that is important in the doctrine of *Annuities certain*. And for farther information, reference may be had to arithmetical writings, particularly Malcolm's Arithmetic, page 595: Simpſon's Algebra, ſect. 16; Dodſon's Mathematical Repoſitory, page 298, &c; Jones's Synopſis, ch. 10; Philoſ. Tranſ. vol. lxvi. page 109.

For what relates to the doctrine of *Annuities on Lives*, ſee Assurance, Complement, Expectation, Life Annuities, Reversions, &c.

Annuity *(Borrowing upon)*; one of the means employed by government for ſupplies. Of this there are two methods; that of borrowing upon annuities for terms of years, and that of borrowing upon annuities for lives. During the reigns of king William and queen Anne, large ſums were frequently

borrowed upon annuities for terms of years, which were ſometimes longer and ſometimes ſhorter. An annuity for a long term of years, though its intrinſic value may be very nearly the ſame with that of a perpetual annuity, will not find nearly the ſame number of purchaſers. The ſubſcribers to a new loan, who mean generally to ſell their ſubſcription as ſoon as poſſible, prefer greatly a perpetual annuity redeemable by parliament, to an irredeemable annuity for a long term of years of only equal amount. The value of the former may be ſuppoſed always the ſame, or very nearly the ſame; and it makes, therefore, a more convenient transferable ſtock than the latter. Annuities, either for terms of years or for lives, are occaſionally granted as premiums to the ſubſcribers to a new loan, over and above the redeemable annuity or intereſt upon the credit of which the loan is ſuppoſed to be made. They are granted, not as the proper fund upon which the money is borrowed; but as an additional encouragement to the lender.

Annuities for lives have likewiſe been granted upon lots of lives, which in French are called *Tontines*, from the name of their inventor. When annuities are granted upon ſeparate lives, the death of every individual annuitant diſburthens the public revenue ſo far as it was affected by his annuity. When annuities are granted upon tontines, the liberation of the public revenue does not commence till the death of all the annuitants comprehended in one lot, which may ſometimes conſiſt of twenty or thirty perſons, of whom the ſurvivors ſucceed to the annuities of all thoſe who die before them; the laſt ſurvivor ſucceeding to the annuities of the whole lot. Upon the ſame revenue more money can always be raiſed by tontines than by annuities for ſeparate lives. An annuity, with a right of ſurvivorſhip, is really worth more than an equal annuity for a ſeparate life; and from the confidence which every man naturally has in his own good fortune, the principle upon which is founded the ſucceſs of all lotteries, ſuch an annuity generally ſells for ſomething more than it is worth. In countries where it is uſual for government to raiſe money by granting annuities, tontines are upon this account generally preferred to annuities for ſeparate lives. The expedient which will raiſe moſt money, is almoſt always preferred to that which is likely to bring about in the ſpeedieſt manner the liberation of the public revenue.

ANNULAR, in a general ſenſe, ſomething in the form of, or reſembling, a ring. It is alſo a peculiar denomination of the fourth finger, commonly called the *ring-finger*.

ANNULET, in architecture, a ſmall ſquare member in the Doric capital, under the quarter round. It is alſo a narrow flat moulding, which is common to divers parts of the columns, as the baſes, capitals, &c. It is the ſame member which Vitruvius calls a *fillet*; Palladio, a *liſtil* or *cincture*; Scamozzi, and Mr. Brown, a *ſupercilium*, *liſt*, *tinea*, *eye-brow*, *ſquare*, *rabbit*. See ARCHITECTURE.

ANNULET, in heraldry, a little circle, borne as a charge in coats-of arms, as alſo added to them as a *difference*. Among the Romans it repreſented liberty and nobility. It alſo denotes ſtrength and eternity, by reaſon of its circular form. When this figure is added as a difference, ſome authors aſſert, that it ſerves to remind the bearer to achieve great actions.

ANNULLING, a term ſometimes uſed for cancelling or making void a deed, ſentence, or the like.

ANNUNCIADA, ANNUNTIADA, or ANNUNTIATA, an order of knighthood in Savoy, firſt inſtituted by Amadeus I. in the year 1409. Their collar was of 15 links, interwoven one with another, in form of a true-lover's knot; and the motto, F. E. R. T. ſignifying, *Fortitudo ejus Rhodum tenuit*. Amadeus VIII. gave the name *Annunciada* to this order, which was formerly known by that of *the knot of love*; changing at the ſame time the image of St. Maurice patron of Savoy, which hung at the collar, for that of the Virgin Mary; and, inſtead of the motto above mentioned, ſubſtituting the words of the angel's ſalutation.

ANNUNCIADA is alſo the title of ſeveral religious orders, inſtituted at different times, and at different places, in honour of the Annunciation.

ANNUNCIATION, the tidings brought by the angel Gabriel to the Virgin Mary, of the incarnation of Chriſt.

ANNUNCIATION is alſo a feſtival, kept by the Church on the 25th of March, in commemoration of theſe tidings. This feſtival appears to be of very great antiquity, having been obſerved before the time of the council of Trullo, in which there is a canon forbidding the celebration of all feſtivals in Lent, excepting the Lord's day, and the feaſt of the Annunciation: ſo that we may date its original from the ſeventh century. In the Romiſh Church, on this feaſt, the pope performs the ceremony of marrying or cloyſtering a certain number of maidens, who are preſented to him in the church, clothed in white ſerge, and muffled up from head to foot: An officer ſtands by, with purſes containing notes of 50 crowns for thoſe who make choice of marriage, and notes of one hundred for thoſe who chooſe the veil.

ANNUNCIATION is likewiſe a title given by the Jews to a part of the ceremony of the paſſover.

ANNUNCIATOR, the name of an officer in the Church of Conſtantinople. It was his buſineſs to inform the people of the feſtivals that were to be celebrated.

ANODYNE, from α privative, and $\dot{o}\delta\dot{\upsilon}\nu\omega$ *doleo*; or α neg. and $\dot{\omega}\delta\dot{\upsilon}\nu\eta$ *pain*; a term applied to medicines which eaſe pain and procure ſleep.

ANOINTERS, a religious ſect in ſome parts of England, ſo called from the ceremony they uſed of anointing all perſons before they admitted them into their church.

ANOLYMPIADES, in antiquity, a name given by the Elians to thoſe Olympic games which had been celebrated under the direction of the Piſæans and Arcadians.

ANOMALISTICAL YEAR, in aſtronomy, the time that the earth takes to paſs through her orbit: it is alſo called the *Periodical Year*. The ſpace of time belonging to this year is greater than the tropical year, on account of the proceſſion of the equinoxes. See ASTRONOMY.

ANOMALOUS *Verbs*, in grammar, ſuch as are not conjugated conformably to the paradigm of their conjugation. They are found in all languages. In Latin, the verb *lego* is the paradigm of the third conjugation; and runs thus, *lego*, *legis*, *legit*: By the ſame rule it ſhould be *fero*, *feris*, *ferit*; but we ſay *fero*, *fers*, *fert*: *fero*, then, is an anomalous verb. In Engliſh the irregularity relates often to the preter tenſe and paſſive participle: for example, *give*, were it formed according to rule, would make *gived* in the preter tenſe and paſſive participle; whereas, in the former, it makes *gave*, and in the latter *given*.

ANOMALY, in aſtronomy, an irregularity in the motion of the planets, whereby they deviate from the aphelion or apogee.

ANOMIA, in zoology, a genus of inſects belonging to the order of vermes teſtacea. The ſhell is bivalve, and the valves are unequal. One valve is perforated near the hinge; affixed by that perforation to ſome other body. There are 25 ſpecies of the anomia; of which only two are natives of the Britiſh ſeas, *viz.* 1. The ephippium, with the habit of an oyſter; the one ſide convex, the other flat; perforated; adherent to other bodies, often to oyſter-ſhells, by a ſtrong tendinous ligature; colour of the inſide perlaceous. Size, near two inches diameter. 2. The ſquammula, with ſhells reſembling the ſcales of fiſh; very delicate, and ſilvery; much flatted; perforated; very ſmall. Adheres to oyſters, crabs, lobſters, and ſhells. The ſpecies of this genus are commonly

called *beaked cockles*. No name has been given to the fiſh that inhabit it; for the recent ſhells of this kind are ſo very rare, that there is ſcarcely one to be found perfect. They are perhaps, as well as that which has given its form to the *cornu ammonis*, inhabitants of the deepeſt parts of the ocean; conſequently it muſt be ſome extraordinary agitation of that great body of water that can bring them at all to our knowledge in their recent ſtate. The foſſile ſpecies of the *anomia* genus are uncommonly numerous in this iſland, in our chalk-pits and limeſtone quarries; and, in Glouceſterſhire, they are as common on the ploughed lands as pebbles in other places.

ANOMOEANS, in eccleſiaſtical hiſtory, the name by which the pure Arians were called in the fourth century, in contradiſtinction to the Semi-Arians. The word is formed from the Greek, ανομοιος *different*, *diſſimilar*. For the pure Arians aſſerted, that the Son was of a nature different from, and in nothing like, that of the Father; whereas the Semi-Arians acknowledged a likeneſs of nature in the Son; at the ſame time that they denied, with the pure Arians, the conſubſtantiality of the world. The Semi-Arians condemned the Anomœans in the council of Seleucia; and the Anomœans in their turn condemned the Semi-Arians in the councils of Conſtantinople and Antioch, eraſing the word ομοιος *like*, out of the Formula of Rimini and that of Conſtantinople.

ANOMORHOMBOIDIA, in natural hiſtory, the name of a genus of ſpars; the word is derived from the Greek ανωμαλης *irregular*, and ρομβοιδης a *rhomboidal* figure. The bodies of this genus are pellucid cryſtalline ſpars of no determinate or regular external form, but always breaking into regularly rhomboidal maſſes; eaſily fiſſile, and compoſed of plates running both horizontally and perpendicularly through the maſſes, but cleaving more readily and evenly in an horizontal, than in a perpendicular direction; the plates being ever compoſed of irregular arrangements of rhomboidal concretions. Of this genus there are five known ſpecies. 1. A white, bright, and ſhattery one; found in great quantities in the lead mines of Derbyſhire, Yorkſhire, and Wales. 2. A milk-white, opake, and ſhattery one, found in ſome parts of France, and very plentifully in Germany, and ſometimes in Wales and Scotland, and in the hills of Yorkſhire. 3. A hard, dull, and ſnow-white one, found in ſome of the mines in Derbyſhire, and in many of our northern counties. 4 A hard grey and pellucid one, found in the lead-mines of Yorkſhire, and very common in Germany. And, 5. A pellucid and colourleſs one; this is found in the lead-mines of Derbyſhire and Yorkſhire. All theſe in ſome degree have their double refraction of the iſland-cryſtal. See Island-*cryſtal*.

ANONIS, in botany. See Ononis.

ANONYMOUS, in commerce. Partnerſhips in trade in France are ſtyled anonymous, when they are not carried on under any particular name, but wherein each of the partners trades viſibly on his own account, and in his own name; after which all the partners give one another an account of their profit or loſs in trade. Theſe ſorts of partnerſhips are concealed, and known only to the parties themſelves.

Anonymous *Partnerſhips in Trade*, are alſo in France, ſuch, wherein perſons of fortune and quality depoſit ſums of money, in order to ſhare the profits and loſs. To this end thoſe who furniſh the capital have no trouble in carrying on the trade, nor do their names appear to be any way intereſted therein. A partner of this deſcription in England, is uſually termed a *ſleeping-partner*.

Anonymous, in law. The ſending anonymous letters demanding money, &c. is felony by the Black Act, 9 Geo. I. cap. 22.

ANOREXIA, Anorexy, from α neg. and ορεξις *appetite*; a want of appetite, or a loathing of food. This may proceed from an original affection of the ſtomach, or may be ſymptomatic. See Medicine.

ANOSSI, a province of the iſland of Madagaſcar, lying between lat. 23. 18. and 26. 0. S.

ANOTTA, or Arnotta, in dyeing, an elegant red colour, formed from the pellicles or pulp of the ſeeds of the Bixa, a tree common in South America. It is alſo called *Terra Orleana*, and *Roucou*. In making it, the red ſeeds are ſteeped in water, till the liquor begins to ferment; then ſtrongly ſtirred and ſtamped with wooden beaters, to promote the ſeparation of the red ſkins: this proceſs is repeated ſeveral times, till the ſeeds are left white. The liquor, paſſed through cloſe cane-ſieves, is pretty thick, of a deep red colour, and a very ill ſmell. In boiling, it throws up its colouring matter to the ſurface in form of ſcum, which is afterwards boiled down by itſelf to a due conſiſtence, and made up while ſoft into balls. To rectified ſpirit of wine it very readily communicates a high orange or yelloviſh red, and hence is uſed as an ingredient in varniſhes, for giving an orange-caſt to the ſimple yellows. Alkaline ſalts render it perfectly ſoluble in boiling water, without altering its colour. Wool or ſilk boiled in the ſolution acquires a deep, but not a very durable, orange-dye. Its colour is not changed by alum or by acids, any more than by alkalis: but when imbibed in cloth, it is diſcharged by ſoap, and deſtroyed by expoſure to the air. It is ſaid to be an antidote to the poiſonous juice of manioc or caſſava. Labat informs us, that the Indians prepare a finer anotta, of a bright ſhining red colour, almoſt equal to carmine. De Laet alſo mentions two kinds of anotta; one of a permanent crimſon colour, uſed as a paint for the face; and another which gives a colour inclining more to that of ſaffron. This laſt, which is our anotta, he ſuppoſes to be a mixture of the firſt ſort with certain reſinous matters, and with the juice of the root of the tree. See Bixa.

ANOUT, a ſmall iſland in the Schagerrack, or that part of the ſea of Denmark which has Norway on the north, Jutland on the weſt, and the iſle of Zealand on the ſouth; it lies in 13. 0. E. long. and 56. 36. N. lat.

ANSÆ, in aſtronomy, implies the parts of Saturn's ring projecting beyond the diſk of the planet. The word properly ſignifies *handles*; theſe parts of the ring appearing like handles to the body of the planets.

ANSARIANS, a people of Syria, ſo called in the country, but ſtyled in Deliſle's maps *Enſarians*, and in thoſe of Danville, *Naſſaris*. The territory occupied by theſe Anſaria is that chain of mountains which extends from Antakia to the rivulet called *Nahr-el-Kahir*, or the Great River.

ANSE, an ancient town of France, in the late Lyonois, ten miles north of Lyons. Long. 6. 55. N. lat. 45. 55.

ANSER, in ornithology, the trivial name of a ſpecies of anas. See Anas.

Anser, in aſtronomy, a ſmall ſtar, of the fifth or ſixth magnitude, in the milky way, between the ſwan and eagle, firſt brought into order by Hevelius.

ANSERES, the name which Linnæus gives to his third order of birds. See Zoology.

ANSIBARII, or Ansivarii, an ancient people of Germany, ſituated ſomewhere in the neighbourhood of the Chauci.

ANSIKO, a kingdom of Africa, bounded on the W. by the river Umbre; on the N. by ſome deſerts of Nubia; and on the S. by Songo and Sonda, provinces of Congo.

ANSLO, a ſea-port town of Norway, in the province of Aggerhuys. E. long. 10. 14. N. lat. 50. 24.

ANSON (George), a gentleman whoſe merit and good fortune, as a naval commander, exalted him to the peerage. He was the ſon of William Anſon, Eſq. of Huckborough,

in Staffordſhire; and, ſhowing an early inclination for the ſea, received a ſuitable education. The firſt command he enjoyed was that of the Weazle ſloop in 1722; and after a variety of ſervices, which make a conſpicuous figure in the naval hiſtory of Great Britain, his late majeſty created him baron of Soberton in Hants. The ſame year he was made vice-admiral of England; in 1748, admiral of the blue; and afterwards firſt lord of the admiralty. The laſt ſervice he performed was that of convoying queen Charlotte to England. He died in June 1762.

ANSPACH, a handſome town and caſtle of Germany, in Franconia, and capital of the margravate of Anſpach. The preſent prince lately abdicated his dominions, in conſideration of a ſtipulated revenue, in favour of the king of Pruſſia, who is of the ſame family. It is ſeated on a river of the ſame name, 25 miles S. W. of Nuremburg. Lon. 10. 47. E. lat. 49. 20. N.

ANSPESSADES, in the French armies, a kind of inferior officers in the foot, below the corporals, but above the common ſoldiers. There are uſually four or five of them in a company.

ANSTRUTHER, *Eaſtern* and *Weſtern*, two royal boroughs of Fifeſhire in Scotland. W. long. 2. 25. N. lat. 56. 20.

ANT, in zoology. See FORMICA and TERMES.

ANT-*Bear*, or *Ant-eater*, in zoology. See MYRMECOPHAGA.

ANT-*Eggs*, a name popularly given to a kind of little white balls found in the banks or neſts of ants, and ſuppoſed to be the ova of this inſect. Late naturaliſts have obſerved, that theſe are not properly the ants eggs, but the young brood themſelves in their firſt ſtate; they are ſo many little vermiculi wrapped up in a film, or ſkin, compoſed of a ſort of ſilk, which they ſpin out of themſelves as ſilk-worms and caterpillars do. At firſt they are hardly obſerved to ſtir: but, after a few days continuance, they exhibit a feeble motion of flexion and extenſion; and begin to look yelloviſh and hairy, ſhaped like ſmall maggots, in which ſhape they grow up till they are almoſt as large as ants. When they paſs their metamorphoſis, and appear in their proper ſhape, they have a ſmall black ſpeck on them cloſe to the anus of the incloſed ant, which M. Lewenhoek probably enough imagines to be the fæces voided by it. Theſe ſuppoſed ants eggs are brought up every morning in ſummer, near the top of the bank, where they are lodged all the warm part of the day, within reach of the ſun's influence. At night, or if it be cool, or likely to rain, they carry them down to a greater depth; ſo that you may dig a foot deep ere you come at them. The true ants eggs are the white ſubſtance which, upon opening their banks, appears to the eye like the ſcatterings of fine white ſugar, or ſalt, but very ſoft and tender. Examined by a microſcope, it is found to conſiſt of ſeveral pure, white appearances, in diſtinct membranes, all figured like the leſſer ſort of birds eggs, and as clear as a fiſh's bladder. The ſame ſubſtance is found in the bodies of the ants themſelves. On this ſpawn, when emitted, they lie in multitudes, to brood, till in ſome time it is turned into thoſe little vermicles which we have been deſcribing.

ANT-*Hills*, are little hillocks of earth, which the ants throw up for their habitation and the breeding of their young. They injure dry paſtures, not only by waſting ſo much land as they cover, but by hindering the ſcythe in mowing the graſs, and yielding a poor hungry food pernicious to cattle. The manner of deſtroying them is to cut them into four parts from the top, and then dig into them ſo deep as to take out the core below, ſo that, when the turf is laid down again, it may lie ſomewhat lower than the level of the reſt of the land: by this means it will be wetter than the reſt of the land; and this will prevent the ants from returning to the ſame place, which otherwiſe they would certainly do. The earth that is taken out muſt be ſcattered to as great a diſtance every way as may be, otherwiſe they will collect it together and make another hill juſt by. The proper time for doing this is winter. Human dung however proves the beſt remedy; for it will kill great numbers of them, and drive the reſt away if only a ſmall quantity of it be put into their hills.

Acid of ANTS, an acid produced by diſtilling millions of theſe inſects, either without addition, or with water. It reſembles vinegar in many reſpects; but differs from it in forming cryſtals with magneſia, iron, and zinc. Its attractions are not yet determined, but are ſuppoſed to coincide with thoſe of vinegar.

ANTA, in the ancient architecture, a ſquare pilaſter, placed at the corners of buildings.

ANTA, or *Ante*, a ſmall kingdom on the Gold Coaſt of Africa, extending about ten leagues in length.

ANTACIDS, in pharmacy, an appellation given to all ſuch medicines as are ſuppoſed to correct acidities in the ſtomach or animal juices.

ANTÆUS, in fabulous hiſtory, a giant of Libya, ſon of Neptune and Terra. Deſigning to build a temple to his father, of men's ſculls, he ſlew all he met; but Hercules fighting him, and perceiving the aſſiſtance he received from his mother, lifted him up from the ground, and ſqueezed him to death.

ANTAGONIST, denotes an adverſary, eſpecially in ſpeaking of combats and games.

ANTAGONIST *muſcles*, in anatomy, thoſe muſcles which have oppoſite functions; as flexors and extenſors, &c.

ANTANACLASIS, in rhetoric, a figure which repeats the ſame word, but in a different ſenſe; as, *dum vivimus, vivamus*.

ANTAGOGE, in rhetoric, a figure by which, when the accuſation of the adverſary is unanſwerable, we load him with the ſame or other crimes.

ANTAPHRODISIACS, in pharmacy, medicines ſuppoſed capable of diminiſhing the ſemen, and leſſening the diſpoſition to venery.

ANTARCTIC, in a general ſenſe, denotes ſomething oppoſite to the arctic or northern pole. Hence antarctic circle is one of the leſſer circles of the ſpheres, and diſtant only 23° 30′ from the ſouth pole, which is likewiſe called antarctic for the ſame reaſon.

ANTARES, in aſtronomy, the name of a ſtar of the firſt magnitude, called alſo the ſcorpion's heart. Its longitude is 60° 13′ 14″ of Sagittarius; and its latitude 4° 31′ 26″ S.

ANTAVARE, a province of the iſland of Madagaſcar, lying about 21° 30′ S. lat. and bounded by the province and cape of Manouſi.

ANTE′, in heraldry, denotes that the pieces are let into one another in ſuch a form as there is expreſſed; for inſtance, by dove-tails, rounds, ſwallow-tails, &c.

ANTEAMBULONES, in Roman antiquity, ſervants who went before perſons of diſtinction to clear the way before them. They uſed this formula, *Date locum domino meo*, i. e. "Make room or way for my maſter."

ANTECEDENT, in grammar, the words to which a relative refers.

ANTECEDENT, in logic, is the firſt of the two propoſitions in an enthymeme

ANTECEDENT, in mathematics, is the firſt of two terms of a ratio, or that which is compared with the other.

ANTECEDENCE, in aſtronomy, an apparent motion of a planet towards the weſt, or contrary to the order of the ſigns.

ANTECESSOR, one that goes before. It was an appellation given to thoſe who excelled in any ſcience. Juſtinian applied it particularly to profeſſors of civil law; and, in the univerſities of France, the teachers of law take the title *anteceſſores* in all their theſes.

ANTECURSORES, in the Roman armies, a party of horſe detached before, partly to get intelligence, proviſions, &c. and partly to chooſe a proper place to encamp in. Theſe were otherwiſe called *anteceſſores*, and by the Greeks *prodromi*.

ANTEDATE, among lawyers, a ſpurious or falſe date prior to the true date of a bond, bill, or the like.

ANTEDILUVIAN *World*; the earth as it exiſted before the flood. See EARTH.

ANTEDILUVIANS, a general name for all mankind who lived before the flood, and in which are included the whole of the human race from Adam to Noah and his family. As Moſes has not ſet down the particular time of any tranſaction before the flood, except only the years of the fathers' age wherein the ſeveral deſcendants of Adam in the line of Seth were begotten, and the length of their ſeveral lives; it has been the buſineſs of chronologers to endeavour to fix the years of the lives and deaths of thoſe patriarchs, and the diſtance of time from the creation to the deluge. In this there could be little difficulty were there no varieties in the ſeveral copies we now have of Moſes's writings; which are, the Hebrew, the Samaritan, and the Greek verſions of the Septuagint; but as theſe differ very conſiderably from one another, learned men are much divided in their opinions concerning the chronology of the firſt ages of the world; ſome preferring one copy, and ſome another. That the reader may the better judge of the variations in the three copies in this period, they are exhibited in the following table, with the addition of thoſe of Joſephus.

A TABLE *of the Years of the Antediluvian Patriarchs.*

	Their ages at their ſons' birth.				Years they lived after their ſons' birth.		
	Heb.	Sam.	Sept.	Joſ.	Heb.	Sam.	Sept.
Adam, -	130	130	230	130	800	800	700
Seth, -	105	105	205	105	807	807	707
Enos, -	90	90	190	90	815	815	715
Cainan, -	70	70	170	70	840	840	740
Mahalaleel, -	65	65	165	65	830	830	730
Jared, -	162	62	162	62	800	785	800
Enoch, -	65	65	165	65	300	300	200
Methuſelah, -	187	67	167	187	782	653	802
Lamech, -	182	53	188	182	595	600	565
Noah was aged at the Flood,	600	600	600	600			
To the Flood,	1656	1307	2262	1556			

How long each of theſe lived is at once known by reſpectively adding the age at his ſons' birth to the number of years he exiſted afterwards. Some writers, in order to explain the conſequences of theſe variations, have added ſeparate chronological tables, ſhewing in what year of his contemporaries the birth and death of each patriarch happened, according to the computation of each of the three copies alluded to.

The antediluvian world was, in all probability, ſtocked with a much greater number of inhabitants than the preſent earth either actually does, or perhaps is capable of containing or ſupplying. This ſeems naturally to follow from the great length of their lives, which exceeding the preſent ſtandard of life in the proportion, at leaſt, of ten to one, the antediluvians muſt accordingly in any long ſpace of time double themſelves, at leaſt in about the tenth part of the time in which mankind do now double themſelves. It has been ſuppoſed that they began to get children as early, and left off as late, in proportion, as men do now; and that the ſeveral children of the ſame father ſucceeded as quickly one after another as they uſually do at this day; and as many generations, which are but ſucceſſive with us, were contemporary before the flood, the number of people living on the earth at once would be by that means ſufficiently increaſed to anſwer any defect which might ariſe from other circumſtances not conſidered. So that, if we make a computation on theſe principles, we ſhall find, that there was a conſiderable number of people in the world at the death of Abel, though their father Adam was not then 130 years old; and that the number of mankind before the deluge would eaſily amount to above one hundred thouſand millions (even according to the Samaritan chronology), that is, to twenty times as many as our preſent earth has, in all probability, now upon it, or can well be ſuppoſed capable of maintaining in its preſent conſtitution.

ANTEGO. See ANTIGUA.

ANTEJURAMENTUM, by our anceſtors called *juramentum calumniæ*, an oath which anciently both accuſer and accuſed were to take before any trial or purgation. The accuſer was to ſwear, that he would proſecute the criminal; and the accuſed to make oath, on the day he was to undergo the ordeal, that he was innocent of the crime charged againſt him.

ANTELOPE, in zoology. See CAPRA.

ANTELUCAN, in eccleſiaſtical writers, is applied to things done in the night or before day. We find frequent mention of the antelucan aſſemblies of the ancient Chriſtians, in times of perſecution, for religious worſhip.

ANTEMURALE, in the ancient military art, denotes much the ſame with what the moderns call an *out-work*.

ANTENATI, in modern Engliſh hiſtory, is chiefly underſtood of the ſubjects of Scotland, born before king James the Firſt's acceſſion to the Engliſh crown, and alive after it. In relation to theſe, thoſe who were born after the acceſſion were denominated *poſtnati*. The antenati were conſidered as aliens in England, whereas the poſtnati claimed the privilege of natural ſubjects.

ANTENCLEMA, in oratory, is where the whole defence of the perſon accuſed turns on criminating the accuſer. Such is the defence of Oreſtes, or the oration for Milo: *Occiſus eſt, ſed latro. Exſectus, ſed raptor.*

ANTENICENE, in eccleſiaſtical writers, denotes a thing or perſon prior to the firſt council of Nice. We ſay, the Antenicene faith, Antenicene creeds, fathers, &c.

ANTENNÆ, in the hiſtory of inſects, ſlender bodies with which nature has furniſhed the heads of theſe creatures, being the ſame with what in Engliſh are called *horns* or *feelers*. See ENTOMOLOGY.

ANTENOR, a Trojan prince, came into Italy, expelled the Enganians on the river Po, and built the city of Padua, where his tomb is ſaid ſtill to exiſt.

ANTEPAGMENTA, in the ancient architecture, the jambs of a door. They are alſo ornaments, or garniſhings, in carved work, of men, animals, &c. made either of wood or ſtone, and ſet on the architrave.

ANTEPENULTIMA, in grammar, the third ſyllable of a word from the end, or the laſt ſyllable but two.

ANTEPILANI, in the Roman armies, a name given to the haſtati and principes, becauſe they marched next before the triarii, who were called *pilani*.

ANTEPILEPTICS, among phyſicians, medicines eſteemed good in the epilepſy.

ANTEPOSITION, a grammatical figure, whereby a

word, which by the ordinary rules of ſyntax ought to follow another, comes before it. As when, in the Latin, the adjective is put before the ſubſtantive, the verb before the nominative caſe, &c

ANTEPREDICAMENTS, among logicians, certain preliminary queſtions which illuſtrate the doctrine of predicaments and categories.

ANTEQUIERA, a handſome town of Spain, in the kingdom of Granada. W. long. 4. 40. N. lat. 36. 51.

ANTEROS, in mythology, one of the two Cupids placed at the foot of the Venus of Medici. This is repreſented with a heavy and ſullen look, agreeably to the poetical deſcription of him, as the cauſe of love's ceaſing. The other was called Eros.

ANTESIGNANI, in the Roman armies, ſoldiers placed before the ſtandards, in order to defend them, according to Limpſius; but Cæſar and Livy mention the anteſignani as the firſt line, or firſt body, of heavy armed troops. The velites, who uſed to ſkirmiſh before the army, were likewiſe called *anteſignani*.

ANTESTATURE, in fortification, a ſmall retrenchment made of paliſadoes, or ſacks of earth, with a view to diſpute with an enemy the remainder of a piece of ground.

ANTESTARI, in Roman antiquity, ſignifies to bear witneſs againſt any one who refuſed to make his appearance in the Roman courts of judicature, according to the tenor of his bail. The plaintiff, finding the defendant after ſuch a breach of his engagement, was allowed to carry him into court by force, having firſt aſked any of the perſons preſent to bear witneſs. The perſon ſo aſked, expreſſed his conſent by turning his right ear, which was inſtantly taken hold of by the plaintiff, and this was to anſwer the end of a ſubpœna.

ANTEVIRGILIAN HUSBANDRY, an appellation given to Mr. Tull's new method of horſe-hoeing huſbandry.

ANTHELION. See CORONA and PARHELION.

ANTHELIX, in anatomy, the inward protuberance of the external ear, being a ſemicircle within, and almoſt parallel to the helix.

ANTHELMINTICS, among phyſicians, medicines proper to deſtroy worms.

ANTHEM, a church-ſong performed in cathedral-ſervice by choriſters, who ſung alternately. It was uſed to denote both pſalms and hymns, when performed in this manner. But, at preſent, anthem is uſed in a more confined ſenſe, being applied to certain paſſages taken out of the ſcriptures, and adapted to a particular ſolemnity. Anthems were firſt introduced in the reformed ſervice of the Engliſh church, in the beginning of the reign of queen Elizabeth.

ANTHEMIS, CAMOMILE; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The eſſential characters are theſe: The receptaculum is chaffy; there is no pappus; the calyx is hemiſpheric and ſubequal; and the florets of the ray are more than five. Of this genus Linnæus enumerates 17 *ſpecies*; of which the moſt remarkable are, 1. The nobilis, or common camomile, which grows in plenty upon commons, and other waſte land. 2. The pyrethrum, or pellitory of Spain, a perennial plant, which grows naturally in Spain and Portugal, from whence the roots are brought to Britain. 3. The tinctoria, with ſawed winged leaves, a perennial plant, which flowers from June to November, and makes a very pretty appearance, ſome of the flowers being of a white, others of a ſulphur, and ſome of a bright yellow colour. 4. The Arabica, with a branching empalement. The ſeeds of this ſpecies were brought from Africa by the late Dr. Shaw. The firſt ſort may be very eaſily propagated by procuring a few ſlips in the ſpring, and planting them about a foot diſtant from each other, where they will ſoon cover the ground. The other ſorts may be propagated from ſeeds ſown in the ſpring: only the third ſort muſt be tranſplanted from the ſeeds into borders near ſhrubs, where they may have room to grow. The firſt and ſecond ſorts are uſed in medicine. The firſt have a ſtrong, not ungrateful, aromatic ſmell, and a very bitter nauſeous taſte. They are continued in ſome of the formulæ of the colleges of London and Edinburgh, though their virtues are certainly very limited. An eſſential oil of camomile was formerly directed, but is now omitted. A ſimple watery infuſion of them taken in a tepid ſtate, is frequently employed to promote the operation of emetics. The root of the pyrethrum is the only part endowed with medical virtue. Its principal uſe is as a maſticatory, for promoting the ſalival flux, and relieving the tooth-ach.

ANTHERA, among botaniſts, that part of the ſtamen which is fixed on the top of the filamentum, within the corolla. It contains the pollen or fine duſt, which, when mature, it emits for the impregnation of the plant, according to Linnæus. The APEX of Ray, Tournef. & Rivin; *Capſula ſtaminis*, of Malpighi.

ANTHERICUM, SPIDER WORT; a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method, ranking under the 10th order, *Coronariæ*. The characters are theſe: There is no *calyx*. The *corolla* conſiſts of ſix oblong petals, which are expanding. The *ſtamina* conſiſt of ſix ſubulated erect filaments; the antheræ are ſmall and furrowed. The *piſtillum* has a three-cornered germen, a ſimple ſtylus, and obtuſe ſtigma. The *pericarpium* is an ovate triſulcated capſule, with three cells and three valves. The *ſeeds* are numerous and angular. Of this genus Linnæus reckons up nine *ſpecies*; but only three of them deſerve notice. 1. The ramoſum, with a branching ſtalk. 2. The liliago. Theſe are perennial plants, which are natives of Spain, Portugal, and other warm countries. 3. The fruteſcens, with a ſhrubby ſtalk, which was formerly known among the gardeners near London by the name of *onion-leaved aloe*. It produces many ligneous branches from the root, each ſupporting a plant with long taper leaves, in ſhape like thoſe of an onion, and full of a yellow pulp very juicy. Theſe plants multiply greatly. The flowers, produced on long looſe ſpikes, are yellow, and appear at different times. This ſpecies is a native of the Cape of Good Hope. The two firſt ſorts are propagated by ſeeds, which ſhould be ſown in the autumn, in a warm ſituation, on a bed of light ſandy earth. The plants muſt afterwards be tranſplanted into a bed of light earth, at a foot diſtance from each other. The third likewiſe requires ſhelter in winter; though ſome of them will live in the open air.

ANTHESPHORIA, in antiquity, a Sicilian feſtival inſtituted in honour of Proſerpine. It ſeems to be the ſame thing with the *florifertum* of the Latins, and anſwers to the harveſt home among us.

ANTHESTERIA, in antiquity, a feaſt celebrated by the Athenians in honour of Bacchus. The word is from the Greek ἄνθος, *flos*, a flower; it being the cuſtom at this feaſt to offer garlands of flowers to Bacchus.

ANTHESTERION, in ancient chronology, the ſixth month of the Athenian year. It contained 29 days; and anſwered to the latter part of our November and beginning of December. The Macedonians called it *daſion* or *daſion*. It had its name from the feſtival antheſteria kept in it.

ANTHISTIRIA, in botany; a genus of the trigynia order, belonging to the triandria claſs of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are theſe: The *calyx* is a four-valved glume equal cleft to the baſe. The *corolla* is a two-valved glume. The *ſtamina* conſiſt of three ſhort ſlender filaments; the anther

oblong and erect. The *piſtillum* has an oblong germen; the ſtyli are two; and the ſtigmata are clavated and hairy. There is no *pericarpium*, except a cloſed calyx. The *ſeed* is oblong and furrowed. There is only one ſpecies of this graſs, the ciliata or fringed anthiſtiria, a native of India.

ANTHOCEROS, or HORN-FLOWER; a genus of the order of algæ, belonging to the cryptogamia claſs of plants; and, in the natural method, ranking under the 57th order, *Algæ*. The eſſential characters are theſe: The calyx of the *male* is ſeſſile, cylindric, and entire; the antheræ (one) is ſubulated, very long, and two-valved. The calyx of the *female* is monophyllous, divided into ſix parts, and expanding. The ſeeds are about three, naked and roundiſh. There are only three ſpecies of the anthoceros, viz. the punctatus or ſpotted anthoceros, a native of Britain; the lævis, a native of Europe and America; and the multifidus, a native of Germany. It is found in moiſt ſhady places, and on heaths.

ANTHOLOGION, the title of the ſervice book uſed in the Greek church. It is divided into 12 months, containing the offices ſung throughout the year, on the feſtivals of our Saviour, the Virgin, and other remarkable ſaints.

ANTHOLOGY, a diſcourſe of flowers, or of beautiful paſſages from different authors. It is alſo the name given to a collection of epigrams taken from ſeveral Greek poets.

ANTHOLYZA, MAD-FLOWER; a genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 6th order, *Enſatæ*. The eſſential characters are theſe: The calyx is tubular, irregular, and bent back; and the capſule is beneath the flower. The *ſpecies* are, 1. The ringens, whoſe flower-ſlips ſpread aſunder, has red bulbous roots, from which ariſe ſeveral rough-furrowed leaves, near a foot long, and half an inch broad: between theſe the flower-ſtalk riſes two feet high, and has ſeveral red flowers coming out on each ſide. 2. The ſpicata, with narrow-furrowed leaves, is in ſhape and ſize like the vernal crocus, but the outer ſkin is thin and white. They are of a white colour, appear in May, and the ſeeds ripen in Auguſt. Both theſe ſpecies are natives of Africa, from whence their ſeeds were firſt obtained. The antholyza may be propagated by off ſets, which it ſends off in very great plenty; or by ſeeds, which are ſometimes perfected in Europe. Theſe ſhould be ſown ſoon after they are ripe, in pots of light earth, in which they may remain two years, if the plants are not too cloſe, and they will then have acquired ſtrength enough to bear tranſplanting in July or Auguſt, when their leaves are decayed. In ſummer the pots may be placed in the open air, but in winter they muſt be placed under a hot-bed frame; or in the green-houſe, where they are a great ornament when in flower.

ANTHONY, *Knights of St.* a military order, inſtituted by Albert duke of Bavaria, Holland, and Zealand, when he deſigned to make war againſt the Turks in 1382. The knights wore a collar of gold made in form of a hermit's girdle, from which hung a ſtick cut like a crutch, with a little bell, as they are repreſented in St. Anthony's pictures.

St. ANTHONY alſo was the denomination of an order of religious founded in France about the year 1095, to take care of thoſe afflicted with St. Anthony's fire. It is ſaid, that, in ſome places, theſe monks aſſumed to themſelves a power of giving, as well as removing, the *ignis ſacer*, or eryſipelas; a power by which they kept the poor in ſubjection and extorted alms. To avoid their menaces, the country people uſed to preſent them every year with a fat hog a-piece. Some prelates endeavoured to perſuade pope Paul III. to aboliſh the order; but though ſuppreſſed in France, they ſtill ſubſiſt in other parts of Europe.

St. ANTHONY's *Fire*, a name popularly given to the eryſipelas. Apparently it took this denomination from thoſe afflicted with it having made their peculiar application to St. Anthony of Padua for a cure. It is known that anciently particular diſeaſes had their particular ſaints. Thus, in the ophthalmia, perſons had recourſe to St. Lucia; in the toothach, to St. Appollonia; in the hydrophobia, to St. Hubert, &c.

ANTHORA, in botany, the trivial name of a ſpecies of Aconitum. See ACONITUM.

ANTHORISMUS, in rhetoric, denotes a contrary deſcription or definition of a thing from that given by the adverſe party. Thus, if the plaintiff urge, that to take any thing away from another without his knowledge or conſent, is a theft; this is called ὅρος, or definition. If the defendant reply, that to take a thing away from another without his knowledge or conſent, provided it be done with deſign to return it to him again, is not theft; this is an Ἀνθορισμος.

ANTHOSPERMUM, the AMBER TREE; a genus of the diœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The eſſential characters are theſe: The calyx of the hermaphrodite flower is divided into four parts; there is no corolla; the ſtamina are four, and the piſtilli two; the germen is beneath the flower: male and female on the ſame or ſeparate plants. Of this genus Linnæus mentions three ſpecies; the Ethiopeca, ciliari, and herbacea; but the firſt is moſt generally known in the gardens of the curious. Its beauty conſiſts in the ſmall evergreen leaves, which grow as cloſe as heath. Theſe being bruiſed between the fingers, emit a very fragrant odour; whence the name amber-tree. This plant is eaſily propagated by cuttings during any of the ſummer-months, in a border of light earth; where they will take root in ſix weeks, provided they are watered or ſhaded as the ſeaſon may require. They muſt be frequently renewed by cuttings, as the old plants are very ſubject to decay.

ANTHOXANTHUM, or VERNAL GRASS; a genus of the digynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the fourth order, *Gramina*. The eſſential characters are theſe: The calyx is a bivalved gluma, with one flower; the corolla is bivalved, obtuſe, and without any awn. There are three ſpecies; viz. the odoratum, or ſpring-graſs, a native of Britain; the indicum, a native of India; and the paniculatum, a native of the Southern parts of Europe. The odoratum is one of the earlieſt ſpring graſſes, and is extremely common in our fertile paſtures. The delightful ſmell of new-mown hay is chiefly from this plant.

ANTHRACIS, ANTHRACIAS, or ANTHRACITIS, names promiſcuouſly uſed by ancient naturaliſts for very different foſſils; viz the carbuncle, hæmatites, and a kind of aſteria. See CARBUNCLE, &c.

ANTHRACOSIS, in ſurgery, a corroding ulcer either in the globe of the eye or the eye-lids.

ANTHRAX, a Greek term, literally ſignifying a burning coal, uſed by the ancients to denote a gem, as well as a diſeaſe, more generally known by the name of *carbuncle*.

ANTHRAX is a term ſometimes alſo uſed for lithanthrax or pitcoal. See LITHANTHRAX.

ANTHROPOGLOTTUS, among zoologiſts, an appellation given to ſuch animals as have tongues reſembling that of mankind, particularly to the parrot kind.

ANTHROPOGRAPHY, denotes the deſcription of the human body, its parts, ſtructure, &c. See ANATOMY.

ANTHROPOLATRÆ, in church hiſtory, an appellation given to the Neſtorians, becauſe they worſhipped Chriſt, notwithſtanding that they believed him a mere man.

ANTHROPOLATRIA, the paying divine honours to a man; ſuppoſed to be the moſt ancient kind of idolatry.

ANTHROPOLITES, a term denoting petrifactions of parts of the human body, as thoſe of quadrupeds are called *zoolites*.

It has been doubted whether any real human petrifactions ever occur; but the naturaliſts beſt verſed in this branch aſſure us of real anthropolites being ſometimes found. And indeed, as it is univerſally admitted that the zoolites are frequently ſeen, what negative argument can be brought againſt the exiſtence of the other? Are not the component parts of the human body nearly ſimilar to thoſe of the brute creation? Conſequently, correſpondent matter may be ſubject to, and acquire, the like accidental changes, wherever the ſame power or cauſes concur to act upon either object. If the former are not ſo common, it may be accounted for, in ſome meaſure, by reflecting that human bodies are generally depoſited in ſelect and appropriated places; whereas the bones of animals are diſperſed every where, and falling into various beds of earth, at a greater or leſs depth, there is more probability of their encountering the petrifying agent. Could we credit ſome authors who have treated on this ſubject, they will tell us of entire bodies and ſkeletons that were found petrified. Theſe indeed are acknowledged to be very rare. Yet it is a known fact, that detached parts, oſteolithi, are ſometimes found. The human vertebræ, fragments or portions of the tibia, and even the whole cranium itſelf, have been ſeen in an abſolute ſtate of petrifaction. As to the petrified bones of pretended giants, they are more probably real zoolites, the bones of the larger animals, which are found in various ſtates, and under different appearances; ſome being only indurated; others calcined, vitriolated or mineraliſed; ſome, again, ſimply incruſted; whilſt others have been proved completely petrified. A poſitive *luſus naturæ* is indeed frequently miſtaken for a petrification. But they are diſtinguiſhable at all times by the two following rules: Firſt, we may determine that foſſil a *luſus naturæ* which deviates in any material degree from the true *res analogica exiſtens*. Secondly, by a parity of reaſoning, thoſe foſſil ſhells are to be eſteemed certain petrifications, and genuine antediluvian *reliquiæ*, in which, on a compariſon with their *analogues* collected from the ſea, there appears an exact conformity in ſize and figure. This comparative obſervation will hold good for all foſſils that preſent themſelves either under the animal or vegetable form. Nevertheleſs all teſtaceous foſſils are not petrified; ſince ſome kinds of them have been found in beds of ſand, in which they retained their original ſhape and quality, but proved very brittle. Shells of this deſcription are always diſſoluble by acids, in contradiſtinction to the petrified or calcareous foſſil ſhells, which reſiſt the action of ſuch *menſtrua*. See PETRIFACTION.

ATHROPOLOGY, a diſcourſe upon human nature.

ANTHROPOLOGY, among divines, denotes that manner of expreſſion by which the inſpired writers attribute human parts and paſſions to God.

ANTHROPOMANCY, a ſpecies of divination, performed by inſpecting the entrails of a human creature.

ANTHROPOMORPHA, a term formerly given to the primates of that claſs of animals which have the greateſt reſemblance to the human kind.

ANTHROPOMORPHISM, among eccleſiaſtical writers, denotes the hereſy or error of the Anthropomorphites.

ANTHROPOMORPHITES, in church-hiſtory, a ſect of ancient heretics, who, taking every thing ſpoken of God in Scripture in a literal ſenſe, particularly that paſſage of Geneſis in which it is ſaid, *God made man after his own image*, maintained that God had a human ſhape. They are likewiſe called *Audeans*, from Audeus their leader.

ANTHROPOMORPHOUS, ſomething that bears the figure or reſemblance of a man. Naturaliſts give inſtances of anthropomorphous plants, anthropomorphous minerals, &c. Theſe generally come under the claſs of *luſus naturæ*.

ANTHROPOPATHY, the figure or expreſſion by which ſome paſſion is aſcribed to God, which belongs only to man.

ANTHROPOPHAGI, from ανθρωπος a *man*, and φαγω to *eat*, MEN-EATERS. That there have been, in almoſt all ages of the world, nations who have followed this barbarous practice, we have abundance of teſtimonies. The Cyclops, the Leſtrygons, and Scylla, are all repreſented in Homer as *anthropophagi*, or men-eaters. According to Herodotus, among the Eſſedonian Scythians, when a man's father died, the neighbours brought ſeveral beaſts which they killed, mixed up their fleſh with that of the deceaſed, and made a feaſt. Among the Maſſagetæ, when any perſon grew old, they killed him and eat his fleſh; but if he died of ſickneſs, they buried him, eſteeming him unhappy. The ſame author alſo aſſures us that ſeveral nations in the Indies killed all their old people and their ſick, to feed on their fleſh: he adds, that perſons in health were ſometimes accuſed of being ſick, to afford a pretence for devouring them. According to Sextus Empiricus, the firſt laws that were made, were for the prevention of this barbarous practice, which the Greek writers repreſent as univerſal before the time of Orpheus.

Of the practice of anthropophagy in later times, we have the teſtimonies of all the Romiſh miſſionaries who have viſited the internal parts of Africa, and even ſome parts of Aſia. Dr. Hawkeſworth's Account of the Voyages to the South Seas renders it pretty certain, that the inhabitants of the iſland of New Zealand, a country unfurniſhed with the neceſſaries of life, eat the bodies of their enemies. It appears alſo to be very probable, that both the wars and anthropophagy of theſe ſavages take their riſe and owe their continuance to irreſiſtible neceſſity, and the dreadful alternative of deſtroying each other by violence, or of periſhing by hunger. Mr. Marſden informs us, that this horrible cuſtom is alſo practiſed by the Battas, a people in the iſland of Sumatra, who do not eat human fleſh to ſatisfy the cravings of nature nor owing to a deficiency of other food, but as a ſpecies of ceremony; as a mode of ſhowing their deteſtation of crimes by an ignominious puniſhment; and as a horrid indication of revenge and inſult to their unfortunate enemies. Many ſtrange and improbable ſtories however have been related on this ſubject, which it would be loſing time to notice at any length.

ANTHROPOPHAGIA, the act or habit of eating human fleſh. This is pretended by ſome to be the effect of a diſeaſe, which prompts people affected with it to reliſh every thing alike. Some chooſe only to conſider it as a ſpecies of PICA. The annals of Milan furniſh an extraordinary inſtance of anthropophagy in a Milaneſe woman, who had an invincible inclination to human fleſh, which ſhe gratified by enticing children into her houſe, where ſhe killed and ſalted them. A diſcovery of this having been made, ſhe was broken on the wheel and burnt in 1519.

ANTHROPOSCOPIA, from ανθρωπος, and σκοπιω *I conſider*, the art of judging or diſcovering a man's character, diſpoſition, paſſions, and inclinations, from the lineaments of his body. In which ſenſe, anthropoſcopia ſeems of ſomewhat greater extent than phyſiognomy or metopoſcopy. Otto has publiſhed an Anthropoſcopia, *ſive judicium hominis de homine e lineamentis externis*.

ANTHROPOTHYSIA, the inhuman practice of offering human ſacrifices. See SACRIFICE.

ANTHUS, in ornithology, a ſynonime of a ſpecies of loxia. See LOXIA.

ANTHYLLIS, Kidney-vetch, or *Lady's finger*; a genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The essential characters are: The calyx is ventricose, and the legumen roundish and covered. Linnæus enumerates nine species; of which the following seem to be most worthy of attention. 1. The vulneraria, with unequal winged leaves, a native of Spain and Portugal, and likewise of Wales. It is a biennial plant, having single leaves at bottom, but those which grow out of the stalks are winged. The flowers collect into heads at the top of the stalks, and are of a bright scarlet colour. It flowers in June and July. 2. The montana, or herbaceous woundwort, with winged leaves, grows naturally on the mountains in the South of France, and in Italy. 3. The barba jovis, or silver-bush, which has its name from the whiteness of its leaves, and grows to the height of ten or twelve feet, dividing into many lateral branches. 4. The cytisoides, or shrubby woundwort; long known in the English gardens. The first and second sorts require no particular management further than being kept free from weeds. The third and fourth may be propagated by cuttings planted during any of the summer months; observing to shade and water them till they have taken good root; when they are to be transplanted into pots, and must always be housed in winter.

ANTHYPOPHORA, in rhetoric, a figure of speech; being the counter part of an hypophora. See Hypophora.

ANTI, a Greek preposition, which enters into the composition of several Latin, French, and English words, in different senses. Sometimes it signifies *before*, as anti-chamber; and sometimes *opposite* or *contrary*, as in the medical names, anti-scorbutic, anti-venereal, &c.

Anti, in matters of literature, is a title given to divers pieces written by way of answer to others, whose names are usually annexed to the anti. See the *Anti* of M. Baillet; and the *Anti-Baillet* of M. Menage: there are also *Anti-Menagiani*, &c. Cæsar the dictator wrote two books by way of answer to what had been objected to him by Cato, which he called *Anti-Catones*.

ANTIBACCHIUS, in ancient poetry, a foot consisting of three syllables, the two first long, and the last short; such is the word āmbīrĕ.

ANTIBES, a sea-port town in the department of Var, and late province of Provence in France. It is opposite to Nice, in the Mediterranean. E. long. 7. 13. N. lat. 43. 35.

ANTICHAMBER, an outer chamber for strangers to wait in, till the person to be spoken with is at leisure.

ANTICHORUS, in botany, a genus of the monogynia order, belonging to the octandria class of plants, whose essential characters are these: The calyx is a four-leaved perianthium. The corolla consists of 4 expanding petals. The pericarpium is a capsule, above, subulated, with 4 cells and 4 valves. The seeds are very numerous. There is but one species, the depressus, a native of Arabia.

ANTICHRIST, among ecclesiastical writers, denotes a great adversary of Christianity, who is to appear upon the earth towards the end of the world. We have demonstrations, disputations, and proofs, in great order and number, both that the pope is, and that he is not, Antichrist. F. Calmet is very large in describing the father and mother of Antichrist, his tribe and pedigree, his wars and conquests, his achievements against Gog, Magog, &c. Some place his capital at Constantinople, others at Jerusalem, others at Moscow, and some few at London; but the generality at Rome, though these last are divided. Grotius and some others suppose Rome Pagan to have been the seat of Antichrist: most of the Lutheran and reformed doctors contend earnestly for Rome Christian under the papal hierarchy. In fact, the point having been maturely debated at the council of Gap, held in 1603, a resolution was taken thereupon, to insert an artiele in the confession of faith, whereby the pope is formally declared to be Antichrist.—Pope Clement VIII. was stung to the quick with this decision; and even king Henry IV. of France was not a little mortified, to be thus declared, as he said, an imp of Antichrist.

Upon the whole, the Antichrist mentioned by the apostle John, 1 Eph. ii. 18. and more particularly described in the book of Revelation, seems evidently to be the same with the *Man of Sin*, &c. characterised by St. Paul in his second Epistle to the Thessalonians, ch. ii. And the entire description literally applies to the excesses of papal power. Had the right of private judgment, says an excellent writer, been always adopted and maintained, Antichrist could never have been; and when the sacred right comes to be universally asserted, and men follow the voice of their own reason and consciences, Antichrist can be no more.

ANTICHRISTIANISM, a state or quality in persons or principles, which denominates them antichristian, or opposite to the kingdom of Christ.

ANTICHRISTIANS, properly denote the followers or worshippers of Antichrist. But the term is more particularly understood of those who set up or believe a false Christ, or Messiah.

ANTICHTHONES, in ancient geography, an appellation given to the inhabitants of opposite hemispheres.

ANTICOR, or Anticoeur, among farriers, an inflammation in a horse's throat, being the same with the quinsey.

ANTICOSTE, a barren island lying in the mouth of the river St. Laurence, in North America. W. long. 64. 16. N. lat. from 49. to 53.

ANTIDESMA, in botany, a genus of the dicœcia order, belonging to the pentandria class of plants. The *calyx* of the male is five-leaved; there is no corolla; the *antheræ* are bifid. The female *calyx* is five-leaved; the corolla is wanting; the *stigmata* are five. The *berry* is cylindric and one-seeded. There is but one species, the alexiteria, a native of India.

ANTIDICOMARIANITES, ancient heretics, who pretended that the holy virgin did not preserve a perpetual virginity, but that she had several children by Joseph after our Saviour's birth.—Their opinion was grounded on some expressions of our Saviour, wherein he mentions his brothers and his sisters; and of St. Matthew, where he says, that Joseph knew not Mary till she had brought forth her first-born son. The Antidicomarianites were the disciples of Helvidius and Jovinian, who appeared in Rome toward the close of the fourth century.

ANTIDORON, in ecclesiastical writers, a name given by the Greeks to the consecrated bread out of which the middle part, marked with the cross, wherein the consecration resides, being taken away by the priest, the remainder is distributed after mass to the poor.

ANTIDOSIS, in antiquity, denotes an exchange of estates, practised by the Greeks on certain occasions with peculiar ceremonies, and first instituted by Solon.—When a person was nominated to an office, the expence of which he was not able to support, he had recourse to the antidosis; that is, he was to seek some other citizen of better substance than himself, who was free from this, and other offices; in which case the former was excused. In case the person thus substituted denied himself to be richest, they were to exchange estates, after this manner: the doors of their houses were close shut up and sealed, that nothing might be conveyed away; then both took an oath to make a faithful discovery of all their effects, and within three days an exchange of estates took place.

ANTIDOTE, among phyſicians, a remedy taken to prevent, or to cure, the effects of poiſon, &c.

ANTIENT. See ANCIENT.

ANTIGONUS, one of Alexander's commanders, to whom Aſia fell, and who was ſlain near Epirus, 301 years before Chriſt.

ANTIGRAPHUS, in antiquity, an officer of Athens, who kept a counterpart of the apodecti, or chief treaſurer's accounts, to correct miſtakes, and prevent them from being falſified.

ANTIGRAPHUS is alſo uſed, in middle-age writers, for a ſecretary or chancellor. He is thus called, according to the old gloſſariſts, on account of his writing anſwers to the letters ſent to his maſter. The antigraphus is ſometimes alſo called *archigraphus*; and his dignity *antigraphia*, or *archigraphia*.

ANTIGRAPHUS is alſo uſed in Iſidorus for one of the notes of ſentences which is placed with a dot to denote a diverſity of ſenſe in tranſlations.

ANTIGRAPHUS is alſo applied in eccleſiaſtical writers to an abbreviator of the papal letters; in which ſenſe the word is uſed by pope Gregory the Great in his regiſter. Of late days the office of antigraphus conſiſts in making minutes of bulls from the petitions agreed to by his holineſs, and renewing the bulls after engroſſing.

ANTIGUA, one of the Antilles or Caribbee iſlands, ſituated 20 leagues eaſt of St. Chriſtophers, in W. long. 62. 5. and N. lat. 17. 30. It is about 50 miles in circumference, and is reckoned the largeſt of all the Britiſh leeward iſlands.

ANTIGUGLER, a tube of metal, ſo bent as eaſily to be introduced into the neck of a bottle, with a view of decanting liquors, without diſturbing them. For this purpoſe the bottle ſhould be a little inclined, and about half a ſpoonful of the liquor poured out, ſo as to admit an equal quantity of air. One end of the bent tube muſt then be ſtopped with the finger, whilſt the other is thruſt into the body of the liquor near to the bubble of air already admitted. When the finger is taken off, the bottle will have vent, and the liquor will run out ſteadily and undiſturbed.

ANTIHECTICS, in pharmacy, medicines good in hectic fevers. The *Antihecticum Poterii* was a medicine formerly much celebrated.

ANTILLES, the French name for the CARIBBEE iſlands.

ANTILOGARITHM, the complement of the logarithm of a ſine, tangent, or ſecant; or the difference of that logarithm from the logarithm of 90 degrees.

ANTILOGY, in matters of literature, an inconſiſtency between two or more paſſages of the ſame book.

ANTILOPE. See CAPRA.

ANTIMENSIUM, a kind of conſecrated table-cloth, occaſionally uſed in the Greek church, in places where there is no proper altar. It anſwers to the *altare portabile*, or portable altar in the Latin church. They are both of late invention, though Habertus would have them as old as St. Baſil.

ANTIMENSIA is alſo applied to other tables, uſed in offices of religion, beſides thoſe whereon the euchariſt is adminiſtered: ſuch, *e. g.* are thoſe whereon the hoſt is expoſed, &c. The origin of the antimenſia is deſcribed by Meurſius: when the biſhop had conſecrated a church, the cloth which had been ſpread on the ground and over the communion table, was torn in pieces, and diſtributed among the prieſts, who carried each a fragment away, to ſerve to cover the tables in their churches and chapels. Not that it was neceſſary that ſuch cloths ſhould be laid on all tables; but only on thoſe which either were not conſecrated, or at leaſt whoſe conſecration was doubted of.

ANTIMERIA, in grammar, a figure whereby one part of ſpeech is uſed for another: e. g. *velle ſuum cuique eſt*, for *voluntas ſua cuique eſt*; alſo, *populus late rex*, for *populus late regnans*.

ANTIMERIA, in a more reſtrained ſenſe, is a figure where the noun is repeated inſtead of the pronoun. The antimeria is frequent in the Hebrew, and is ſometimes retained in our verſion of the Old Teſtament: e. g. *Hear myvoice, ye wives of Lamech*, for *my wives*, Gen. iv. 23.

ANTIMETABOLE, in rhetoric, a figure which ſets two things in oppoſition to each other. The word is compounded of ανθι *againſt*, and μεταβολη, from μεταβαλλω I *ſhift* or *transfer*, *i. e.* a ſhifting, or ſetting two things over-againſt each other. This figure is twice exemplified in an apophthegm of Muſonius; which, on account of its excellence, is called *aureum monitum*, the golden maxim or precept.

Αν τι πραξης καλον μετα πονου, ο μεν πονος οιχεται, το δε καλον μενει. Αν τι ποιησης αισχρον μετα ηδονης, το μεν ηδυ οιχεται, το δε αισχρον μενει.

In Engliſh thus:

"Allowing the performance of an honourable action to be attended with labour; the labour is ſoon over, but the honour immortal: whereas, ſhould even pleaſure wait on the commiſſion of what is diſhonourable, the pleaſure is ſoon gone, but the diſhonour eternal."

ANTIMETATHESIS, in rhetoric, is the inverſion of the parts or members of an Antitheſis. Such is that of Cicero, in Verrem, lib. iv. cap. 52. "Compare this peace with that war; the arrival of this governor with the victory of that general; his profligate troops with the invincible army of the other; the luxury of the former with the temperance of the latter: you will ſay, that Syracuſe was founded by him who took it; and taken by him, who held it when founded."

ANTIMONARCHICAL, an appellation given to whatever oppoſes monarchical government.

ANTIMONIALS, in medicine, preparations of antimony. See PHARMACY.

ANTIMONY, a blackiſh mineral ſubſtance, full of long ſhining, needle-like ſtriæ, hard, brittle, and conſiderably heavy. It is found in different parts of Europe, as Bohemia, Saxony, Tranſylvania, Hungary, France, and England; commonly in mines by itſelf, intermixed with earth and ſtony matters. Sometimes it is blended with the richer ores of ſilver, and renders the extraction of that metal difficult by volatilizing a part of the ſilver; or, in the language of the miners, *robbing the ore*. See METALLURGY.

Antimony is the *ſtibium* of the ancients; by the Greeks called στιμμι. The reaſon of its modern denomination, *antimony*, is uſually referred to Baſil Valentine a German monk, who, as the tradition relates, having thrown ſome of it to the hogs, obſerved, that, after purging them violently, they immediately grew fat upon it. This made him think, that, by giving his fellow-monks a like doſe, they would be the better for it. The experiment, however, ſucceeded ſo ill, that they all died of it; and the medicine thenceforward was called *antimony*, q. d. *anti-monk*.

The modern uſes of antimony are very numerous and important. It is a common ingredient in ſpecula or burning concaves, ſerving to give the compoſition a finer texture. It makes a part in bell metal, and renders the ſound more clear. It is mingled with tin, to make it more hard, white, and ſounding; and with lead, in the caſting of printers' types, to render them more ſmooth and hard. It is alſo a general help in the melting of metals, and eſpecially in the caſting of cannon balls. It is likewiſe made uſe of for purifying and heightening the colour of gold.

For a long time this mineral was eſteemed poiſonous. In 1566, its uſe was prohibited in France by an edict of parliament; and in 1609, one Beſnier was expelled the faculty for having given it. The edict was repealed in 1650; antimony having a few years before been received into the number of purgatives. In 1668, a new edict came forth, forbidding its uſe by any but doctors of the faculty, but it is now univerſally allowed, that antimony in its crude ſtate has no noxious quality; and that though many of its preparations are moſt violently emetic and cathartic, yet by different combinations antimony becomes mild in its operation, and conſtitutes a moſt valuable medicine. See CHEMISTRY, PHARMACY, and MEDICINE.

The virtues of antimony in the diſeaſes of the horſe and other animals are juſtly extolled. The virtues of this drug in fattening cattle have been thought imaginary, but experiment proves it to be a real truth. A horſe that is lean and ſcabby, and not to be fatted by any other means, will become fat on taking a doſe of antimony every morning for about two months. If to a boar fed for brawn an ounce of antimony be given every morning, he will become fat a fortnight ſooner than others put into the ſtye at the ſame time, and fed in the ſame manner, but without the antimony.

ANTINOE. See ENFINE'.

ANTINOEIA, in antiquity, annual ſacrifices, and quinquennial games, in memory of Antinous the Bithynian. They were inſtituted at the command of Adrian the Roman emperor, at Mantinea in Arcadia, where Antinous was honoured with a temple and divine worſhip.

ANTINOMIANS, in eccleſiaſtical hiſtory, certain heretics who maintain the law of no uſe or obligation under the goſpel-diſpenſation, or who hold doctrines that clearly ſuperſede the neceſſity of good works and a virtuous life. The Antinomians took their origin from John Agricola about the year 1538; who taught, that the law is no way neceſſary under the goſpel; that good works do not promote our ſalvation, nor ill ones hinder it; that repentance is not to be preached from the decalogue, but only from the goſpel. This ſect ſprung up in England during the protectorate of Oliver Cromwell.

ANTIOCH, a city of Syria in Aſia, ſituated on the river Orontes, in E. long. 37. 5. N. lat. 36. 20. It was built by Seleucus Nicator, founder of the Syro-Macedonian empire, who made it his capital.

ANTIOCHETTA, a town of Turkey in Aſia, in Carimania. E. long. 32. 15. N. lat. 36. 42.

ANTIOCHIAN SECT or *Academy*, a name given to the fifth academy, or branch of academies. It took the denomination from its being founded by Antiochus, a philoſopher contemporary with Cicero. The Antiochian academy ſucceeded the Philonian. As to point of doctrine, the philoſophers of this ſect appear to have reſtored that of the ancient academy, except that in the article of the criterion of truth. Antiochus was really a ſtoic, and only nominally an academic.

ANTIOCHIAN *Epocha*, a method of computing time from the proclamation of liberty granted the city of Antioch about the time of the battle of Pharſalia.

ANTIOCHUS, the name of ſeveral kings of SYRIA; alſo the name of a celebrated philoſopher, the diſciple of Philo of Lariſſa, the maſter of Cicero, and the friend of Lucullus and Brutus. He was founder of a fifth academy; but, inſtead of attacking other ſects, he ſet himſelf down to reconcile them together, particularly the ſect of the ſtoics with that of the ancient academy.

ANTIOPE, in fabulous hiſtory, the wife of Lycus, king of Thebes, who, being deflowred by Jupiter in the form of a ſatyr, brought forth Amphion and Zethus.

ANTIPÆDOBAPTISTS, from *αντι againſt*, *παις*, *παιδος*, *child*, and *βαπτιζω baptize*, whence *βαπτισης*, is a diſtinguiſhing denomination given to thoſe who object to the baptiſm of infants; becauſe they ſay infants are incapable of being inſtructed, and of making that profeſſion of faith which intitles them to this ordinance and an admiſſion into church communion. See ANABAPTISTS and BAPTISTS.

ANTIPAROS, an iſland in the Archipelago, oppoſite to Paros, from whence it is ſeparated by a ſtrait about ſeven miles over. It is the ancient *Oleäros* or *Oliaros*.

ANTIPATHES, among the ancient naturaliſts, was uſed to diſtinguiſh any ſtone or gem which, according to their ſuperſtitious ideas of the virtues of gems at that time, was ſuppoſed to have a power of reſiſting the force of enchantments.

ANTIPATHES, a ſpecies of the *gorgonia*, in the order of *zoophytes*.

ANTIPATHY, a natural enmity or averſion of one body to another; in which ſenſe the word ſtands oppoſed to SYMPATHY. The term is compounded of *αντι contra*, *againſt*, and *παθος paſſion*. Such an averſion is commonly ſaid to exiſt between the ſalamander and the tortoiſe, the vine and the elm, the toad and the weaſel, the ſheep and the wolf, the olive and the oak, &c. (Phil. Tranſ. No. cccxxxix.) The peripatetics account for *antipathies*, from certain occult qualities inherent in bodies; whilſt ſome think, that the term *antipathy* can only be applied to any certain purpoſe, when uſed with the reſtriction of modern philoſophers; among whom it ſignifies no more than a *vis centrifuga*, or repelling power. A large proportion of the inſtances of *antipathies* are, perhaps, no better than fables, and a ſevere examination would leave them no other footing than vulgar errors.

ANTIPATHY is ſometimes alſo uſed in a *moral* ſenſe, to denote a conteſt between the mind and the body, or between reaſon and inclination.

ANTIPATHY is uſed in *Painting*, for an oppoſition between the qualities of colours. This *antipathy* is chiefly obſerved between colours, which endeavour, as it were, to predominate over each other, and which by their mixture deſtroy each other, e. g. *ultramarine* and *vermilion*. This does not obtain in the *claro obſcuro*; for, though there be nothing more oppoſite to each other than black and white, as the one repreſents light and the other darkneſs; yet they each preſerve themſelves in the mixture, and form together a grey, which partakes of both.

ANTIPELARGIA, among the ancients, a law, whereby children were obliged to furniſh neceſſaries to their aged parents. The ciconia, or ſtork, is a bird famous for the care it takes of its parents when grown old. Hence in ſome Latin writers, this is rendered *lex ciconiaria*, or the ſtork's law.

ANTIPHONARY, ANTIPHONARIUM, a ſervice-book, which contained all the invitatories, reſponſories, collects, and whatever elſe was ſung or ſaid in the choir, except the leſſons. This is otherwiſe called *reſponſorium*, from the reſponſes therein contained. The author of the Roman *antiphonary* was pope Gregory the Great. The uſe of theſe and many other popiſh books was forbidden by the 3d and 4th of Edward VI. c. 10.

ANTIPHONY, the anſwer made by one choir to another, when the pſalm or anthem is ſung between two. It alſo ſometimes denotes a ſpecies of pſalmody, wherein the congregation, being divided into two parts, repeat the pſalms, verſe for verſe, alternately. In this ſenſe antiphony ſtands contradiſtinguiſhed from ſymphony, where the whole congregation ſing together. Antiphony differs from reſponſorium, becauſe in this latter, the verſe is only ſpoken by one perſon, whereas in the former, the verſes are ſung by the two choirs alternately.

Antiphony is alſo uſed to denote the words given out at the beginning of the pſalm, to which both the choirs are to accommodate their ſinging.

Antiphony, in a more modern ſenſe, denotes a kind of compoſition made of ſeveral verſes extracted out of different pſalms, adapted to expreſs the myſtery ſolemnized on the occaſion.

ANTIPODES, in geography, a name given to thoſe inhabitants of the globe that live diametrically oppoſite to each other. The word is compounded of *αντι oppoſite*, and *πους a foot*; becauſe their feet are oppoſite to each other.—The antipodes lie under oppoſite meridians and oppoſite parallels; in the ſame degree of latitude, but of oppoſite denominations, one being north and the other ſouth. They have nearly the ſame degree of heat and cold, days and nights of equal length, but in oppoſite ſeaſons. It is noon to one when midnight to the other; and the longeſt day with the one is the ſhorteſt with the other.—The ancients could not conceive how men and trees ſhould ſubſiſt ſuſpended in the air with their feet upwards. They never reflected that theſe terms *upwards* and *downwards* are merely relative; and ſignify only nearer to, or farther from, the common centre to which all heavy bodies gravitate; and that, therefore, our antipodes have not their feet upwards and head downwards any more than ourſelves; becauſe they, like us, have their feet nearer the centre of the earth, and their heads farther from it.

ANTIQUARE, among Roman lawyers, properly denotes the rejecting of a new law, or refuſing to paſs it; in which ſenſe, *antiquating* differs from *abrogating*.

Antiquare is alſo uſed for a law's growing obſolete, or into diſuſe, either by age or non-obſervance.

Antiquarii, a name given to copiers of old books. After the decline of learning amongſt the Romans, and when many religious houſes were erected, learning was chiefly in the hands of the clergy; the greateſt number of whom were regulars, and lived in monaſteries. In theſe houſes were many induſtrious men who were continually employed in making new copies of old books, either for the uſe of the monaſtery, or for their own emolument. Theſe writing monks were diſtinguiſhed by the name of *Antiquarii*. They deprived the poor librarii, or common ſcriptores, of great part of their buſineſs, ſo that theſe found it difficult to gain a ſubſiſtence for themſelves and families. This put them upon finding out more expeditious methods of tranſcribing books. They formed the letters ſmaller, and made uſe of more jugations and abbreviations than had been uſual. They proceeded in this manner till the letters became exceedingly ſmall; the abbreviations were very numerous, and extremely difficult to be read. This in ſome meaſure accounts for the great variety of hands in the ſpecies of writing called *Modern Gothic*. When a number of copies were to be made of the ſame work, it was uſual to employ ſeveral perſons at the ſame time in writing it; each perſon, except him who wrote the firſt ſkin, began where his fellow was to leave off.

ANTIQUARY, a perſon who ſtudies and ſearches after monuments and remains of antiquity; as old medals, books, ſtatues, ſculptures, and inſcriptions; and, in general, all curious pieces that may afford any view into antiquity. In the chief cities of Greece and Italy, there were perſons of diſtinction called *antiquaries*, whoſe buſineſs it was to ſhow ſtrangers the antiquities of the place, and explain the ancient inſcriptions. Pauſanias calls theſe antiquaries Εξηγηται. The Sicilians call them *myſtogogi*. There was an ancient college of antiquaries erected in Ireland by Ollam Fodhla, 700 years before Chriſt, for compoſing a hiſtory of that country; and to this, ſay the Iriſh hiſtorians, it is owing, that the hiſtory and antiquities of that kingdom may be traced back beyond thoſe of moſt other nations. There is a ſociety of antiquaries in London, and another in Edinburgh, incorporated by the king's charter.

Antiquary is alſo uſed by ancient writers for the keeper of the antiquarium, or cabinet of antiquities. This officer is otherwiſe called *archæota*, or antiquary of a king, a prince, a ſtate, or the like.

Henry VIII. gave John Leland the title of his *antiquary*; a title which, under a king of England, nobody ever enjoyed beſides himſelf. The kings of Sweden have been at great expence in order to illuſtrate the antiquity of their country, having eſtabliſhed an academy of antiquaries with this ſingle view.—The office of the ancient Iriſh antiquaries was to preſerve the genealogies of the kings of Ireland, to correct the regal tables of ſucceſſion, and deliver down the pedigrees of every branch of the royal family.

ANTIQUE, a term uſed by ſculptors, painters, and architects, to denote ſuch pieces of their different arts as were executed by the ancient Greeks and Romans. Thus we ſay, an antique buſt, an antique ſtatue, &c.

Antique is ſometimes contradiſtinguiſhed from *ancient*; which ſignifies a leſs degree of antiquity. Thus, antique architecture is frequently diſtinguiſhed from ancient architecture.

ANTIQUITIES, a term implying all teſtimonies, or authentic accounts, that have come down to us of ancient nations. Bacon calls antiquities *the wrecks of hiſtory*, or ſuch particulars as induſtrious and learned perſons have collected from genealogies, inſcriptions, monuments, coins, names, etymologies, archives, inſtruments, fragments of hiſtory, &c.—*Antiquities* form a very extenſive ſcience, including "an hiſtorical knowledge of the edifices, magiſtrates, offices, habiliments, manners, cuſtoms, ceremonies, worſhip, and other objects worthy of curioſity, of all the principal ancient nations of the earth." This ſcience is not a matter of mere curioſity, but is indiſpenſable to the theologian; who ought to be thoroughly acquainted with the antiquities of the Jews, to enable him properly to explain numberleſs paſſages in the Old and New Teſtaments: to the lawyer; who, without the knowledge of the antiquities of Greece and Rome, can never well underſtand and properly apply the greateſt part of the Roman laws: to the phyſician and the philoſopher, that they may have a complete knowledge of the hiſtory and principles of the phyſic and philoſophy of the ancients: to the critic, that he may be able to underſtand and interpret ancient authors: to the orator and poet, who will be thereby enabled to ornament their writings with numberleſs images, alluſions, compariſons, &c.

Antiquities are divided into ſacred and profane, into public and private, univerſal and particular, &c. It is true, that the antiquaries (eſpecially ſuch as are infected with a ſpirit of pedantry, and the number of theſe is great) frequently carry their inquiries too far, and employ themſelves in laborious reſearches after learned trifles; but the abuſe of a ſcience ought never to make us neglect the applying it to rational and uſeful purpoſes. Many antiquaries alſo reſtrain their learned labours to the eclairciſſement of the antiquities of Greece and Rome; but this field is far too confined, and by no means contains the whole of this ſcience, ſeeing it properly includes the antiquities of the Jews, Egyptians, Perſians, Phœnicians, Carthaginians, Hetruſcans, Germans, and, in general, all thoſe principal nations mentioned in ancient hiſtory; ſo far as any accounts of them are come down to us.

If to the general ſubjects above mentioned we add the particular ſtudy of antiques, of the ſtatues, bas-reliefs, and the precious relics of architecture, painting, medals, &c. it is eaſy to conceive that antiquities form a ſcience very extenſive and very com-

plicated, and with which only a very ſmall acquaintance could have been attainable by any one man, if our predeceſſors had not prepared the way for us; if they had not left us ſuch inеſtimable works as thoſe of Gronovius, Grævius, Montfaucon, Count Caylus, Winekelman, the Hebraic Antiquities of D. Iken of Bremen, the Grecian Antiquities of Brunings, the Roman Antiquities of Nieupoort, and eſpecially that work which is intitled *Bibliographia Antiquaria Joh. Alberti Fabricii*, profeſſor at Hamburgh; &c. &c. Nor muſt we here forget that very valuable work, with which our countryman Mr. Robert Wood has alſo enriched this ſcience, and which is ſo well known, and ſo juſtly eſteemed by all true connoiſſeurs, under the title of the *Ruins of Palmyra*, and thoſe of *Balbec*. It is by this work that we are fully convinced of the grandeur and magnificence, the taſte and elegance, of the buildings of the ancients. We here ſee that the invention of theſe matters is not all owing to the Greeks, but that there were other nations who ſerved them as models. For though many of the edifices of Palmyra are to be attributed to the emperor Aurelian, and to Odenatus and his wife Zenobia, who reigned there about the year 264, yet there are found at the ſame place ruins of buildings that appear to be of far greater antiquity, and that are not leſs beautiful. The ancient Perſepolis is ſufficient to prove this aſſertion. When we duly reflect on all theſe matters, and eſpecially if we attempt to acquire any knowledge of this ſcience, we ſhall ſoon be convinced that it but ill becomes a petit-maitre to laugh at a learned antiquary.

ANTIQUITY, ſignifies times or ages paſt long ago. Thus, we ſay, the heroes of antiquity, &c.

ANTIQUITY is alſo uſed to denote the works or monuments of antiquity. See ANTIQUITIES.

ANTIQUITY likewiſe expreſſes the great age of a thing; and in this ſenſe we ſay, the antiquity of a family, the antiquity of a kingdom.

ANTIRRHINUM, SNAP-DRAGON, or CALVES-SNOUT; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The eſſential characters are theſe: The calyx conſiſts of five leaves; the baſis of the corolla is bent backwards, and furniſhed with nectaria; the capſule is bilocular. There are fourteen ſpecies of the antirrhinum, ten of which are natives of Britain; viz. the cymbalaria, or ivy-leaved toad-graſs; the elatine, or ſharp-pointed fluellin; the ſpurium, or round-leaved fluellin; the arvenſe, or corn-blue toad-flax; the repens, or creeping toad-flax; the monoſpermum, or ſweet-ſmelling toad-flax; the linaria, or common yellow toad-flax; the minus, or leaſt toad-flax; the majus, or greater ſnap-dragon; and the orontium, or leaſt ſnap-dragon. The linaria is ſaid to be cathartic and diuretic; but it is not uſed in medicine.

ANTISABBATARIANS, a modern religious ſect, who oppoſe the obſervance of the Chriſtian Sabbath. The great principle of the Antiſabbatarians is, that the Jewiſh ſabbath was only of ceremonial, not moral obligation; and conſequently is aboliſhed by the coming of Chriſt.

ANTISAGOGE, in rhetoric, a figure differing little from that called *conceſſion*. The following paſſage from Cicero is an inſtance of it: *Difficilis ratio belli gerendi; at plena fidei, plena pietatis: et ſi dicas, magnus labor, multa pericula proponuntur; at gloria ex his immortalis eſt conſecutura.* See CONCESSION.

ANTISCII, in geography, people who live on different ſides of the Equator, whoſe ſhadows at noon are projected oppoſite ways. Thus the people of the north are Antiſcii to thoſe of the ſouth; the one projecting their ſhadows at noon toward the north pole, and the other toward the ſouth pole.

ANTISCORBUTICS, medicines good in ſcorbutic caſes.

ANTISEPTICS, from αντι and σηπτος *putrid*, an appellation given to ſuch ſubſtances as reſiſt putrefaction. The late Sir John Pringle has taken ſome pains to aſcertain the particular virtues of remedies of this claſs. After a ſeries of experiments by which he was enabled to decide on the comparative properties of different ſalts, he proceeded to an examination of various other ſubſtances, to which are uſually attributed ſtill more conſiderable powers. Myrrh, afafætida, terra japonica, and aloes, he found at leaſt 12 times more antiſeptic than ſea-ſalt. Two grains of camphor were equivalent to 60 grains of that ſalt. An infuſion of a few grains of Virginian ſnake-root, in powder, exceeded 12 times its weight of ſea-ſalt. Camomile flowers have nearly the ſame extraordinary quality. The jeſuits bark has it alſo. Beſides theſe, pepper, ginger, ſaffron, contrayerva-root, are 12 times more antiſeptic than ſea-ſalt. Dried ſage, rhubarb, the root of the wild valerian, mint, angelica, ground-ivy, ſenna, green-tea, red roſes, wormwood, muſtard, and horſe-radiſh, were likewiſe found to be conſiderably antiſeptic. To this claſs may likewiſe be added, fermented liquors, acids, ſpirits, and even ſome plants, thought to be haſteners of putrefaction. Vegetables poſſeſſing this virtue are the more valuable, ſince they may be taken in much greater quantities than either ſpirits, acids, reſins, or even the neutral ſalts.

ANTISPASMODICS, are medicines proper for the cure of ſpaſms and convulſions. Opium, muſk, afafætida, ether, camphor, hemlock, tobacco, balſam of Peru, and the eſſential oils of many vegetables, are the principal in this claſs of medicines; but opium excels, for its immediate effects, every other remedy of this claſs.

ANTISTASIS, in oratory, a defence of an action from the conſideration that had it been omitted worſe would have enſued. This is called by Latin writers *comparativum argumentum*; ſuch, *e. g.* would be the general's defence who had made an inglorious capitulation, That, without it, the whole army muſt have periſhed.

ANTISTOECHON, in grammar, the uſing one letter inſtead of another; as *olli* for *illi*.

ANTISTROPHE, in grammar, a figure by which two things mutually depending on one another, are reciprocally converted; as, *the ſervant of the maſter, the maſter of the ſervant*.

ANTISTROPHE, among lyric poets, that part of a ſong and dance in uſe among the ancients, which was performed before the altar, in returning from weſt to eaſt; in oppoſition to ſtrophe. See STROPHE and ODE.

ANTITACTÆ, in church hiſtory, a branch of Gnoſtics, who held, that God was good and juſt, but that a creature had created evil; and conſequently that it is our duty to oppoſe this author of evil, in order to avenge God of his adverſary.

ANTITHENAR, in anatomy, a name given to the abductor indicis. See ANATOMY, *Table of the Muſcles*.

ANTITHESIS, in rhetoric, a contraſt or oppoſition of words or ſentiments. Such is that of Cicero, in the ſecond Catilinarian: "On one ſide ſtands modeſty, on the other impudence; on one fidelity, on the other deceit; here piety, there ſacrilege; here continency, there luſt, &c." Such alſo is that of Auguſtus to ſome ſeditious young men. *Audite, juvenes, ſenem, quem juvenem ſenes audivere.* Such again is that of Seneca: *Curæ leves loquuntur, ingentes ſtupent.*

Many antient writers ſeem greatly to affect antitheſes; but among the moderns they are generally decried. The following, however, is an example of modern antitheſis:

——— *Though gentle, yet not dull;*
Strong, without rage; without o'erflowing, full.

ANTITHESIS is ſometimes uſed for controverſy. In this ſenſe we meet with *antithetic* method, *antithetic* diſcourſes, &c. Marcion compoſed a volume of Antitheſes, or contrarieties and oppoſitions between the law and the goſpel.

ANTITRAGUS, in anatomy, a muſcle of the ear.

ANTITRINITARIANS, thoſe who deny the Trinity, and teach that there are not three perſons in the Godhead. Thus the Samoſatenians, who do not believe the diſtinction of perſons in God; the Arians, who deny the divinity of the Word; and the Macedonians, who deny that of the Holy Spirit, are all properly Antitrinitarians. Among the moderns, Antitrinitarians are particularly underſtood of Socinians, called alſo Unitarians.

ANTITYPE, properly ſignifies a type or figure correſponding to ſome other type. This word occurs twice in the New Teſtament; viz. in the epiſtle to the Hebrews ix. 24. and in St. Peter, 1 Eph. iii. 21. where its genuine import has been much controverted. The former ſays, that "Chriſt is not entered into the holy places made with hands, which are αντιτυπα, the figures or antitypes of the true------now to appear in the preſence of God for us." Now τυπος ſignifies the pattern by which another thing is made; and as Moſes was obliged to make the tabernacle, and all things in it, according to the pattern ſhowed him in the mount; the tabernacle ſo formed was the antitype of what was ſhown to Moſes: any thing, therefore, formed according to a model or pattern, is an antitype.

ANTITYPE, among the ancient Greek fathers, and in the Greek liturgy, is alſo applied to the ſymbols of bread and wine in the ſacrament.

ANTIVARI, a ſtrong town of Turkey in Europe, in Dalmatia. E. lon. 29. 15. N. lat. 43. 0.

ANTLER, among ſportſmen, a ſtart or branch of a deer's attire. *Brow*-ANTLER, denotes the branch next the head; and, *Bes*-ANTLER, the branch next above the brow-antler.

ANTLIA, an ancient machine, ſuppoſed to be the ſame with our pump. Hence the phraſe *in antliam condemnari*, according to the critics, denotes a kind of puniſhment, whereby criminals were condemned to drain ponds, ditches, or the like.

ANTOEICI, in geography, thoſe inhabitants of the earth who live under the ſame meridian, and at the ſame diſtance from the Equator; the one towards the north, and the other towards the ſouth. Hence they have the ſame longitude; and their latitude is alſo the ſame, but of a different denomination. They are in the ſame ſemicircle of the meridian, but oppoſite in parallels. They have preciſely the ſame hours of the day and night, but oppoſite ſeaſons; and the night of the one is always equal to the day of the other.

ANTOINE (St.), a ſmall town of France, in the department of Iſere, and late province of Dauphiny; 13 miles E. of Lyons. E. lon. 5. 20. N. lat. 45. 43.

ANTONIA, a citadel of Jeruſalem, the origin of which we have in Joſephus; who ſays, that Hyrcanus, the firſt high-prieſt of that name, built Baris near the temple, a houſe with turrets, where he generally reſided. Herod afterwards made it ſtronger, for the ſecurity and defence of the temple; and in honour of Marc Antony, who then commanded in the eaſt, called it *Antonia*. It was very extenſive, and could accommodate a Roman legion.

ANTONIAN WATERS, medicinal waters of Germany, very pleaſant to the taſte, and eſteemed good in many chronic and hypochondriac caſes.

ANTONINUS PIUS, the Roman emperor, was born at Lanuvium in Italy, A. C. 86, of a family originally from Niſmes in Languedoc. His character was in all reſpects one of the nobleſt that can be imagined; and he had the title of *Pius* given him by the ſenate. This great and good emperor died in 161. aged 75 years, having reigned 23.

ANTONINUS PHILOSOPHUS (Marcus Aurelius), the Roman emperor, born at Rome, the 26th of April, in the 121ſt year of the Chriſtian æra. He was called by ſeveral names till he was admitted into the Aurelian family, when he took that of Marcus Aurelius Antoninus. He died on the 17th of March 180, in the 59th year of his age, and 19th of his reign; and the whole empire regretted his loſs.

ANTONINE's *Column*. See COLUMN.

ANTONINUS's *Wall*, the name of the third rampart or defence that had been built or repaired by the Romans againſt the incurſions of the North Britons. It is called by the people in the neighbourhood, *Graham's Dyke*; from the notion that one Graham or Grimus firſt made a breach in it after the retreat of the Romans out of Britain. Though we cannot diſcover exactly how many years this wall of the emperor Antoninus continued to be the boundary of the Roman territories in Britain, yet we know with certainty that it was not very long. For we are told by an author of undoubted credit, that, in the reign of Commodus, A. D. 180, "he had wars with ſeveral foreign nations, but none ſo dangerous as that of Britain. For the people of the iſland, having paſſed the wall which divided them from the Romans, attacked them, and cut them in pieces."

ANTONIO (St.), one of the Cape de Verd iſlands, 15 miles from St. Vincent. It is full of high mountains, whence proceed ſtreams of excellent water, which render the land very fruitful. The principal town is ſeated among the mountains. Lon. 25. 0. W. lat. 17. 0. N.

ANTONIO (St.), a Dutch fort in Axim, on the Gold Coaſt of Africa.

ANTONIUS (Marcus), a famous Roman orator. While he filled the office of prætor, Sicily fell to his lot, and he cleared the ſeas of the pirates which infeſted that coaſt. He was made conſul with A. Poſthumius Albinus, in the year of Rome 653; when he oppoſed the turbulent deſigns of Sextus Titus, tribune of the people, with great reſolution and ſucceſs. Some time after, he was made governor of Cilicia, in quality of proconſul; where he performed ſo many great exploits, that he obtained the honour of a triumph. He was unfortunately killed during thoſe bloody tumults raiſed at Rome by Marius and Cinna, 90 years before the Chriſtian æra.

ANTONOMASIA, a form of ſpeech, in which, for a proper name, is put the name of ſome dignity, office, profeſſion, ſcience, or trade; or when a proper name is put in the room of an appellative. Thus a king is called his *majeſty*; a nobleman, his *lordſhip*. We ſay the *philoſopher* inſtead of Ariſtotle, and the *orator* for Cicero. Thus a man is called by the name of his country, a *German*, an *Italian*; a grave man is called a *Cato*, and a wiſe man a *Solomon*.

ANTOSIANDRIANS, a ſect of rigid Lutherans, who oppoſe the doctrine of Oſiander relating to juſtification. Theſe are otherwiſe denominated *Oſiandromaſtiges*. The Antoſiandrians deny that man is made juſt, with that juſtice wherewith God himſelf is juſt; that is, they aſſert, that he is not made eſſentially, but only imputatively, juſt; or, that he is not really made juſt, but only pronounced ſo.

ANTRIM, the moſt northerly county of Ireland. It is bounded by that of Down on the ſouth-eaſt, that of Londonderry on the weſt, from which it is ſeparated by the river Bann, part of Armagh on the ſouth, St. George's channel on the eaſt, and the Deucaledonian ocean on the north.

The capital town bears the ſame name, and is ſeated at the N. end of the lake Lough-Neagh, about 6 miles from the mouth of the bay. W. long. 6. 26. N. lat. 54. 45.

ANTRUM, among anatomiſts, a term uſed to denote ſeveral cavities of the body: as the *antrum highmorianum*, or that in the maxillary or jaw-bone; *antrum pylori*, or that at the bottom of the pylorus, &c.

ANTWERP, a city of the duchy of Brabant, in the Auſtrian Netherlands, capital of the marquiſate of Antwerp, otherwiſe called the *marquiſate of the holy Roman empire*, ſituated in E. long. 4. 15. N. lat. 51. 12. It lies in a low marſhy ground on the Scheldt, 24 miles from Bruſſels to the north, and is the

third city in rank in Brabant, containing 22 ſquares, and above 200 ſtreets, all ſtraight and broad, eſpecially that called the *Mere*, in which ſix coaches can go abreaſt.

ANUBIS, a ſymbolical deity of the Egyptians, was regarded as the faithful companion of Oſiris and of Iſis. Temples and prieſts were conſecrated to him, and his image was borne in all religious ceremonies.

ANUS, in anatomy, the lower extremity of the inteſtinum rectum, or orifice of the fundament.

ANVIL, a ſmith's utenſil, ſerving to place the work on to be hammered or forged. The face or uppermoſt ſurface of the anvil muſt be very flat and ſmooth, without flaws, and ſo hard that a file will not touch it. At one end there is ſometimes a pike, bickern, or beak-iron, for the rounding of hollow work. The whole is uſually mounted on a firm wooden block.—Forged anvils are better than thoſe of caſt work, and the beſt have the upper part made of ſteel. Lockſmiths have a ſmaller kind of anvil, called the *ſtake*, which is moveable, and placed ordinarily on their work-bench. Its uſe is for ſetting ſmall cold work ſtraight, or to cut or punch on with the cold chiſſel or cold punch.

AONIDES, in mythology, one of the many appellations of the muſes; ſo called from Aonia, a part of ancient Bœotia.

AORASIA, in antiquity, the inviſibility of the gods. The word is Greek, ἀοραϛια, and derived from α priv. and ὁραω *o ſee*. The opinion of the ancients with regard to the appearance of the gods to men, was, that they never ſhowed themſelves face to face, but were known from their backs as they withdrew. Neptune aſſumed the form of Calchas to ſpeak to the two Ajaxes; but they knew him not till he turned his back to leave them, and diſcovered the god by his maeſtic ſtep as he went from them. Venus appeared to Æneas n the character of a huntreſs: but her ſon knew her not till he departed from him; her divinity was then betrayed by her adiant head, her flowing robe, and her majeſtic pace.

AORIST, among grammarians, a tenſe peculiar to the Greek language, comprehending all the tenſes; or rather expreſſing an action in an indeterminate manner, without any egard to paſt, preſent, or future.

AORISTIA, in the ſceptic philoſophy, denotes that tate of the mind wherein we neither aſſert nor deny any thing oſitively, but only ſpeak of things as ſeeming or appearing to s in ſuch a manner. The aoriſtia is one of the great points or erms of ſcepticiſm, to which the philoſophers of that denonination had continual recourſe by way of explication or ſubterfuge. Their adverſaries, the Dogmatiſts, charged them with logmatizing, and aſſerting the principles and poſitions of their ect to be true and certain.

AORNUS, a very high rock of India, having its name rom its extraordinary height, as being above the flight of a ird. Its circuit was about 25 miles, its height 11 furlongs, nd the way leading up to the top artificial and narrow. At he bottom, on one ſide, ran the river Indus; on the top was fine plain, part of which was covered with a thick wood; he reſt arable land, with a fountain furniſhing abundance of xcellent water.

AORTA, in anatomy, the great artery which riſes immeiately from the left ventricle of the heart, and is from thence iſtributed to all parts of the body. It riſes and afterwards aſſes down in one large trunk, the different portions of which re diſtinguiſhed by the epithets *aſcending* and *deſcending*. See NATOMY.

AOUSTA, or AOST, a town of Italy, in Piedmont, ſeated t the foot of the Alps, on the river Doria. E. long. 7. 33. N. lat. 45. 38.

AOUSTA, a territory of Piedmont, with the title of a uchy. The capital is of the ſame name.

AOUTA, the name of the paper mulberry-tree at Otaheite, in the South Sea, from which a cloth is manufactured, that is worn by the principal inhabitants. See BARK.

APACHES, a people of New Mexico in North America, brave, reſolute, and warlike, fond of liberty, and the inveterate enemies of tyranny and oppreſſion. Of this the Spaniards had fatal experience towards the end of the laſt century, ſince when they have remained their allies, not their ſubjects; and the viceroy of Mexico has been obliged to maintain a more formidable garriſon.

APÆDUSIA, denotes ignorance or unſkilfulneſs in what relates to learning and the ſciences. Hence alſo perſons uninſtructed and illiterate are called *apædeutæ*. The term *apædeutæ* was particularly uſed among the French in the time of Huet; when the men of wit at Paris were divided into two factions, one called by way of reproach *apædeutæ*, and the others *eruditi*.

APAGOGE, in logic. See ABDUCTION.

APAGOGE, in the Athenian law, the carrying a criminal taken in the fact to the magiſtrate. If the accuſer was not able to bring him to the magiſtrate, it was uſual to take the magiſtrate along with him to the houſe where the criminal lay concealed, or defended himſelf.

APAGOGE, in mathematics, is ſometimes uſed to denote a progreſs or paſſage from one propoſition to another; when the firſt having been once demonſtrated, is afterwards employed in the proving of others.

APAGOGICAL DEMONSTRATION, an indirect way of proof, by ſhowing the abſurdity of the contrary.

APALACHIAN MOUNTAINS, more properly called the *Allegany Mountains*, have their ſouthern beginning near the bay of Mexico, in the latitude of 30°, extending northerly on the back of the Britiſh colonies, and running parallel with the ſea-coaſt to the latitude of 40° north; but their diſtance from the ſea, on the weſt, is not exactly known, though it is generally thought to be above 200 miles.

APANAGE, or APPENNAGE, in the French cuſtoms, were lands aſſigned by the ſovereign for the ſubſiſtence of his younger ſons, which were to revert to the crown upon the failure of male iſſue in that branch to which the lands were granted.

APANOMIA, a town of Santorin, an iſland in the Mediterranean Sea, called in this part, by ſome, the *Sea of Candia*. E. long. 25. 59. N. lat. 36. 18.

APANTHROPY, denotes a love of ſolitude, and averſion from the company of mankind. It is by ſome reckoned among the ſymptoms, by others among the ſpecies or degrees, of melancholy.

APARINE, in botany, a ſynonime of the utricularia and ſeveral other plants.

APARITHMESIS, in rhetoric, denotes the anſwer to the protaſis or propoſition itſelf. Thus, if the protaſis be, *Appellandi tempus non erat*,—The aparithmeſis is, *At tecum anno plus vixi*.

APARTISMENUS, in the ancient poetry, an appellation given to a verſe, which comprehended an entire ſenſe or ſentence in itſelf. This is ſometimes alſo written *apartemenus*, i. e. ſuſpended, as not needing any ſubſequent verſe.

APATHY, among the ancient philoſophers, implied an utter privation of paſſion, and an inſenſibility to pain. The word is compounded of α priv. and πάθος *affection*. The Stoics affected an entire apathy. They conſidered it as the higheſt wiſdom to enjoy a perfect calmneſs or tranquillity of mind, incapable of being ruffled by either pleaſure or pain. In the firſt ages of the church, the Chriſtians adopted the term *apathy* to expreſs a contempt of all earthly concerns; a ſtate of mortification, ſuch as the goſpel preſcribes. Clemens Alexandrinus, in particular, brought it exceedingly into vogue;

thinking hereby to draw the philoſophers to Chriſtianity, who aſpired after ſuch a ſublime pitch of virtue. Quietiſm is only apathy diſguiſed under the appearance of devotion.

APATURIA, in antiquity, a ſolemn feaſt celebrated by the Athenians in honour of Bacchus. The word is uſually derived from *απατη fraud*. It is ſaid to have been inſtituted in memory of a fraudulent victory obtained by Melanthus king of Athens over Xanthus king of Bœotia, in a ſingle combat, which they agreed upon, to put an end to a debate between them relating to the frontiers of their countries. Hence Budæus calls it *feſtum deceptionis*, "the feaſt of deceit." But other authors give a different etymology of this feaſt.

APAULIA, in antiquity, the third day of a marriage ſolemnity. It was thus called, becauſe the bride, returning to her father's houſe, lodged apart from the bridegroom. Some will have the apaulia to have been the ſecond day of the marriage, viz. that whereon the chief ceremony was performed; thus called by way of contradiſtinction from the firſt day, which was called *προαυλια*. On the day called *απαυλια* (whenever that was) the bride preſented her bridegroom with a garment called *απαυλιδηρια*.

APE, in zoology, the general Engliſh name of a very numerous race of animals, the natural hiſtory of which is given at large under the article SIMIA.

Sea-APE, a name given by Steller to a marine animal which he ſaw on the coaſt of America, and is thus deſcribed in the hiſtory of Kamtſchatka, p. 136. "The head appeared like that of a dog, with ſharp and upright ears, large eyes, and with both lips bearded: the body round and conoid; the thickeſt part near the head: the tail forked; the upper lobe the longeſt: the body covered with thick hair, grey on the back, reddiſh on the belly. It ſeemed deſtitute of feet. It was extremely wanton, and played a multitude of monkey-tricks."

APELYTES, Chriſtian heretics in the ſecond century, who affirmed that Chriſt received a body from the four elements, which at his death he rendered back to the world, and ſo aſcended into heaven without a body.

APELLA, among the old phyſicians, was a name given to thoſe whoſe prepuce was either wanting or ſhrunk, ſo as no longer to cover the glans. But, according to Salmaſius and others, it was no more than the proper name of a certain Jew.

APELLES, one of the moſt celebrated painters of antiquity. He was born in the iſle of Cos, and flouriſhed in the time of Alexander the Great, with whom he was in high favour. He executed a picture of this prince, holding a thunderbolt in his hand; a piece, finiſhed with ſo much ſkill, that it uſed to be ſaid there were two Alexanders; one invincible, the ſon of Philip; the other inimitable, the production of Apelles. Alexander gave him a remarkable proof of his regard: for when he employed Apelles to draw Campaſpe, one of his miſtreſſes, having found that he had conceived an affection for her, he reſigned her to him; and it was from her that Apelles is ſaid to have drawn his Venus Anadyomene, which was eſteemed the moſt exquiſite figure that the pencil could create.

APENE, in antiquity, a kind of ſuperb chariot whereon the images of the gods were carried in proceſſion on certain days, attended with ſolemn pomp, hymns, dancing, &c.

APENINUS, or *Appenninus*; a mountain, or ridge of mountains, running through the middle of Italy.

APENRADE, a town of Denmark in the duchy of Sleſwick, 25 miles N. from Sleſwick. E. long. 9. 28. N. lat. 55. 4.

APENZEL, a town of Switzerland, in the canton of the ſame name, ſeated on the river Chuz. E. long. 9. 1. N. lat. 47. 31.

APEPSIA, from *α* neg. and *πεπτω* to *digeſt*, indigeſtion. It is equally liable to be produced by abſtemiouſneſs and exceſs.

APER, in zoology, a ſynonime of the ſus ferosa. See SUS.

APERIENTS, in the materia medica, the name of a claſs of medicines, ſuppoſed to facilitate the circulation by removing obſtructions. Mild purges are alſo called aperients.

APERTURE, in geometry, the ſpace between two right lines which meet in a point and form an angle.

APERTURE, in optics, a round hole in a turned bit of wood or plate of tin, placed within the ſide of a teleſcope or microſcope, near to the object-glaſs, by means of which more rays are admitted, and a more diſtinct appearanec of the object is obtained.

APERTURES, or *Apertions*, in architecture, are uſed to ſignify doors, windows, chimneys, &c.

APETALOSE, or APETALOUS, among botaniſts, an appellation given to ſuch plants as have no flower-leaves.

APEX, the vertex or ſummit of any thing.

APEX, in antiquity, the creſt of a helmet, but more eſpecially a kind of cap worn by the flamens.

APEX, among grammarians, denotes the mark of a long ſyllable, falſely called a *long accent*.

APHÆRESIS, in grammar, a figure by which a letter or ſyllable is cut off from the beginning of a word. Thus *ciconia* by aphæreſis is written *conia*; *contemnere*, *temnere*, &c. A like retrenchment at the end of a word is called APOCOPE.

APHÆRESIS, in medicine, denotes a neceſſary taking away or removal of ſomething that is noxious. In ſurgery, it ſignifies an operation whereby ſomething ſuperfluous is cut off.

APHANES, a genus of the monogynia order, belonging to the tetrandria claſs of plants, and in the natural method ranking under the 35th order, *Senticoſæ*. The eſſential characters are theſe: The calyx is divided into eight parts; there is no corolla; the ſeeds are two, and naked. There is only one ſpecies, the arvenſis, or parſley-piert, a native of Britain. It is extremely common in corn-fields. The ſtalks riſe five or ſix together; they are three inches long, round, hairy, and procumbent. The leaves ſtand very thick upon them, and are roundiſh, but divided, as it were, into three parts, and thoſe deeply ſerrated at their edges. The flowers come out in a double ſeries, arranged all along the branches, and are of a greeniſh white, and the whole plant is of a greyiſh or whitiſh-green colour.

APHASIA, from *α* and *φημι* I ſpeak, in the ſceptic philoſophy, denotes a ſtate of doubt, wherein a perſon not knowing what to determine on, it is beſt for him to be ſilent. In this ſenſe, *aphaſia* ſtands oppoſite to *phaſis*, under which are included both aſſertion and negation.

APHELIUM, or APHELION, in aſtronomy, is that point in any planet's orbit, in which it is fartheſt diſtant from the ſun, being that end of the greater axis of the elliptical orbit of the planet moſt remote from the focus where the ſun is.

APHIOM KARAHISSART, a town of Natolia, in Aſiatic Turkey. E. long. 32. 18. N. lat. 38. 35.

APHIS, in zoology, the PUCERON, VINE-FRETTER, or PLANT-LOUSE; a genus of inſects belonging to the order of inſecta hemiptera. The roſtrum or beak of the aphis is inflexed; the antennæ or feelers are longer than the thorax; the wings are four, and erect, or they are wanting; the feet are of the ambulatory kind; and the belly often ends in two horns, from which is ejected that moſt delicate juice called *Honey-dew*. See HONEY-*dew*.

Linnæus enumerates 33 ſpecies of the aphis, all of them inhabitants of particular plants, from which their trivial names are taken; as aphis *ribis*, *ulmi*, *roſæ*, &c. And he adds, that

there ſeem to be a greater variety of plants producing aphides than there are different ſorts of this inſect. But ſome late obſervers have been able to diſtinguiſh more than double the above number of ſpecies; and it is probable that many more remain ſtill to be added, as many of the ſame kind of plants are found to ſupport two or three quite different ſorts of aphides. Thus the plum-tree has two ſorts very diſtinct from each other; one of a yelloviſh green, with a long and ſhort body; the other of a blueiſh green, as it were enamelled with white, and the ſhape more oblong. On the goſeberry-buſh and currant the ſame aphides may be found, but each of theſe is inhabited by two very different ſpecies: one being of a duſky green, with a ſhort plump body, the other of a paler green, the body more taper, and tranſverſely wrinkled. The roſe-tree, again, ſupports not leſs than three diſtinct ſpecies: the largeſt is of a deep green, having long legs of a browniſh caſt, with the joints of a very dark brown, as are alſo the horns and antennæ; a ſecond ſort is of a paler green, has much ſhorter legs, and a more flat body; the third ſort is of a pale red, its body tranſverſely wrinkled, and is moſt frequently found on the ſweet-brier. See Plate I.

The extraordinary nature of theſe inſects has for ſome time paſt juſtly excited the wonder and attention of naturaliſts. They were long ranked among the animals which had been claſſed with the true androgynes ſpoken of by Mr. Breynius: for having never been catched copulating, it was haſtily concluded that they multiplied without copulation. This, however, was but a doubt, or at beſt a mere ſurmiſe: but this ſurmiſe was believed and adopted by Mr. Reaumur; and though he ſupported it by ſome obſervations peculiar to himſelf, the queſtion remained ſtill undecided, till Mr. Bonnet ſeemed to have cleared it up in the affirmative, by taking and ſhutting up a young aphis at the inſtant of its birth, in the moſt perfect ſolitude, which yet brought forth in his ſight 95 young ones. The ſame experiment being made on one of the individuals of this family, that had been tried with its chief, the new hermit ſoon multiplied like its parent; and one of this third generation, in like manner brought up in ſolitude, proved no leſs fruitful than the former. Repeated experiments, in this reſpect, as far as the fifth or ſixth generation, all uniformly preſenting the obſerver with *fecund virgins*, were communicated to the Royal Academy of Sciences; when an unforeſeen and very ſtrange ſuſpicion, imparted by Mr. Trembley to Mr. Bonnet, engaged him anew in a ſeries of ſtill more painful experiments than the foregoing. In a letter which that celebrated obſerver wrote to him from the Hague in 1741, he ſays, "I formed, ſince the month of November, the deſign of rearing ſeveral generations of ſolitary pucerons, in order to ſee if they would ſtill equally bring forth young. In caſes ſo remote from uſual circumſtances, it is allowed to try all ſorts of means; and I argued with myſelf, Who knows, but that one copulation might ſerve for ſeveral generations?" This "*who knows*," to be ſure, was next to avouching nothing; but as it came from Mr. Trembley, it was ſufficient to perſuade Mr. Bonnet that he had not gone far enough in his inveſtigation. If the fecundity of aphides was owing to the ſecret copulation ſuggeſted by Mr. Trembley; this copulation ſerved at leaſt five or more ſucceſſive generations. Mr. Bonnet therefore reared to the amount of the tenth generation of ſolitary aphides, and had the patience to keep an account of the days and hours of the births of each generation. In ſhort, it was diſcovered, that they are really diſtinguiſhed by ſexes: that there are males and females amongſt them, whoſe amours are the leaſt equivocal of any in the world: that the males are produced only in the tenth generation, and are but few in number: that theſe, ſoon arriving at their full growth, copulate with the females: that the virtue of this copulation ſerves for ten generations: that all theſe generations, except the firſt (from the fecundated eggs), are produced viviparous; and all the individuals are females, except thoſe of the laſt generations, among whom, as we have already obſerved, ſome males make their appearance, to lay the foundations of a freſh ſeries. Theſe circumſtances have been confirmed by other naturaliſts. In particular we have a curious and accurate detail of them by Dr. Richardſon of Rippon, in the Philoſophical Tranſactions, vol. xi. art. 22.

Theſe inſects are found in great numbers, not only on the ſtems and leaves, but even upon roots of many trees and plants. Thoſe trees that are moſt loaded with them, as we have already obſerved, ſuffer greatly from them. The plant-lice thruſt their ſharp-pointed roſtrum into the ſubſtance of the leaf to draw out their ſuſtenance, which warps the ſtems and leaves, and occaſions in the latter cavities underneath, and ſwellings above; nay, in ſome, a kind of hollow gall is even filled with inſects, as is often ſeen on elm-leaves. It appears aſtoniſhing that the ſlight puncture of ſo ſmall an animal ſhould ſo greatly diſfigure a plant; but it muſt be remembered, that plant-lice always live in numerous aſſociations, which increaſe viſibly by the prodigious fruitfulneſs of thoſe inſects; ſo that although each puncture be ſlight, yet the number of them is ſo great, ſo reiterated, that it is no longer a wonder the leaves ſhould be diſfigured. Lovers of gardening and plants are extremely anxious to free and cleanſe their trees from this vermin; but their care often proves unavailing, the inſect is ſo fruitful that it ſoon produces a freſh colony. The beſt and ſureſt method of extirpating it is to put on the trees infeſted with them ſome larvæ of the plant-louſe lion, or aphidivorous flies. (See COCCINELLA, ICHNEUMON, HEMEROBIUS, &c.) For thoſe voracious larvæ deſtroy every day a great number of the inſects, and that with ſo much the more facility, as the latter remain quiet and motionleſs in the neighbourhood of theſe dangerous enemies, who range over heaps of plant-lice, which they gradually devour.

APHLASTUM, in ancient navigation, a wooden ornament, ſhaped like a plume of feathers, faſtened on the gooſe's or ſwan's neck uſed by the ancient Greeks in the heads of their ſhips. The aphlaſtum had much the ſame office and effect in a ſhip that the creſt had on the helmet. It ſerved alſo to indicate from what quarter the wind blew, having a party-coloured ribband faſtened to it.

APHONIA, among phyſicians, ſignifies a ſuſpenſion or total loſs of voice. It is never a primary diſeaſe, but a conſequence of ſome other.

APHORISM, a maxim or principle of a ſcience; or a ſentence which comprehends a great deal in a few words. The word comes from ἀφορίζω *I ſeparate*; q. d. a choice or ſelect ſentence.

APHRACTI, in the ancient military art, denotes open veſſels, without decks or hatches, furniſhed only at head and ſtern with croſs-planks, whereon the men ſtood to fight.

APHRODISIA, in antiquity, feſtivals kept in honour of Venus, the moſt remarkable of which was that celebrated by the Cyprians.

APHRODISIACS, medicines ſaid to increaſe the quantity of ſemen, and create an inclination to venery.

APHRODITA, in zoology, an inſect of the order of vermes molluſca. The body of the aphrodita is oval, with many ſmall tentacula or protuberances on each ſide, which ſerve as ſo many feet. The mouth is cylindrical at one end of the body, and capable of being retracted, with two briſtly tentacula. See Pl. I. There are four ſpecies of this inſect; viz. 1. The aculeata, by ſome called the *ſea-mouſe*, with 32 tentacula or feet, an inhabitant of the European ſeas, and often found in the belly of the cod-fiſh. It feeds upon ſhell-fiſh.

2. The ſcabra, of an oblong ſhape, ſcabrous on the back, with 20 tentacula. It inhabits the Belgic ſea. It is ſometimes taken off Brighthelmſtone, an inch long. 3. The ſquamata, with 24 feet, and ſcaly on the back. The mouth is wrapt up in an aperture, and the tail is terminated by a few very ſhort briſtles. It inhabits the European ocean. 4. The imbricata, is very like the former, only its ſcales are more glabrous. It inhabits the northern ocean.

APHRODITE, in mythology, a name of Venus, derived from *αφρος froth*; becauſe, according to the poets, Venus was produced from the froth or foam of the ſea.

APHRONITRE, in natural hiſtory, a name given by the ancients to a particular kind of natron.

APHTHÆ, in medicine, ſmall, round, and ſuperficial ulcers ariſing in the mouth, and called the *thruſh*.

APHTHARTODOCETÆ, a ſect, ſworn enemies of the council of Chalcedon. The word is derived from *αφθαρτος incorruptible*, and *δοκεω I imagine*; and was given them, becauſe they imagined the body of Jeſus Chriſt was incorruptible and impaſſible, and not capable of death. They aroſe among the Eutychians, and made their firſt appearance in the year 535.

APHYLLANTHES, LEAFLESS FLOWER, or BLUE MONTPELLIER PINK; a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 5th order, *Tetrapetaloidæ*. In character it differs not from the JUNCUS or ruſh, but in having a calyx of ſix petals, whereas the juncus has no calyx. There is only one ſpecies, the Monſpelienſes, a native of France. The root conſiſts of a number of ſlender, hard, woody, long, and contorted fibres: the radical leaves are very numerous, two inches long, extremely narrow, and wither very quickly. The ſtalk is round, ſmooth, without a joint or knot, naked, and tolerably firm; at its top ſtands a ſingle and very beautiful blue flower, ariſing from a kind of compound imbricated cup.

APIARY, a place where bees are kept. See BEE.

APIASTER, in ornithology, the trivial name of a ſpecies of the merops. See MEROPS.

APICES, in botany, the ſame with ANTHERÆ.

APICIUS. There were at Rome three perſons of that name, famous for their gluttony: the ſecond is the moſt celebrated of the three. He lived under Tiberius, ſpent immenſe ſums on his belly, and invented divers ſorts of cakes which bore his name. He kept a ſort of ſchool of gluttony at Rome.

APIS, in mythology, a divinity worſhipped by the ancient Egyptians at Memphis. It was an ox, having certain exterior marks; in which animal the ſoul of the great Oſiris was ſuppoſed to ſubſiſt. This animal had the preference to all others, as being the ſymbol of agriculture, the improvement of which that prince had ſo much at heart. Writers however aſſert, that Apis was only a ſymbolical deity.

APIS, or BEE, in zoology, a genus of inſects belonging to the order of inſecta hymenoptera. The mouth is furniſhed with two jaws, and a proboſcis infolded in a double ſheath; the wings are four in number, the two foremoſt covering thoſe behind when at reſt: in the anus or tail of the females and working-bees there is a hidden ſting. Theſe inſects are diſtinguiſhed into ſeveral ſpecies, each of which has its peculiar genius, talent, manners, and diſpoſition. Variety prevails in the order of their architecture, and in the nature of their materials. Some live in ſociety, and ſhare the toils; ſuch are the common bee and the drone. Others dwell and work in ſolitude, building the cradles of their families; as the leaf-cutter bee does with the roſe-tree leaf; the upholſterer with the gaudy tapeſtry of the corn-roſe; the maſon-bee with a plaſter, the wood-piercer with ſaw-duſt. All are employed in their little hermitage, with the care of providing for the wants of their poſterity.

The ſpecies enumerated by Linnæus are no fewer than 55 of which the following are the moſt remarkable. 1. The florifomis, or black bee with a cylindrical incurvated belly having two toothed-like protuberances at the anus, and a kind of prickles on the hind-legs. This bee ſleeps in flowers. 2. The dentata, or ſhining green bee, with black wings, and a kind of teeth on the hind thighs. The tongue of this bee is almoſt as long as its body. 3. The variegata; the breaſt and belly are variegated with white and black ſpots; the legs are of an iron colour. It is a native of Europe. This ſpecies ſleeps in the geranium phæim, or ſpotted crane's-bill. 4. The rofſtrata is diſtinguiſhed by the upper-lip being inflected and of a conical ſhape, and by the belly being inveſted with blueiſh belts. They build their neſts in high ſandy grounds, and there is but one young in each neſt. 5. The ferruginea, or ſmooth black bee, with the feelers, mouth, belly, and feet of an iron colour. This is a ſmall bee, and ſuppoſed to be of an intermediate kind between the bee and waſp. It is a native of Europe. 6. The carioſa is a yellowiſh hairy bee; and the feet and front are of a bright yellow colour. It builds in the rotten trees of Europe. 7. The braſilianorum, or pale-red hairy bee, with the baſis of the thighs black. This is a very large bee, every where covered with a teſtaceous ſkin. It is a native of America. 8. The lapidaria, or red hairy bee, with a yellow anus builds in holes of rocks. 9. The terreſtris is black and hairy with a white belt round the breaſt, and a white anus: it builds its neſt very deep in the earth. 10. The violacea is a red bee and very hairy, with blueiſh wings. It is a native of Europe. The violacea is ſaid to perforate trees, and hollow them out in a longitudinal direction; they begin to build their cells at the bottom of theſe holes, and depoſit an egg in each cell, which is compoſed of the farina of plants and honey or a kind of gluten. 11. The muſcoſum, or yellow hairy bee with a white belly, builds in moſſy grounds. The ſkill diſplayed by theſe builders is admirable. In order to enjoy the pleaſure of ſeeing their operations, let a neſt be taken to pieces, and the moſs conveyed to a diſtance. The bees will be ſeen to form themſelves into a chain, from their neſt to the place where the moſs has been laid. The foremoſt lays hold of ſome with her teeth, clears it bit by bit with her feet (which circumſtance has alſo gotten them the name of carding-bees), then, by the help of her feet, ſhe drives the unravelled moſs under her belly; the ſecond, in like manner, puſhes it on to the third. Thus there is formed an uninterrupted chain of moſs, which is wrought and interwoven with the greateſt dexterity by thoſe that abide by the neſt; and to the end their neſt may not be the ſport of the winds, and may ſhelter them from rain, they throw an arch over it, which they compoſe with a kind of wax, tenacious, yet thin in ſubſtance, which is neither the unwrought bee wax nor the real wax; though diſſolved in oil of turpentine, may be uſed in taking off impreſſions. 12. The centuncularis leaf-cutter, or black bee, having its belly covered with yellow down. The neſts of this ſpecies are made of leaves curiouſly plaited in the form of a matt or quilt. There are ſeveral varieties of the leaf-cutting bees, all equally induſtrious. They dig into the ground, and build their neſts, of which ſome have the form and ſize of thimbles inſerted one within another, others the ſhape and ſize of gooſe quills. Theſe neſts are compoſed of pieces of leaves; and each ſort of bees cuts its own materials; ſome the roſe-tree leaf, others the horſe-chefnut. A careful obſerver may diſcover roſe-tree leaves cut as it were with a pinking-iron; and there he may procure himſelf the pleaſure of ſeeing with what dexterity a bee, deſtitute of any mathematical inſtrument, cuts out a circular piece, fit to be

either the bottom or the lid of one of thoſe neſts; others it cuts out into ovals and ſemi-ovals, which form the ſides of the neſts, into each of which it depoſits one egg with ready prepared victuals. 13. The mellifica, or domeſtic honey-bee. But the particulars concerning this valuable ſpecies are ſo numerous and intereſting as to require a ſeparate article for their detail; and which will be found under the article BEE.

In the Philoſophical Tranſactions, N° clxxii. vol. i. we have an account of a ſpecies of honey-bee found in ſome parts of America, very different in form and manners from the common bee of Europe. Their combs are compoſed of a ſeries of ſmall bottles or bladders of wax, of a duſky brown or blackiſh colour; and each nearly of the ſize and ſhape of a Spaniſh olive. See Pl. 29. They hang together in cluſters, almoſt like a bunch of grapes, and are ſo contrived, that each of them has its aperture, while the bees are at work upon it; but as ſoon as it is filled with honey, this aperture is cloſed, and the bees leave it, and go to work upon another veſſel. Their lodgings are uſually taken up in the hollow of an old tree, or in ſome cavity of a rock by the ſea-ſide. They are ſagacious in chooſing the moſt ſecure retreats, becauſe their honey is ſo delicious a b , that they are hunted after by many animals; and they have o power of defending themſelves, having no ſtings as our bees have. The combs are brittle; and the honey is clear and liquid, like rock-water. It is uſed by the natives rather as a drink with their food than as honey. They uſe it alſo in medicine as a purge, drinking half a pint of it in the morning faſting.

The Abbé Clavigero, in his hiſtory of Mexico, mentions a ſpecies ſimilar in every reſpect to ours, but without the ſting. This is the bee of Yucatan and Chiapa, which makes the fine clear honey of *Eſtabentùn*, of an aromatic flavour, ſuperior to that of all the other kinds of honey with which we are acquainted. Another ſpecies deſcribed by the ſame author, reſembles in its form the winged ant, but is ſmaller than the common bee and without a ſting. This inſect, which is peculiar to warm and temperate climates, forms neſts in ſize and ſhape reſembling ſugar-loaves, and even ſometimes greatly exceeding theſe in ſize, which are ſuſpended from rocks, or from trees, and particularly from the oak. Theſe hives are much more numerouſly peopled than thoſe of the common bee. The nymphs of this bee, which are eatable, are white and round, like a pearl. The honey is of a greyiſh colour, but of a fine flavour.

APIUM, PARSLEY; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is of an oval ſhape, and ſtreaked; the involucrum conſiſts of one leaf; and the petals are inflected. There are only two ſpecies of apium; the petroſelinum, or common parſley, a native of Sardinia; and the graveolens or ſmallage, a native of Britain; the culture of both which are well known. The roots and ſeeds of the *petroſelinum* are uſed in medicine.

APIVORUS, in ornithology, a ſynonime of a ſpecies of falco. See FALCO.

APLUDA; a genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx is a bivalved gluma; the floſcules of the female are ſeſſile, and the male floſcules are furniſhed with pedunculi; the female has no calyx; the corolla has a double valve; there is but one ſtylus, and one covered ſeed. The male has three ſtamina. There are three ſpecies of apluda, viz. the mutica, ariſtata, and zengites, all natives of the Indies.

APOBATERION, in antiquity, a valedictory ſpeech or poem made by a perſon on departing out of his own country, and addreſſed to his friends or relations.

APOCALYPSE, REVELATION, the name of one of the ſacred books of the New Teſtament, including revelations concerning ſeveral important doctrines of Chriſtianity. The word is derived from *αποκαλιπτω*, *to reveal* or *diſcover*.

This book, according to Irenæus, was written about the year 96 of Chriſt, in the iſland of Patmos, whither St. John had been baniſhed by the emperor Domitian. But ſir Iſaac Newton places the writing of it earlier, viz in the time of Nero. Some attribute this book to the arch-heretic Cerinthus: but the ancients unanimouſly aſcribed it to John, the ſon of Zebedee, and brother of James; whom the Greek fathers call the *Divine*, by way of eminence, to diſtinguiſh him from the other evangeliſts. This book has not, at all times, been eſteemed canonical. There have likewiſe been ſeveral other works publiſhed under the title of *Apocalypſes*. Sozomen mentions a book uſed in the churches of Paleſtine, called the *Apocalypſe*, or *Revelation of St. Peter*. He alſo mentions an Apocalypſe of St. Paul; which the Cophtæ retain to this day.

APOCOPE, among grammarians, a figure which cuts off a letter or ſyllable from the end of a word; as *ingeni* for *ingenii*.

APOCRISARIUS, in eccleſiaſtical antiquity, a fort of reſident in an imperial city, in the name of a foreign church or biſhop, whoſe office was to negotiate, as proctor at the emperor's court, in all eccleſiaſtical cauſes in which his principals might be concerned. The inſtitution of this office ſeems to have been in the time of Conſtantine, or not long after, when, the emperors being become Chriſtians, foreign churches had more occaſion to promote their ſuits at court than formerly. However, we find it eſtabliſhed by law in the time of Juſtinian. In imitation of this officer, almoſt every monaſtery had its Apocriſarius, or reſident, in the imperial city. The title and quality of Apocriſary became at length appropriated to the Pope's agent, or *Nuncio*, as he is now called; who reſided at Conſtantinople, to receive the Pope's diſpatches, and the Emperor's anſwers.

APOCRUSTICS, in medicine, the ſame with repellents.

APOCRYPHA, or APOCRYPHAL BOOKS, ſuch books as are not admitted into the canon of ſcripture, being either not acknowledged as divine, or conſidered as ſpurious. The word is derived from *απο*, and *κρυπτω* to *hide* or *conceal*. When the Jews publiſhed their ſacred books, they gave the appellations of *canonical* and *divine* only to ſuch as they then made public: ſuch as were ſtill retained in their archives they called *apocryphal*, for no other reaſon but becauſe they were not public; ſo that they might be really ſacred and divine, though not promulged as ſuch. Thus, in reſpect of the Bible, all books were called *apocryphal* which were not inſerted in the Jewiſh canon of ſcripture.

The proteſtants acknowledge thoſe books of ſcripture only to be canonical that were ſo eſteemed in the firſt ages of the church; ſuch as are cited by the earlieſt writers among the Chriſtians as of divine authority, and after the moſt diligent enquiry were received and ſo judged to be by the council of Laodicea. The ſeveral epiſtles of which doubts have been expreſſed, and alſo the book of Revelations, whatever the ſentiments of ſome particular perſons are or may have been of them, are allowed by all the reformed churches to be parts of the canon of the New Teſtament. The apocryphal books, however, according to the ſixth article of the church of England, are to be read for example of life and inſtruction of manners; but it doth not apply them to eſtabliſh any doctrine.

APOCYNUM, DOGSBANE: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. The eſſential characters are theſe: The corolla is bell-ſhaped; and the filaments are five, alternate with the ſtamina. Of this

genus botanical writers enumerate 11 ſpecies; of which the following are the moſt remarkable: 1. The veretum, with an upright herbaceous ſtalk, grows on a ſmall iſland in the ſea near Venice, but is ſuppoſed to have been originally brought from ſome other country. There are two varieties of it; one with purple, and the other with white flowers, which appear in July and Auguſt. 2. The ſpecioſiſſimum, with large flowers, a native of Jamaica in the ſavannahs, whence it has the name of *Savannah flower* in that iſland. This ſort riſes three or four feet high, having woody ſtalks which ſend out a few lateral branches, garniſhed with ſmooth oval leaves placed by pairs oppoſite, of a ſhining green colour on their upper ſides, but pale and veined underneath. 3. Cordatum, with a climbing ſtalk. 4. The villoſum, with hairy flowers and a climbing ſtalk. Both are climbers, and mount to the tops of the talleſt trees. In England they have climbed over plants in the ſtoves, and riſen to upwards of 20 feet high. The third ſort has produced flowers ſeveral times; but the fourth never ſhowed an appearance of any. The firſt ſort will live in England in the open air, if planted in a warm ſituation and dry ſoil. It is propagated only by its creeping roots; the beſt time for removing and planting which is in the ſpring, juſt before they begin to puſh out new ſtalks. The other ſorts are propagated by ſeeds, but require being kept conſtantly in a ſtove. Each ſpecies of this plant abounds with a milky juice, which flows out from any part of the ſtalk and leaf when broken. This is ſuppoſed to be hurtful if taken inwardly, but will not bliſter the ſkin like the juice of ſpurge and other acrid plants. The pods of all the ſorts are filled with ſeeds, which are for the moſt part compreſſed and lie over one another *imbricatim*, like tiles on a houſe; theſe have each a long plume of a cottony down faſtened to their crowns, by which, when the pods are ripe and open, the ſeeds are wafted by the wind to a conſiderable diſtance, ſo that the plants become very troubleſome weeds. This down is in great eſteem in France, for ſtuffing of eaſy chairs, making quilts, &c. for it is exceedingly light and claſtic. It is called by the French *delawad;* and might probably become a vendible commodity in England, were people attentive to the collecting of it in Jamaica where the plants are found in plenty.

APODECTÆ, in antiquity, a denomination given to ten general receivers appointed by the Athenians to receive the public revenues, taxes, debts, and the like. The apodectæ had alſo a power to decide all controverſies relative to money and taxes, except thoſe of the higheſt concern, which were reſerved for the courts of judicature.

APODECTÆI, in the Athenian government, officers appointed to ſee that the meaſures of corn were juſt.

APODES, in a general ſenſe, denotes things without feet. Zoologiſts apply the name to a fabulous ſort of birds, ſaid to be found in ſome of the iſlands of the New World, which, being entirely without feet, ſupport themſelves on the branches of trees by their crooked bills.

APODES, in the Linnæan ſyſtem, the name of the *firſt order* of fiſhes, or thoſe which have no belly-fins. See ZOOLOGY.

APODICTICAL, among philoſophers, a term importing a demonſtrative proof, or ſyſtematic method of teaching.

APODOSIS, in rhetoric, makes the third part of a complete exordium, being properly the application, or reſtriction of the *protaſis*. The apodoſis is the ſame with what is otherwiſe called *axioſis*; and ſtands oppoſed to *protaſis*: e. g. *protaſis*, all branches of hiſtory are neceſſary for a ſtudent; *cataſcene*, ſo that, without theſe, he can never make any conſiderable figure; *apodoſis*, but literary hiſtory is of a more eſpecial uſe, which recommends it, &c.

APODYTERIUM, in the ancient baths, the apartments where perſons dreſſed and undreſſed.

APOGEE, in Aſtronomy, that point in the orbit of a planet which is at the greateſt diſtance from the earth. The apogee of the ſun is that part of the earth's orbit which is at the greateſt diſtance from the ſun; and conſequently the ſun's apogee, and the earth's aphelion, are one and the ſame point.

APOLIDES, in antiquity, thoſe condemned for life to the public works, or exiled into ſome iſland, and thus diveſted of the privileges of Roman citizens.

APOLLINARIAN GAMES, in Roman antiquity, were inſtituted in the year of Rome 542. The occaſion was a kind of oracle delivered by the prophet Marcus after the fatal battle at Cannæ, declaring, that to expel the enemy, and cure the people of an infectious diſeaſe which then prevailed, ſacred games were to be annually performed in honour of Apollo; the prætor to have the direction of them, and the decemviri to offer ſacrifices after the Grecian rite. The men, who were ſpectators at theſe games, wore garlands on their heads; the women performed their devotions in the temples at the ſame time. The Apollinarian games were merely ſcenical; no chariot races, or other exerciſes of the body, being ever practiſed at them.

APOLLINARIANS, APOLLINARISTS, called alſo by Epiphanius *Dimaritæ*, ancient heretics, who denied the proper humanity of Chriſt, and maintained that the body which he aſſumed was endowed with a ſenſitive, and not a rational, ſoul, but that the Divine Nature ſupplied the place of the intellectual principle in man. This ſect derived its name from Apollinaris, biſhop of Laodicea in the fourth century.

APOLLO, in mythology, a Pagan deity worſhipped by the Greeks and Romans. Cicero mentions four of this name, the moſt ancient of whom was the ſon of Vulcan; the ſecond a ſon of Corybas, and born in Crete; the third an Arcadian, called *Nomian*, from his being a great legiſlator; and the laſt, to whom the greateſt honour is aſcribed, the ſon of Jupiter and Latona. Apollo had a variety of other names, either derived from his principal attributes, or the chief places where he was worſhipped. He was called the *Healer*, from his enlivening warmth and cheering influence; *Pæan*, from his peſtilential heats: to ſignify the former, the ancients placed the graces in his right hand; and for the latter, a bow and arrows in his left: *Nomius*, or the ſhepherd, from his fertilizing the earth, and thence ſuſtaining the animal creation: *Delius*, from his rendering all things manifeſt: *Pythius*, from his victory over Python; *Lycias*, *Phœbus*, and *Phaneta*, from his purity and ſplendor. As Apollo is almoſt always confounded by the Greeks with the ſun, it is no wonder that he ſhould be dignified with ſo many attributes. It was natural for the moſt glorious object in nature, whoſe influence is felt by all creation, and ſeen by every animated part of it, to be adored as the fountain of light, heat, and life. The power of healing diſeaſes being chiefly given by the ancients to medicinal plants and vegetable productions, it was natural to exalt into a divinity the viſible cauſe of their growth. Hence he was alſo ſtyled the *God of Phyſic;* and that external heat which cheers and invigorates all nature, being transferred from the human body to the mind, gave riſe to the idea of all mental effervеſcence coming from this god: hence, likewiſe, poets, prophets, and muſicians, are ſaid to be *Numine afflati*, inſpired by Apollo.

APOLLO *Belvidere*, one in the firſt claſs of the ancient ſtatues. The excellence of this ſtatue conſiſts in the expreſſion of ſomething divine, whereas the reſt excel only in things that are common to men. This ſtatue may perhaps juſtly enough claim the preference, even in the ſuperior and diſtinguiſhed claſs of the beſt remains of all antiquity. There are about twenty ancient ſtatues which the moderns have diſcovered that are referred to the firſt claſs, and conſidered each as the chief beauty in its kind.

APOLLONIA, the name of ſeveral ancient cities, particularly of a colony of the Mileſians in Thrace, from which

Lucullus took away a coloſſus of Apollo, and placed it in the capitol.

APOLLONIA, certain feaſts ſacred to Apollo.

APOLLONIA, in geography, a promontory of Africa, upon the coaſt of Guinea, near the mouth of the river Mancu.

APOLLYON, a Greek word that ſignifies *the deſtroyer*, and anſwers to the Hebrew *Abaddon*.

APOLOGETIC, APOLOGETICAL, ſomething ſaid or written, by way of excuſe or apology, for any action or perſon. The Apologetic of Tertullian vindicates the Chriſtians from all that had been objected to them; particularly from the abominable crimes ſaid to be perpetrated at their meetings, and their want of love and fidelity to their country. He addreſſes his Apologetic to the magiſtrates of Rome, the emperor Severus being then abſent.

APOLOGUE, in matters of literature, an ingenious method of conveying inſtruction by means of a feigned relation called a *moral fable*. The only difference between a parable and an apologue is, that the former, being drawn from what paſſes among mankind, requires probability in the narration; whereas the apologue, being taken from the ſuppoſed actions of brutes, or even of things inanimate, is not tied down to the ſtrict rules of probability. Æſop's fables are a model of this kind of writing.

APOMELI, among the old phyſicians, a decoction of honey and vinegar, uſed to promote ſtool, urine, &c.

APOMYOS DEUS, from απο, and μυια *fly*, in the Heathen mythology, a name under which Jupiter was worſhipped at Elis, and Hercules as well as Jupiter at the Olympic games. Theſe deities were ſupplicated under this name, to deſtroy or drive away the vaſt number of flies which always attended at the great ſacrifices.

APONEUROSIS, among anatomiſts, a term denoting the expanſion of a tendon in the manner of a membrane.

APONOGETON; a genus of the digynia order, belonging to the heptandria claſs of plants, which has no Engliſh name. The calyx is an oblong omentum; there is no corolla; and the capſulæ are three-ſeeded. There are two ſpecies, natives of the Indies.

APONUS, a hamlet near Patavium, the birth-place of Livy, now called *Albano*. E. long. 10. Lat. 45. 15.

APOPEMPTIC, in the ancient poetry, a hymn addreſſed to a ſtranger on his departure from a place to his own country. The ancients had certain holidays, wherein they took leave of the gods with *apopemptic* ſongs, as ſuppoſing them returning each to his own country.

APOPHASIS, a figure in rhetoric, by which the orator, ſpeaking ironically, ſeems to wave what he would plainly inſinuate; as, *Neither will I mention thoſe things; which, if I ſhould, you notwithſtanding could neither confute, nor ſpeak againſt.*

APOPHLEGMATIZANTS, in pharmacy, medicines proper to increaſe the ſecretions from the head and noſe.

APOPHTHEGM, a ſhort, ſententious, and inſtructive remark, pronounced by a perſon of diſtinguiſhed character. Such is that of Cyrus: *He is unworthy to be a magiſtrate, who is not better than his ſubjects.* Or this: *He that will not take care of his own buſineſs, will be forced to take care of that of others.*

APOPHYGE, in architecture, a concave part or ring of a column, lying above or below the flat member. The French call it *le conge d'en bas*, or *d'en haut*: the Italians, *cavo di baſſo*, or *di ſopra*; and alſo *il vivo di baſſo*. The apophyge originally was no more than the ring, or ferril, at firſt fixed on the extremities of wooden pillars, to keep them from ſplitting; which afterwards was imitated in ſtone.

APOPHYSIS, in anatomy, a proceſs or protuberance of a bone. See ANATOMY.

APOPLEXY, a diſeaſe in which the patient is ſuddenly deprived of all his ſenſes, and of voluntary motion. See MEDICINE.

APORIA, is a figure in rhetoric, by which the ſpeaker ſhows, that he doubts where to begin for the multitude of matter, or what to ſay in ſome ſtrange and ambiguous thing; and doth, as it were, argue the caſe with himſelf. Thus Cicero ſays, *Whether he took them from his fellows more impudently, gave them to a harlot more laſciviouſly, removed them from the Roman people more wickedly, or altered them more preſumptuouſly, I cannot well declare.*

APORON, or APORIME, a problem difficult to reſolve, and which has never been reſolved, though it be not, in itſelf, impoſſible. The word is derived from απορος, which ſignifies ſomething very difficult, and impracticable; being formed from the privative α, and πορος; *paſſage*. Such we conceive the quadrature of the circle; the duplicature of the cube; the triſection of an angle, &c.—This word is alſo uſed by ſome law writers for an inexplicable ſpeech or diſcourſe.

APOSIOPESIS, in rhetoric, otherwiſe called *reticency*, and *ſuppreſſion*; a figure, by which a perſon really ſpeaks of a thing, at the ſame time that he makes a ſhow as if he would ſay nothing of it. The word comes from αποσιωπαω, *I am ſilent*.—It is commonly uſed to denote the ſame with ELLIPSIS. Jul. Scaliger diſtinguiſhes them; the latter, according to him, being only the ſuppreſſion of a word; as, *me, me; adſum qui feci*; the former, the omitting to relate ſome part of the action; as,

Dixerat, atque illam media inter talia ferro
Collapſam adſpiciunt——————

where the poet does not mention how Dido killed herſelf.—This figure is of uſe to keep up the grandeur and ſublimity of a diſcourſe.

APOSPHRAGISMA, from απο, and σφραγιζω *I ſeal*, in antiquity, the figure or impreſſion of a ſeal.—It was forbid among the ancients to have the figure or image of God on their rings and ſeals; but in proceſs of time it was uſual enough to have the figures of Egyptian and other deities, as well as of heroes, monſters, friends, anceſtors, and even brutes, on their *dactyli*, or ring-ſeals.

APOSTACY, the abandoning the true religion. The primitive Chriſtian church diſtinguiſhed ſeveral kinds of apoſtacy. The firſt, of thoſe who went over entirely from Chriſtianity to Judaiſm; the ſecond, of thoſe who mingled Judaiſm and Chriſtianity together; and the third, of thoſe who complied ſo far with the Jews, as to communicate with them in many of their unlawful practices, without making a formal profeſſion of their religion. But the fourth ſort was of thoſe who, after having been ſome time Chriſtians, voluntarily relapſed into Paganiſm.

APOSTASIS, in medicine, the ſame with abſceſs.

APOSTATA CAPIENDO, in the Engliſh law, a writ that formerly lay againſt a perſon who, having entered into ſome order of religion, broke out again, and wandered up and down the country.

APOSTATE, one who deſerts his religion. Among the Romaniſts, it ſignifies a man who, without a legal diſpenſation, forſakes a religious order of which he had made profeſſion.

A POSTERIORI, or demonſtration *à poſteriori*. See DEMONSTRATION.

APOSTIL, in matters of literature, the ſame with a marginal note.

APOSTLE properly ſignifies a meſſenger or perſon ſent by another upon buſineſs; and hence, by way of eminence, denotes one of the diſciples commiſſioned by Jeſus Chriſt to preach the goſpel.

Our bleſſed Lord ſelected twelve out of the number of his diſciples to be inveſted with the apoſtleſhip. Their names were Simon Peter, Andrew, James the greater, John, Philip, Bartholomew, Thomas, Matthew, James the leſs, Jude ſurnamed Lebbeus or Thaddeus, Simon the Canaanite, and Judas Iſcariot. Of theſe Simon, Andrew, James the greater, and John, were fiſhermen; and Matthew a publican, or receiver of the public revenues: of what profeſſion the reſt were, we are not told in Scripture; though it is probable they were fiſhermen.

There are various conjectures as to the reaſon of our Saviour's making choice of *twelve* apoſtles. The moſt probable is, that it might be in alluſion to the twelve patriarchs, as the founders of their ſeveral tribes; or to the twelve chief heads or rulers of thoſe tribes, of which the body of the Jewiſh nation conſiſted. This opinion ſeems to be countenanced by what our Saviour tells his apoſtles, that "when the Son of man ſhall ſit in the throne of his glory, *they* alſo ſhall ſit upon twelve thrones judging the twelve tribes of Iſrael."

After the apoſtles had exerciſed their miniſtry for twelve years in Paleſtine, they reſolved to diſperſe themſelves in different parts of the world, and agreed to determine by lot what parts each ſhould take. According to this diviſion, St. Peter went into Pontus Galatia, and thoſe other provinces of the Leſſer Aſia. St. Andrew had the vaſt northern countries of Scythia and Sogdiana allotted as his portion. St. John's was partly the ſame with Peter's, namely the Leſſer Aſia. St. Philip had the Upper Aſia aſſigned to him, with ſome parts of Scythia and Colchis. Arabia Felix fell to St. Bartholomew's ſhare. St. Matthew preached in Chaldæa, Perſia, and Parthia. St. Thomas preached likewiſe in Parthia; as alſo to the Hyrcanians, Bactrians, and Indians. St. James the leſs continued in Jeruſalem, of which church he was biſhop. St. Simon had for his portion Egypt, Cyrene, Libya, and Mauritania; St. Jude, Syria and Meſopotamia; and St. Matthias, who was choſen in the room of the traitor Judas, Cappadocia and Colchis. Thus, by the diſperſion of the apoſtles, Chriſtianity was very early planted in a great many parts of the world. We have but very ſhort and imperfect accounts of their travels and actions.

The appellation is given in like manner to thoſe perſons who firſt planted the Chriſtian faith in any place. Thus Dionyſius of Corinth is called the *apoſtle of France;* Xavier the *apoſtle of the Indies*, &c. In the Eaſt Indies the Jeſuit miſſionaries are alſo called *apoſtles*.

Apostle is alſo uſed among the Jews for a kind of officer anciently ſent into the ſeveral parts and provinces in their juriſdiction, by way of viſitor or commiſſary, to ſee that the laws were duly obſerved, and to receive the monies collected for the reparation of the temple, and the tribute payable to the Romans. The Theodoſian code, lib. 14. *De Judæis*, calls thoſe *apoſtoli, qui ad exigendum aurum atque argentum a patriarcha certo tempore diriguntur*. Julian the apoſtate remitted the Jews the *apoſtole*, αποστολη; that is, as he himſelf explains it, the tribute they had been accuſtomed to ſend him. Theſe apoſtles were a degree below the officers of the ſynagogues called *patriarchs*, and received their commiſſions from them.

Apostle, in the Greek liturgy, is particularly uſed for a book containing the epiſtles of St. Paul, printed in the order wherein they are to be read in churches, through the courſe of the year. The Apoſtle of late days has alſo contained the other canonical epiſtles, the Acts of the Apoſtles, and the Revelations.

Apostle is alſo thought by many to have been the original name for biſhops, before the denomination *biſhop* was appropriated to their order.

Apostles' *Creed:* A *formula*, or ſummary of the Chriſtian faith, drawn up, according to Ruffinus, by the apoſtles themſelves, who, during their ſtay at Jeruſalem, ſoon after our Lord's aſcenſion, agreed upon this *creed*, as a rule of faith, and as a *word of diſtinction* by which they were to know friends from foes. Baronius, and ſome other authors, conjecture, that they did not compoſe it till the ſecond year of the reign of Claudius, a little before their diſperſion. As to their manner of compoſing it, ſome fancy, that each apoſtle pronounced his article, which is the reaſon of its being called *ſymbolum apoſtolicum*, it being made up of ſentences jointly contributed, after the manner of perſons paying each their club *(ſymbolum)* or ſhare of a reckoning. But there are reaſons which may induce us to queſtion whether the apoſtles compoſed any ſuch creed as this. The primitive Chriſtians did not publicly recite the creed, except at the times of baptiſm; which, unleſs in caſes of neceſſity, were only at Eaſter and Whitſuntide. The conſtant repeating it was not introduced into the church till the end of the 5th century; about which time Petrus Gnapheus, biſhop of Antioch, preſcribed the recital of it every time divine ſervice was performed.

APOSTOLARE, Apostolicare, *apoſtolizing*, in ſome middle-age writers, denotes the being preferred to the dignity of pope.

APOSTOLATE, in a general ſenſe, is uſed for miſſion. In this ſenſe, Olearius has a diſcourſe concerning the apoſtolate of Chriſt.

Apostolate more properly denotes the dignity or office of an apoſtle of Chriſt; but it is alſo uſed in ancient writers, for the office of a biſhop. In this ſenſe we meet with ſeveral letters, petitions, requeſts, &c. directed to biſhops, under the title of your *apoſtolate*, or *apoſtolatus veſter*. But as the title *apoſtolicus* had been appropriated to the pope, ſo that of *apoſtolate* became at length reſtrained to the ſole dignity of the popedom. Every biſhop's ſee was anciently dignified with the title of *ſedes apoſtolica*, an apoſtolical ſee, which is now the peculiar denomination of the ſee of Rome.

APOSTOLI, in law, denote thoſe letters miſſive which are demanded in caſes of appeal.

APOSTOLIC, Apostolical, ſomething that relates to the apoſtles, or deſcends from them. Thus we ſay, the *apoſtolical* age, *apoſtolical* doctrine, *apoſtolical* character, traditions, &c.

Apostolic, in the primitive church, was an appellation given to all ſuch churches as were founded by the apoſtles; and even to the biſhops of thoſe churches, as being the reputed ſucceſſors of the apoſtles.—Theſe were confined to four, viz. Rome, Alexandria, Antioch, and Jeruſalem. But in after times other churches aſſumed the ſame quality.

Apostolical *Conſtitutions*. See Constitution.

Apostolical *Traditions*. See Tradition.

Apostolical *Fathers* is an appellation uſually given to the writers of the firſt century who employed their pens in the cauſe of Chriſtianity.

APOSTOLICI, or Apostolics, was a name aſſumed by three different ſects, on account of their pretending to imitate the manner and practice of the apoſtles.

APOSTOLICUM is a peculiar name given to a kind of ſong or hymn, anciently uſed in churches. Voſſius underſtands it as ſpoken of the apoſtles' creed. Suicer thinks this impoſſible, for that this creed was then unknown in the churches of the eaſt.

APOSTOOLIANS, a ſect of the Mennonites, which firſt ſprung up in the year 1664, and derived its name from Apoſtool, one of the Mennonite miniſters at Amſterdam. They concurred with them in doctrine, and admitted to their communion thoſe only who profeſſed to believe all the ſentiments which are contained in their public confeſſion of faith.

APOSTROPHE, in rhetoric, a figure by which a perſon who is either abſent or dead is addreſſed as if he were preſent, and attentive to us. This figure is, in boldneſs, a degree lower than the addreſs to perſonified objects (ſee PERSONIFICATION); ſince it requires a leſs effort of imagination to ſuppoſe perſons preſent who are dead or abſent, than to animate inſenſible beings and direct our diſcourſe to them. The poems of Oſſian abound with the moſt beautiful inſtances of this figure. "Weep on the rocks of roaring winds, O Maid of Iniſtore! Bend thy fair head over the waves, thou fairer than the ghoſt of the hills when it moves in a ſun-beam at noon over the ſilence of Morven! He is fallen! Thy youth is low; pale beneath the ſword of Cuchullin!"

APOSTROPHE, in grammar, the contraction of a word by the uſe of a comma: as *call'd* for *called*, *tho'* for *though*.

APOTACTITÆ, or APOTACTICI, an ancient ſect, who affecting to follow the evangelical counſels of poverty, and the examples of the apoſtles and primitive chriſtians, renounced all their effects and poſſeſſions.

APOTEICHISMUS, in the ancient military art, a kind of line of circumvallation drawn round a place in order to beſiege it. This was alſo called *periteichiſmus*. The firſt thing undertaken when cloſe ſiege was laid to a place, was the apoteichiſmus, which ſometimes conſiſted of a double wall, or ramparts, of earth; the innermoſt to prevent ſudden ſallies from the town, the outermoſt to keep off foreign enemies from coming to the relief of the beſieged. This anſwered to what are now called *lines of contravallation* and *circumvallation*.

APOTHECARY, one who practiſes the art of pharmacy. In London, the apothecaries are one of the city-companies. They were incorporated by a charter of king James I. till which time, they only made a part of the grocers' company; and plums, ſugar, ſpice, Venice treacle, mithridate, &c. were ſold in the ſame ſhop and by the ſame perſon. The reaſon of ſeparating them was, that medicines might be better prepared, and in oppoſition to divers perſons who impoſed unwholeſome remedies on the people. But however good this deſign might be, the public ſeem to benefit little from the reſult; ſince *ſophiſtication* and *ſubſtitution* are ſaid to be *crying ſins* with this claſs of practitioners; to ſay nothing of their interference in what alone is the proper buſineſs of phyſicians and ſurgeons. By an act which was made perpetual in the ninth year of George I. they are exempted from ſerving upon juries, or in ward and pariſh offices. They are *required* to make up their medicines according to the formulas preſcribed in the college diſpenſatory; and are *liable* to have their ſhops viſited by the *cenſors* of the college, who are empowered to deſtroy ſuch medicines as they think not good. They have a hall in Blackfriars, where all the ſurgeons' cheſts are ſupplied with medicines for the Britiſh navy.

The charitable diſpenſation of medicines by the Chineſe is deſerving of ſome notice. They have a ſtone, which is ten cubits high, erected in the public ſquares of their cities; on this ſtone are engraved the names of all ſorts of medicines, with the price of each; and when the poor ſtand in need of any relief from phyſic, they go to the treaſury, where they receive the price each medicine is rated at.

APOTHECARY, *Apothecarius*, in writers of the middle age, denotes a ſhop-keeper, or ware-houſe keeper. It is alſo uſed to denote a ſtore-keeper, or officer appointed to have the direction of a magazine, granary, &c. In which ſenſe *apothecarii* is ſometimes rendered by *horearii* and *rationarii*.

APOTHEOSIS, in antiquity, an heathen ceremony, whereby their emperors and great men were placed among the gods. The word is derived from ἀπο, and Θεος *God*. After the apotheoſis, which they alſo called *deification* and *conſecration*, temples, altars, and images were erected to the new deity; ſacrifices, &c. were offered, and colleges of prieſts inſtituted. It was one of the doctrines of Pythagoras, which he had borrowed from the Chaldees, that virtuous perſons after their death were raiſed into the order of the gods. And hence the ancients deified all the inventors of things uſeful to mankind; and thoſe who had done any important ſervice to the commonwealth. A gem in the muſæum of Brandenburg repreſents the apotheoſis of Julius Cæſar, mounted upon the celeſtial globe, and holding an helm in his hand, as if he were now the governor of heaven, as before of the earth.

APOTHERAPIA, from ἀποθεραπευω *I cure*, in phyſic, properly denotes a complete or finiſhed cure.

APOTHERAPIA is alſo uſed in the gymnaſtic art, for the laſt part of all regular exerciſe, viz. friction or unction with oil, before as well as after bathing.

APOTOME, in geometry, the difference between two incommenſurable lines.

APOTOME, in muſic, the difference between a greater and leſſer ſemi-tone; expreſſed by the ratio, 128; 125.

APOTROPÆA, from ἀποτρεπω *I avert*, in ancient poetry, verſes compoſed for averting the wrath of incenſed deities.

APOZEM, in medicine, the ſame with decoction.

APPARATUS, a term denoting a complete ſet of inſtruments, or utenſils, belonging to any art or machine.

APPARATUS is particularly uſed for the operation of cutting for the ſtone, in which there are three ſorts of apparatus, viz. the ſmall, great, and high apparatus. See SURGERY.

APPARATUS is alſo uſed as a title for ſeveral books compoſed in form of catalogues, bibliothecas, dictionaries, &c. for the eaſe and convenience of ſtudy. The apparatus to Cicero is a kind of concordance, or collection of Ciceronian phraſes, &c. The apparatus ſacer of Poſſovin is a collection of all kinds of eccleſiaſtical authors printed in 1611, in three volumes.—Gloſſaries, comments, &c. are alſo frequently called *apparatuſes*.

APPARENT, among mathematicians and aſtronomers, denotes things as they appear to us, in contradiſtinction from real or true; thus we ſay, the apparent diameter, diſtance, magnitude, place, figure, &c. of bodies.

APPARENT *Heir*, in law. No inheritance can veſt, nor can any perſon be the actual complete heir of another, till the anceſtor is previouſly dead. *Nemo eſt hæres viventis*. Before that time the perſon who is next in the line of ſucceſſion is called an *heir apparent*, or *heir preſumptive*. Heirs *apparent* are ſuch, whoſe right of inheritance is indefeaſible, provided they outlive the anceſtor; as the eldeſt ſon or his iſſue, who muſt by the courſe of the common law be heirs to the father whenever he happens to die. Heirs *preſumptive* are ſuch, who, if the anceſtor ſhould die immediately, would in the preſent circumſtances of things be his heirs: but whoſe right of inheritance may be defeated by the contingency of ſome nearer heir being born; as a brother, or nephew, whoſe preſumptive ſucceſſion may be deſtroyed by the birth of a child; or daughter, whoſe preſent hopes may be hereafter cut off by the birth of a ſon. Nay, even if the eſtate hath deſcended, by the death of the owner, to ſuch brother, or nephew, or daughter, in the former caſes, the eſtate ſhall be diveſted and taken away by the birth of a poſthumous child; and, in the latter, it ſhall alſo be totally diveſted by the birth of a poſthumous ſon.

APPARITION, in a general ſenſe, denotes ſimply the appearance of a thing. In a more limited ſenſe, it is uſed for a ſpectre or ghoſt.—Several inſtances of apparitions occur in the Bible; that of Samuel, raiſed by the witch of Endor, has occaſioned great diſputes. The celebrated Dr. Johnſon believed their exiſtence, but this is ſuſpected to be leſs a proof

of wiſdom than of weakneſs in that extraordinary man. The apparitions we find ſo ſolemnly inſiſted on by writers, are mere deluſions of the ſenſe; many others are fictitious, contrived merely to amuſe, or to anſwer ſome unjuſtifiable purpoſe.

APPARITOR, among the Romans, a general term to comprehend all attendants of judges and magiſtrates appointed to receive and execute their orders. *Apparitor*, in England, is a meſſenger that ſerves the proceſs of a ſpiritual court, or a beadle in an univerſity who carries the mace.

APPAUMEE, in heraldry, denotes one hand extended, with the full palm appearing, and the thumb and fingers at full length.

APPEAL, in law, the removal of a cauſe from an inferior to a ſuperior court or judge, when a perſon thinks himſelf aggrieved by the ſentence of the inferior judge. Appeals lie from all the ordinary courts of juſtice to the Houſe of Lords. In eccleſiaſtical caſes, if an appeal is brought before a biſhop, it may be removed to the archbiſhop; if before an archdeacon, to the court of arches, and thence to the archbiſhop; and from the archbiſhop's court to the king in chancery.

Appeal, in common law, denotes an accuſation by a private ſubject againſt another for ſome heinous crime; demanding puniſhment on account of the particular injury ſuffered, rather than for the offence againſt the public.—This private proceſs, for the puniſhment of public crimes, had probably its original in thoſe times, when a private pecuniary ſatisfaction, called a *weregild*, was conſtantly paid to the party injured, or his relations, to expiate enormous offences. But the only appeals now in force for things done within the realm, are appeals of felony and mayhem.

An appeal of felony may be brought for crimes committed either againſt the parties themſelves or their relations. The crimes againſt the parties themſelves are *larceny*, *rape*, and *arſon*. And for theſe, as well as for mayhem, the perſons robbed, raviſhed, maimed, or whoſe houſes are burnt, may inſtitute this private proceſs. The only crime againſt one's relation, for which an appeal can be brought, is that of *killing* him, by either murder or manſlaughter. But this cannot be brought by every relation; but only by the wife for the death of her huſband, or by the heir-male for the death of his anceſtor; which heirſhip was alſo confined by an ordinance of Henry I. to the four neareſt degrees of blood. It is given to the wife on account of the loſs of her huſband; therefore, if ſhe marries again, before or pending her appeal, it is loſt and gone; or, if ſhe marries after judgment, ſhe ſhall not demand execution. The heir, as was ſaid, muſt alſo be heir-male, and ſuch a one as was the next heir by the courſe of the common law at the time of the killing of the anceſtor. But this rule has three exceptions: 1. If the perſon killed leaves an innocent wife, ſhe only, and not the heir, ſhall have the appeal: 2. If there be no wife, and the heir be accuſed of the murder, the perſon, who next to him would have been heir-male, ſhall bring the appeal: 3. If the wife kills her huſband, the heir may appeal her of the death. And, by the ſtatute of Glouceſter, 6 Ed. I. c. 9. all appeals of death muſt be ſued within a year and a day after the completion of the felony by the death of the party, which ſeems to be only declaratory of the old common law.

Theſe appeals may be brought previous to any indictment; and, if the appellee be acquitted thereon, he cannot be afterwards indicted for the ſame offence. In like manner as by the old Gothic conſtitution, if any offender gained a verdict in his favour, when proſecuted by the party injured, he was alſo underſtood to be acquitted of any crown-proſecution for the ſame offence: but, on the contrary, if he made his peace with the king, ſtill he might be proſecuted at the ſuit of the party. And ſo, in England, if a man be acquitted on an indictment of murder, or found guilty, and pardoned by the king, ſtill he ought not (in ſtrictneſs) to go at large, but be impriſoned or let to bail till the year and day be paſt, by virtue of the ſtatute 3 Hen. VIII. c. 1. in order to be forthcoming to anſwer any appeal for the ſame felony, not having as yet been puniſhed for it: though, if he hath been found guilty of manſlaughter on an indictment, and hath had the benefit of clergy, and ſuffered the judgment of the law, he cannot afterwards be appealed; for it is a maxim in law, "that *nemo bis punitur pro eodem delicto*." Before this ſtatute was made, it was not uſual to indict a man for homicide within the time limited for appeals; which produced very great inconvenience.

If the appellee be acquitted, the appellor (by virtue of the ſtatute of Weſtm. 2. 13 Edw. I. c. 12.) ſhall ſuffer one year's impriſonment, and pay a fine to the king, beſides reſtitution of damages to the party for the impriſonment and infamy which he has ſuſtained: and, if the appellor be incapable to make reſtitution, his abettors ſhall do it for him, and alſo be liable to impriſonment. This proviſion, as was foreſeen by the author of Fleta, proved a great diſcouragement to appeals; ſo that thenceforward they ceaſed to be in common uſe.

If the appellee be found guilty, he ſhall ſuffer the ſame judgment, as if he had been convicted by indictment; but with this remarkable difference, that on an indictment, which is at the ſuit of the king, the king may pardon and remit the execution; on an appeal, which is at the ſuit of a private ſubject, to make an atonement for the private wrong, the king can no more pardon it, than he can remit the damages recovered on an action of battery. In like manner as, while the weregild continued to be paid as a fine for homicide, it could not be remitted by the king's authority. And the ancient uſage was, ſo late as Henry the Fourth's time, that all the relations of the ſlain ſhould drag the appellee to the place of execution; a cuſtom, founded upon that ſavage ſpirit of family-reſentment which prevailed univerſally through Europe after the irruption of the northern nations, and is peculiarly attended to in their ſeveral codes of law; and which prevails even now among the wild and untutored inhabitants of America: as if the finger of nature had pointed it out to mankind, in their rude and uncultivated ſtate. However, the puniſhment of the offender may be remitted and diſcharged by the concurrence of all parties intereſted; and as the king by his pardon may fruſtrate an indictment, ſo the appellant by his releaſe may diſcharge an appeal: "*nam quilibet poteſt renunciare juri pro ſe introducto*."

APPEARANCE, in law, ſignifies a defendant's filing a common or ſpecial bail, on any proceſs iſſued out of a court of judicature.

APPELLANT, in a general ſenſe, one who appeals. See Appeal.

Appellants, in church hiſtory, an appellation given to ſuch of the catholic clergy as appeal from the conſtitution unigenitus to a general council.

APPELLATIVE names, in grammar, in contradiſtinction to proper names, are ſuch as ſtand for univerſal ideas, or a whole rank of beings, whether general or ſpecial. Thus fiſh, bird, man, city, river, are common or appellative names; and ſo are trout, eel, lobſter; for they all agree to many individuals, and ſome to many ſpecies.

APPELLEE, among lawyers, the perſon againſt whom an appeal is brought. See Appeal.

APPENDIX, in literature, a treatiſe or ſupplement added at the end of a work, to render it more complete.

APPERCEPTION, or Adperception, a term uſed by Leibnitz and his followers for conſciouſneſs.

APPETITE, in a general ſenſe, the deſire of enjoying ſome object, ſuppoſed to be conducive to our happineſs. When this inclination is guided by reaſon, and proportioned to

the intrinsic value of the object, it is called *rational appetite*; as, on the other hand, it is denominated *sensitive appetite*, when we have only a blind propensity to a thing, without determinate ideas of the good qualities for which we desire it.

Appetites are passions directed to general objects, in contradistinction to passions directed to particular objects, which retain their proper name. Thus we say, an *appetite* for fame, for glory, for conquest, for riches; but we say the *passion* of love, of gratitude, of envy, &c. Appetite may be also distinguished from passion, since the latter has no existence till a proper object be presented; whereas the former exists first, and then is directed to an object.

Appetite, in medicine, a certain uneasy sensation excited in the stomach by the calls of hunger. An excessive appetite has been called by physicians *bulimy* or *fames canina*; a defect or loss of it, *anorexy*; and that after things improper for food, *pica*.

APPIA VIA, a way reaching from Rome through Capua to Brundusium, between 330 and 350 miles long. Its course is described by Horace, Strabo, and Antonine.

APPLAUSE, an approbation of something, signified by clapping the hands, still practised in theatres. Applause, in antiquity, differed from ACCLAMATION, as the latter was articulate and performed with the voice, the former with the hands. Among the Romans, applause was an artificial musical kind of noise, made by the audience or spectators to express their satisfaction. There were three species of applause, denominated from the different noises made in them, viz. *Bombus*, *Imbrices*, and *Testæ*; the first a confused din, made either by the hands or the mouth; the second and third, by beating on a sort of sounding vessels placed in the theatres for this purpose. Persons were instructed to give applause with skill; and there were even masters who professed to teach the art. The proficients in this way let themselves out for hire to the vain-glorious among the poets, actors, &c. and were properly disposed to support a loud applause. These they called *Laudicæni*, and Σοφοκλεις. At the end of the play, a loud peal of applause was expected, and even asked of the audience, either by the chorus or the person who spoke last. The formula was, *Spectatores, plaudite*, or *Valete, et plaudite*. The *plausores*, or applauders, were divided into chori, and disposed in theatres opposite to each other like the choristers in cathedrals, so that there was a kind of concert of applauses.

APPLE, the fruit of the pyrus malus. See PYRUS.

Apple *of the eye*, a name not unfrequently given to the pupil. See ANATOMY.

Apples *of Love*. See LYCOPERSICON.

Mad Apples. See MELONGENA.

APPLEBY, the county-town of Westmoreland, seated on the banks of the river Eden. W. long. 3. 52. N. lat. 54. 30.

APPLICATION, in geometry, is used either for division, for applying one quantity to another, whose areas, but not figures, shall be the same; or, for transferring a given line into a circle, or other figure, so that its ends shall be in the perimeter of the figure.

Application, in theology, is particularly used, by some divines, for the act whereby our Saviour transfers, or makes over to us, what he had earned or purchased by his holy life and death. Accordingly it is by this application of the merits of Christ that we are to be justified, and intitled to grace and glory.

APPOGIATURA, in music, a small note inserted by the practical musician, between two others, at some distance.

APPOINTEE, a foot-soldier, formerly in the French army, &c. who for his long service and bravery received pay above a private sentinel. Till the year 1670, they had also captains and lieutenants under the appellation of *appointees*, who, without residing in the regiment, received pay.

Appointee, in heraldry, the same as *aguisée*: Thus we say, a cross appointée, to signify that with two angles at the end cut off, so as to terminate in points.

APPOINTMENT, a pension or salary originally designed to be given by princes and ministers to persons of worth and parts, in order to retain them in the service of their country; but now chiefly applied to purposes of corruption. Appointments differ from wages, in that the latter are fixed, and paid by the ordinary treasurers; whereas appointments are annual gratifications granted by *brevet* for a time uncertain, and paid out of the privy purse.

APPOSER signifies an examiner. In the court of exchequer, there is an officer called the *foreign apposer*. In the office of confirmation, in the first liturgy of Edward VI. the rubric directs the bishop, or such as he shall appoint, to appose a child; and a bishop's examining chaplain was anciently called his *poser*.

APPOSITION, in grammar, the placing two or more substantives together in the same case, without any copulative conjunction between them; as, *Ardebat Alexim, delicias domini*.

APPRAISER, from *ad* to, and *pretium* value, one who rates or sets a value upon goods, &c. It is practised by brokers of household-furniture, by upholsterers and others, who are supposed to be skilled in the commodities to be appraised or valued. They are employed in cases of death, executions brought in upon goods, or of stock to be turned over from one person to another, or divided between copartners; and are called *sworn appraisers*, from their taking an oath to do justice between party and party. They sometimes appraise on behalf of both sides, each party agreeing to have the same appraiser or appraisers; sometimes in opposition, each party choosing one or more of a side; and sometimes by commission or deputation of trustees, masters in chancery, &c.

APPRAISING, the act of rating, valuing, or setting a price on goods, by a person who is a competent judge, and is authorised thereto.

APPREHENSION, in logic, denotes the simple attention of the mind to an object presented either to our sense or our imagination, without passing a judgment or making any inference.

Apprehension is likewise used to express an inadequate and imperfect idea: and thus it is applied to our knowledge of God, in contradistinction to comprehension.

Apprehension, in law, signifies the seizing a criminal, in order to bring him to justice.

APPRENTICE, from *apprendre* to learn, one who is bound by covenant to serve a tradesman or artificer a certain time, upon condition of the master's instructing him in his art or mystery.

Apprentices may be bound to husbandmen, or even to gentlemen; and they, as well as tradesmen, in England, are compellable to take the children of the poor, whom the overseers, with the consent of two justices, may bind till the age of twenty-one years. Apprentices may be discharged on reasonable cause; but if any, whose premium has been less than ten pounds, run away from their masters, they are compellable to serve out the time of absence, or give satisfaction for it, at any period within seven years after expiration of the original contract. Apprentices gain a settlement in that parish where they last served forty days; and by the 5th of Elizabeth, c. 4. they have an exclusive right to exercise the trade in which they have been instructed, in any part of England.

Apprentices' indentures, and articles of clerkship, pay a stamp duty of seven shillings. Parish indentures are excepted.

and pay ſixpence only, by 5 W. III. c. 21. In the caſe of attornies' clerks, there is a further duty of 100l. if the articles be in order to admiſſion in the courts at Weſtminſter; and 50l. if ſuch articles are in order to admiſſion in any inferior court, holding pleas to the amount of 40s. For fees given with apprentices, clerks, or ſervants, bound or articled by indentures, from 1l. to 50l. maſters pay for every pound ſixpence; and for fees above 50l. one ſhilling in the pound. 8 Ann. c. 9.

Anciently, benchers in the inns of court were called *apprentices of the law*, in Latin *apprenticii juris nobiliores*; as appears by Mr. Selden's note on Forteſcue: and ſo the learned Plowden ſtyles himſelf. Sir Henry Finch, in his *Nomotechnia*, writes himſelf, *apprentice de ley*: ſir Edward Coke in his *Inſt.* ſays, *Apprenticii legis*, in pleading, are called *homines conſiliarii et in lege periti*; and in another place, *apprentices* and other counſellors of law.

In France, the ſons of tradeſmen, living in their father's houſe till ſeventeen years of age, are reputed to have ſerved an apprenticeſhip. In that country, the times of ſerving are different in the different profeſſions, from three years to eight. After ſerving out an apprenticeſhip, the perſon becomes what they call an *aſpirant*, or candidate for maſterſhip, and is to be examined by proper officers as to his ſkill and proficiency, and alſo to exhibit a *chef d'oeuvre*, or maſterpiece in the art he has been bred to, before he be ſuffered to ſet up to practiſe for himſelf. Thus the cuſtom of France in regard to apprentices is not unworthy the imitation of other nations.

APPRENTICESHIP, the ſervitude of an apprentice, or the duration of his indenture.

Seven years ſeem anciently to have been, all over Europe, the uſual term eſtabliſhed for the duration of apprenticeſhips in the greater part of incorporated trades. All ſuch incorporations were anciently called *univerſities*; which, indeed, is the proper Latin name for any incorporation whatever. The univerſity of ſmiths, the univerſity of taylors, &c. are expreſſions which we commonly meet with in the old charters of ancient towns. When thoſe particular incorporations which are now peculiarly called *univerſities* were firſt eſtabliſhed, the term of years which it was neceſſary to ſtudy, in order to obtain the degree of maſter of arts, appears evidently to have been copied from the term of apprenticeſhip in common trades, of which the incorporations were much more ancient. As to have wrought ſeven years under a maſter properly qualified was neceſſary in order to intitle any perſon to become a maſter, and to have himſelf apprentices in a common trade; ſo to have ſtudied ſeven years under a maſter properly qualified was neceſſary to intitle him to become a maſter, teacher, or doctor (words anciently ſynonimous) in the liberal arts, and to have ſcholars or apprentices (words likewiſe originally ſynonimous) to ſtudy under him.

By the 5th of Elizabeth, commonly called the *ſtatute of apprenticeſhip*, it is enacted, that no perſon ſhall for the future exerciſe any trade, craft, or myſtery, at that time exerciſed in England, unleſs he has previouſly ſerved to it an apprenticeſhip of ſeven years at leaſt. Under this act, perſons ſerving ſeven years as apprentices to any trade, have an excluſive right to exerciſe that trade in any part of England; but it being a penal ſtatute made in reſtraint of that natural right which every man had of exerciſing whatever trade he pleaſed, the courts have rather confined than extended the reſtriction: for it has been long ſettled, that the act only extends to ſuch trades as were eſtabliſhed in England before the 5th of Elizabeth.

In France, the duration of apprenticeſhips is different in different towns and in different trades. In Paris, five years is the term required in a great number; but before any perſon can be qualified to exerciſe the trade as a maſter, he muſt, in many of them, ſerve five years more as a journeyman. During this latter term he is called the *companion* of his maſter, and the term itſelf is called his *companionſhip*.

In Scotland there is no general law which regulates univerſally the duration of apprenticeſhips. The term is different in different corporations. Where it is long, a part of it may generally be redeemed by paying a ſmall fine. In moſt towns, too, a very ſmall fine is ſufficient to purchaſe the freedom of any corporation. The weavers of linen and hempen cloth, the principal manufactures of the country, as well as all other artificers ſubſervient to them, wheelmakers, reelmakers, &c. may exerciſe their trades in any town corporate without paying any fine. In all towns corporate, all perſons are free to ſell butcher's meat upon any lawful day of the week. Three years is in Scotland a common term of apprenticeſhip, even in ſome very nice trades; and in general there is no country in Europe in which corporation laws are ſo little oppreſſive.

Apprenticeſhips were altogether unknown to the ancients. The reciprocal duties of maſter and apprentice make a conſiderable article in every modern code. The Roman law is perfectly ſilent with regard to them. There is no Greek or Latin word which expreſſes the idea we now annex to the word apprentice; a ſervant bound to work at a particular trade for the benefit of a maſter during a term of years, upon condition that the maſter ſhall teach him that trade.

Long apprenticeſhips Dr. Smith conſiders as altogether unneceſſary. The arts, which are much ſuperior to common trades, ſuch as thoſe of making clocks and watches, contain no ſuch myſtery as to require a long courſe of inſtruction. The firſt invention of ſuch beautiful machines, indeed, and even that of ſome of the inſtruments employed in making them, muſt, no doubt, have been the work of deep thought and long time, and may juſtly be conſidered as among the happieſt efforts of human ingenuity: but when both have been fairly invented and are well underſtood, to explain to any young man, in the completeſt manner, how to apply the inſtruments and how to conſtruct the machines, cannot well require more than the leſſons of a few weeks; perhaps thoſe of a few days might be ſufficient. In the common mechanic trades, thoſe of a few days might certainly be ſufficient. The dexterity of hand, indeed, even in common trades, cannot be acquired without much practice and experience. But a young man would practiſe with much more diligence and attention, if from the beginning he wrought as a journeyman, being paid in proportion to the little work which he could execute, and paying in his turn for the materials which he might ſometimes ſpoil through awkwardneſs and inexperience. His education in this way generally would be more effectual, and always leſs tedious and expenſive. The maſter, indeed, would be a loſer; he would loſe all the wages of the apprentice, which he now ſaves, for ſeven years together. In the end, perhaps, the apprentice himſelf would be a loſer. In a trade ſo eaſily learnt he would have more competitors; and his wages, when he came to be a complete workman, would be much leſs than at preſent. The ſame increaſe of competition would reduce the profits of the maſters as well as the wages of the workmen. The trades, the crafts, the myſteries, would all be loſers: but the public would be a gainer; the work of all artificers coming in this way much cheaper to market.

On the other hand, it has been inſiſted (and with much reaſon), that apprenticeſhips are uſeful to the commonwealth, by employing of youth, and learning them to be early induſtrious. But that no one would be induced to undergo ſeven years' ſervitude, if others, though equally ſkilful, were allowed the ſame advantages, without having undergone the ſame diſcipline.

APPROACHES, in fortification, the works thrown up by beſiegers, in order to get nearer a fortreſs, without being expoſed to the enemy's cannon.

APPROACHING, in fowling, a term uſed to expreſs ſuch devices as are contrived for the getting within ſhot of ſhy birds. It is principally uſed in marſhy low places, and is effected by dreſſing up a man ſo as to reſemble a cow, a buſh, or any other object not likely on its approach to excite any alarm.

Approaching, in gardening, the inoculating or ingrafting the ſprig of one tree into another, without cutting it off the parent-tree.

APPROBATION, a ſtate or diſpoſition of the mind, wherein we put a value upon, or become pleaſed with, ſome perſon or thing. Moraliſts are divided on the principle of approbation, or the motive which determines us to approve and diſapprove. The Epicureans will have it to be only ſelf-intereſt: according to them, that which determines any agent to approve his own action, is its apparent tendency to his private happineſs; and even the approbation of another's action flows from no other cauſe but an opinion of its tendency to the happineſs of the approver, either immediately or remotely. Others reſolve approbation into a moral ſenſe, or a principle of benevolence by which we are determined to approve every kind affection either in ourſelves or others, and all publicly uſeful actions, which we imagine to flow from ſuch affection, without any view therein to our own private happineſs.

Approbation is more particularly uſed in ſpeaking of recommendations of books, given by perſons qualified or authoriſed to judge of them. Thoſe formerly appointed to grant licences and imprimaturs, uſed to expreſs their approbation of books. Books were ſubjected to a licenſer in England by the 13th Car. II. c. 33. which act is long ſince expired; and being incompatible with the noble principles of the Revolution, has never ſince been, and it is to be hoped never will be, revived.

APPROPRIATION, in the canon law, a ſevering of a benefice eccleſiaſtical to the proper and perpetual uſe of ſome religious houſe. The contrivance of appropriations ſeems to have ſprung from the policy of the monaſtic orders, who have never been deficient in ſubtile inventions for the increaſe of their own power and emoluments. At the firſt eſtabliſhment of parochial clergy, the tithes of the pariſh were diſtributed in a fourfold diviſion; one for the uſe of the biſhop, another for maintaining the fabric of the church, a third for the poor, and the fourth to provide for the incumbent. When the ſees of the biſhops became otherwiſe amply endowed, they were prohibited from demanding their uſual ſhare of theſe tithes, and the diviſion was into three parts only. And hence it was inferred by the monaſteries, that a ſmall part was ſufficient for the officiating prieſt; and that the remainder might well be applied to the uſe of their own fraternities (the endowment of which was conſtrued to be a work of the moſt exalted piety), ſubject to the burden of repairing the church and providing for its conſtant ſupply. And therefore they begged and bought, for maſſes and obits, and ſometimes even for money, all the advowſons within their reach, and then appropriated the benefices to the uſe of their own corporation. But, in order to complete ſuch appropriation effectually, the king's licence, and conſent of the biſhop, muſt firſt be obtained; becauſe both the king and the biſhop may ſome time or other have an intereſt, by lapſe, in the preſentation to the benefice; which can never happen if it be appropriated to the uſe of a corporation, which never dies; and alſo becauſe the law repoſes a confidence in them, that they will not conſent to any thing that ſhall be to the prejudice of the church. The conſent of the patron alſo is neceſſarily implied, becauſe the appropriation can be originally made to none but to ſuch ſpiritual corporation as is alſo the patron of the church; the whole being indeed nothing elſe but an allowance for the patrons to retain the tithes and glebe in their own hands, without preſenting any clerk, they themſelves undertaking to provide for the ſervice of the church. When the appropriation is thus made, the appropriators and their ſucceſſors are perpetual parſons of the church; and muſt ſue and be ſued, in all matters concerning the rights of the church, by the name of *parſons*.

This appropriation may be ſevered, and the church become diſappropriate, two ways; as, firſt, if the patron or appropriator preſents a clerk, who is inſtituted and inducted to the parſonage: for the incumbent ſo inſtituted and inducted is to all intents and purpoſes complete parſon; and the appropriation being once ſevered, can never be reunited again, unleſs by a repetition of the ſame ſolemnities. And, when the clerk ſo preſented is diſtinct from the vicar, the rectory thus veſted in him becomes what is called a *ſine-cure*; becauſe he hath no cure of ſouls, having a vicar under him to whom that cure is committed. Alſo, if the corporation which has the appropriation is diſſolved, the parſonage becomes diſappropriate at common law: becauſe the perpetuity of perſon is gone, which is neceſſary to ſupport the appropriation.

In this manner, and ſubject to theſe conditions, may appropriations be made at this day; and thus were moſt if not all of the appropriations at preſent exiſting originally made; being annexed to biſhoprieks, prebends, religious houſes, nay, even to nunneries, and certain military orders, all of which were ſpiritual corporations. At the diſſolution of monaſteries, by ſtatutes 27 Hen. VIII. c. 28. and 31 Hen. VIII. c. 13. the appropriations of ſeveral parſonages, which belonged to thoſe reſpective religious houſes (amounting to more than one third of all the pariſhes in England), would have been by the rules of the common law diſappropriated. See the articles Parson and Vicar.

APPROVER, in law, one who, confeſſing felony in himſelf, appealeth or impeacheth another or more of his accomplices. He is ſo called from the French *approuver*, *comprobare*, becauſe he muſt prove what he hath alleged in his appeal.

Approvers of the king are thoſe who have the letting of the king's demeſnes in ſmall manors, &c. In the ſtatute of the 1ſt of Ed. III. c. 8. ſheriffs are called the king's *approvers*.—It being in the diſcretion of the court to ſuffer one to be an approver, this method of late hath ſeldom been practiſed. But we have, in caſes of burglary and robbery on the highway, what ſeems to amount to the ſame by ſtatute; it being ordained, that where perſons charged with ſuch crimes out of priſon, diſcover two others concerned in the crime, they ſhall have a pardon, &c. Stat. 5th Anne, c. 31.

Approver is particularly uſed in ancient law writers, for a bailiff or land-ſteward, appointed to have the care of a manor, franchiſe, or the like, and improve and make the moſt of it for the benefit of his maſter. In this ſenſe, the word is alſo written *appruare*.

APPROXIMATION, in arithmetic and algebra, the coming nearer and nearer to a root, or other quantity ſought, without expecting to be ever able to find it exactly.

APPUI, in the menage, (*q. d.* reſt or ſtay upon the hand); is the reciprocal effort between the horſe's mouth and the bridle-hand, or the ſenſe of the action of the bridle on the hand of the horſeman.

A juſt appui of the hand, is the nice bearing up or ſtay of the bridle, ſo that the horſe, being awed by the ſenſibility and tenderneſs of his mouth, dares not reſt too much upon the bit-mouth, nor check or bear upon the hand to withſtand it.

A horſe is ſaid to have no appui, when he is too apprehenſive of the hand, and cannot bear the bit. He is ſaid to have too much appui, when he reſts or throws himſelf too much upon the bit. Horſes deſigned for the army ought to have a full appui upon the hand. To give a horſe a good appui, he ſhould be galloped, and put often back.

APPULSE, in aſtronomy, the approach of any planet to a conjunction with the ſun, or a ſtar. It is a ſtep towards a tranſit, occultation, conjunction, eclipſe, &c. M. Flamſtead, M. de la Hire, and others, have given obſervations of the moon's appulſes to the pleiades. *Phil. Tranſ.* N° xxvi. p. 361. *M. Acad. Scienc. an.* 1708.

APRICOT, in botany. See PRUNUS.

APRIL, the fourth month of the year, according to the common computation; but the ſecond, according to that of the aſtronomers. It contains 30 days.—The word is derived from *aprilis*, of *aperio* I open; becauſe the earth, in this month, begins to open her boſom for the production of vegetables. In this month the ſun travels through the ſign Taurus.

A PRIORI, a kind of demonſtration. See DEMONSTRATION.

APRON, in naval architecture, a piece of curved timber fixed behind the lower part of the ſtern, immediately above the foremoſt end of the keel.

APRON is alſo a name given to a platform or flooring of plank, raiſed at the entrance of a dock, againſt which the dock-gates are ſhut.

APRON, in gunnery, a piece of lead which caps or covers the vent or touch-hole of a great gun.

APSIRTIDES. See ABSORUS.

APSIS or ABSIS, ſignifies the bowed or arched roof of a houſe, room, or oven, &c. as alſo the ring or compaſs of a wheel.

APSIS, in eccleſiaſtical writers, denotes an inner part in the ancient churches, wherein the clergy ſat, and where the altar was placed. It is ſuppoſed to have been thus called, becauſe covered with an arch or vault of its own, by the Greeks called αψις, by the Latins *abſis*. Apſis, in this ſenſe, amounts to the ſame with what is otherwiſe called *choir*, *concha*, *camera*, and *preſbyterian*; and ſtands oppoſite to the *nave* or body of the church.

APSIS is more particularly uſed for the biſhop's ſeat, or throne, in ancient churches. This was peculiarly called *apſis gradata*, becauſe raiſed on ſteps above the ordinary ſtalls.—It was alſo denominated *exedra*, and in latter times *tribune*.

APSIS is alſo uſed for a reliquary, or caſe, wherein the relics of ſaints were anciently kept. It took the name *apſis*, from its being round, or arched at the top; or perhaps from the place where it was kept. The *apſis* was commonly placed on the altar. It was uſually of wood, ſometimes alſo of gold and ſilver, with ſculptures, &c.

APSIS, in aſtronomy, a term uſed indifferently for either of the two points of a planet's orbit, where it is at greateſt or leaſt diſtance from the ſun or earth; and hence the line connecting thoſe points is called the line of the *apſides*. The word is derived from απτω to *connect*. The apſis at the greateſt diſtance from the ſun is called the *aphelion*, and at the greateſt diſtance from the earth the *apogee*; while that at the leaſt diſtance from the ſun is termed the *perihelion*, and at the leaſt diſtance from the earth the *perigee*.

APTERA, a term uſed by Linnæus for his ſeventh order of inſects, comprehending ſuch as have no wings.

APTHANE, a title anciently given to the higher degrees of nobility in Scotland. See THANE.

APTOTE, among grammarians, an indeclinable noun, or one which has no variation of caſes.

APUS, *Avis Indica*, in aſtronomy, a conſtellation of the ſouthern hemiſphere placed near the pole, between the triangulum auſtrale and the chameleon, ſuppoſed to repreſent the bird of paradiſe.

APYCNI SUONI, in muſic, ſounds diſtant one or more octaves, and yet concord.

APYCNOS, in muſic, is ſaid of the diatonic genus, on account of its having ſpacious intervals, in compariſon of the chromatic and enharmonic.

APYREXY, in medicine, denotes the intermiſſion of a fever.

APYROUS, a word applied to denote that property of ſome bodies, by which they reſiſt the moſt violent fire without any ſenſible alteration. Apyrous bodies ought to be diſtinguiſhed from thoſe which are refractory. Refractory ſubſtances are thoſe which cannot by violent heat be fuſed, whatever other alteration they may ſuſtain. But a body, properly ſpeaking, apyrous, can neither be fuſed by heat, nor can undergo any other change. Diamonds were long thought to be poſſeſſed of this property. But ſome late experiments have ſhown, that diamonds may be entirely diſſipated or evaporated by heat, and are therefore not entitled to be ranked among apyrous ſubſtances. Perhaps there is no body in nature eſſentially and rigorouſly apyrous. But it is ſufficient that there be bodies apyrous relatively to the degree of fire which art can produce, to intitle them to that name.

AQUA, a term uſed by phyſicians, chemiſts, &c. for certain medicines, or menſtrua, in a liquid form, diſtinguiſhed from each other by peculiar epithets, as AQUA *roſæ*, *Aqua ammoniæ acetatæ*, *&c.* See PHARMACY.

AQUA *Fortis*, a name by which artiſts call nitrous acid of a certain ſtrength, from its diſſolving power; that which is concentrated, is called *ſmoking ſpirit of nitre*. The aquafortis uſed by dyers, braſs-founders, &c. is not only weaker than ſpirit of nitre, but contains a portion of vitriolic acid. It may be made by diſtilling crude nitre with calcined vitriol, in equal parts. The nitrous acid, expelled by the vitriolic, will riſe in red fumes, and paſs into the receiver. The vitriolic acid, uniting with the alkaline baſis of the nitre, forms vitriolated tartar; but, there being more vitriolic acid than is requiſite to ſaturate the alkali, the ſurplus riſes with the nitrous acid: aquafortis, therefore, is a mixture of theſe two acids. It may alſo be made by diſtilling crude nitre with ſomewhat more than half its weight of oil of vitriol; or by mixing one part of oil of vitriol with nine parts pure ſpirit of nitre. See ACIDS and CHEMISTRY.

AQUA *Marina*, a name by which the jewellers call the beryl on account of its ſea-green colour. See BERYL.

AQUA *Regia*, a compound of the nitrous and marine acids, in different proportions according to the purpoſe for which it is intended. It is uſually made by diſſolving in nitrous acid, ſal ammoniac, or common ſalt, both which are combinations of marine acid with alkali. When made with ſal ammoniac, the common proportion is one part of this ſalt to four parts of nitrous acid; but to diſſolve platina, equal parts are requiſite. A purer aqua regia may be made by ſimply mixing the two acids. Aqua regia is particularly uſed as a menſtruum for gold; it likewiſe diſſolves all other metals, except ſilver. The gold diſſolved in aqua regia is, in fact, diſſolved in the dephlogiſticated marine acid only, which, being deprived of its phlogiſton by the nitrous acid, recovers it from the gold and thus renders gold ſoluble; for metals are not ſoluble in acids until they loſe a part of their phlogiſton. See CHEMISTRY.

AQUA *Secunda*; aquafortis greatly diluted with pure water. It is employed in ſeveral of the arts, to clean the ſurface of metals and ſtones, and for various other purpoſes.

AQUA *Vitæ*, is commonly underſtood of what is otherwiſe called *brandy*, or ſpirit of wine, either ſimple, or prepared with aromatics. Some, however, diſtinguiſh between them; applying the term *brandy* to what is drawn from wine, or the grape; and *aqua vitæ* to that drawn after the ſame manner from malt, &c.

AQUÆDUCT, AQUÆDUCTUS, q. d. *ductus aquæ, a conduit of water*, is a conſtruction of ſtone or timber, built on an uneven ground, to preſerve the level of water, and convey it, by a canal, from one place to another. There are *aquæducts* under ground, and others raiſed above it, ſupported by arches.—The Romans were very magnificent in their *aquæducts*; they had ſome that extended an hundred miles. Frontinus, a man of conſular dignity, and who had the direction of the *aquæducts* under the emperor Nerva, tells us of nine that emptied themſelves through 13,594 pipes, of an inch diameter. Vigenere has obſerved, that, in the ſpace of twenty-four hours, Rome received from theſe *aquæducts* no leſs than five hundred thouſand hogſheads of water.—The three chief *aquæducts* now in being are thoſe of the Aqua Virginea, Aqua Felice, and Aqua Paulina. The firſt was repaired by pope Paul IV. The ſecond was conſtructed by pope Sixtus V. and is called from the name which he aſſumed before he was exalted to the papal throne. The third was repaired by pope Paul V. in the year 1611.—The *aquæduct* built by Lewis XIV. near Maintenon, for carrying the river Bure to Verſailles, is perhaps the greateſt in the world. It is 7000 fathoms long, and its elevation 2560 fathoms; containing 242 areades. Vide Phil. Tranſ. ap. Lowth. Abr. vol. i. p. 594.

AQUAMBOE, one of the greateſt monarchies on the coaſt of Guinea in Africa, ſtretching 20 miles in breath, and ten times that ſpace in length from eaſt to weſt.

AQUARIANS, Chriſtians in the primitive church who conſecrated water in the euchariſt inſtead of wine, under pretence of abſtinence and temperance.

AQUARIUS, the WATER-CARRIER, in aſtronomy, the 11th ſign in the zodiac, reckoning from Aries; from which alſo the 11th part of the ecliptic takes its name.—The ſun moves through Aquarius in the month of January; it is marked thus, ♒. The ſtars in the conſtellation Aquarius, in Ptolemy's catalogue, are 45; in Tycho's 41; in Hevelius's 47; in Flamſtead's 108.

AQUARTIA, in botany, a genus of the tetrandria monogynia claſs. The calyx is campanulated; the corolla is rotated, with linear diviſions; and the berry is four-ſeeded. There is but one ſpecies, the *aculeata*, a native of America.

AQUATIC, in natural hiſtory, an appellation given to ſuch things as live or grow in the water.

AQUATINTA, a method of etching on copper, lately invented, and by which a ſoft and beautiful effect is produced, reſembling a fine drawing in water-colours or Indian ink.—Previous to the operation upon the plate, the following powder muſt be prepared. Take equal parts of aſphaltum and fine tranſparent roſin, and powder them ſeparately in a mortar. Through a muſlin ſieve, ſift upon a ſheet of paper a thin ſtratum of the aſphaltum, above which ſift a ſimilar layer of the roſin, and upon this another layer of aſphaltum, continuing theſe alternate layers till both of the powders are exhauſted. Then paſs the mixture both together through the ſame ſieve ſo as to mix them ſufficiently for uſe. Some, inſtead of the above mixture, uſe powdered gum ſandarach only.

The proceſs is as follows.—A copper plate being poliſhed in the uſual way, lay the etching ground upon it, and etch the outlines of your deſign in the manner directed under the article ETCHING. The ground is then to be ſoftened with a little greaſe, and wiped off with a piece of rag; leaving, however, as much greaſe upon the plate as juſt to dim the copper. Next ſift the powder upon the ſurface of the plate; after which, ſtrike the other ſide of it pretty ſmartly againſt the edge of a table to diſcharge it of the looſe powder. This done, with a hand-vice hold the back of the plate over a chaffing-diſh of burning charcoal, till it become ſo hot as to give pain upon being touched with the back of the hand; when the powder which adhered to the greaſe will now be fixed to the plate. The plate being then ſuffered to cool, take turpentine varniſh mixed with ivory black; and with a hair-pencil dipt in it, cover all the lights or places where there is no work or ſhade. A rim or border of bees-wax is now to be raiſed round the plate; and having reduced a quantity of aquafortis to a proper ſtrength with water, pour it on, and let it ſtand five minutes for the firſt or lighteſt ſhade; after which, pour it off: and having waſhed the plate with water, ſet it edgewiſe to dry. Then with varniſh ſtop out all the light ſhades, pour on the aquafortis for the ſecond tint, and let it ſtand five minutes more; proceeding in the ſame manner for every tint till you produce the darkeſt ſhades. If a bold open ground is wanted in any part, this requires an after-operation. The ground muſt be laid as in the other caſe, by ſifting on the powder; only this powder muſt be much coarſer, and the plate more heated in order that the particles of the powder may ſpread, and form ſmall circles: even good clean roſin will do by itſelf. In etching landſcapes, the ſky and diſtant objects are alſo performed by a ſecond operation, and the powder is ſifted upon the plate with a finer ſieve. If the trees or any part of the fore-ground require to be finiſhed higher, the plate muſt be entirely cleanſed from greaſe with bread, and a ground laid in the common way of etching; when you may finiſh as highly and neatly as you pleaſe with the needle or point, by ſtippling with dots, and biting in thoſe parts, or by a rolling-wheel, which is more expeditious.

If different colours are to be expreſſed in aqua tinta, there will be required ſo many different plates, each having only that part etched upon it which is deſigned to be charged with its proper colour. It may happen however in particular ſubjects that ſome of the colours are ſo diſtant from each other as to allow the printer room to rub them in without blending; in which caſe, two or three different colours may be printed from the ſame plate at once.—Where different plates are neceſſary, a ſeparate one, having a pin in each corner, muſt be provided as a ſole or bottom to the aquatinta plates; and theſe again muſt be exactly fitted, having each a ſmall hole in their corners for paſſing over the pins of the ſole: the ſaid pins ſerving the double purpoſe of retaining the plates ſucceſſively in their due poſition, and of directing the printer in placing the paper exactly on each plate ſo as not to ſhift; by which means each tint or colour will be exactly received on its proper place. This is the method practiſed in France.—A landſkip or any ſimilar ſubject may be printed off at once in its different proper colours, by laying theſe upon the plate. In this caſe, the colours muſt be pretty thick in their conſiſtence; and the plate muſt be carefully wiped in the uſual way after the laying on of each tint, as well as receive a general wipe when charged with all the tints.

The art of engraving in aquatinta is kept a ſecret by thoſe artiſts who practiſe it. In order to ſucceed in it, great care and judgment are requiſite; and much depends upon a certain nicety of management, which is only attainable by practice.

AQUAVIVA, a town of the kingdom of Naples, and province of Barri.

AQUEDUCT. See AQUÆDUCT.

AQUEOUS, in a general ſenſe, ſomething partaking of the nature of water, or that abounds with it.

AQUEOUS *Humour*. See ANATOMY, p. 211.

AQUILA, in ornithology, a ſynonime of the eagle. See FALCO.

AQUILA the EAGLE, in aſtronomy, a conſtellation of the northern hemiſphere; uſually joined with Antinous. The ſtars in the conſtellation Aquila and Antinous, in Ptolemy's catalogue, are 15; in Tycho's, 19; in Hevelius's, 42; in the Britannic catalogue, 71.

AQUILA, a fine large city of Italy, and the capital of Abruzzo, ſeated on a hill, on the banks of the river Peſcara, near its ſource. E. long. 14. 20. N. lat. 42. 20.

AQUILEGIA, COLUMBINE; a genus of the pentagynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, *Multiſiliquæ*. It has no calyx; the petals are five, with a horn-like nectarium inſerted between each; and there are five ſeparate capſules. The *Species* are, 1. The vulgaris, or wild columbine, with blue flowers, growing wild in the woods in England. 2. The alpina, with long oval and larger flowers, grows naturally near Ingleborough-hill in Yorkſhire. 3. The inverſe, or garden columbine, of which there are great varieties. Theſe are commonly called *roſe columbines*; their colours are cheſnut, blue, red, and white, and ſome are finely variegated. 4. The canadenſis, or Canada columbine, flowers almoſt a month before the other ſorts, and therefore is preſerved, though not remarkable for beauty. There is a variety of this with taller flower-ſtems.—Theſe plants are all propagated by ſowing the ſeeds, or parting the old roots; but the former method is chiefly practiſed. The ſeeds ſhould be ſown in a nurſery-bed in Auguſt or September; for thoſe which are kept till the ſpring ſeldom grow well, or at leaſt remain in the ground a whole year. The ſpring following the plants will appear above ground, and ſhould be kept clear of weeds; and if the ſeaſon proves dry, they muſt be watered. In the middle or latter end of May, they will be ſtrong enough to tranſplant; for which purpoſe, ſome beds of good undunged earth ſhould be prepared, planting them therein at eight or nine inches diſtance from each other. In the following autumn, when the plants have acquired ſtrength enough to flower the year following, the roots ſhould be planted in the borders of the flower-garden.

AQUILEIA, formerly a flouriſhing trading town of Italy, but now gone to decay. It is ſeated on the Friuli, near the ſea, 57 miles N. E. of Venice. Lon. 13. 8. E. Lat. 46. 0. N.

AQUILICIUM, or AQUILICIANA, in Roman antiquity, ſacrifices performed in times of exceſſive drought, to obtain rain of the gods.

AQUILO, is uſed by Vitruvius for the north-eaſt wind; or that which blows at 45° from the north toward the eaſt point of the horizon.—The poets gave the name *aquilo* to all ſtormy winds dreaded by the mariner.

AQUILUS, among the ancients, a dark, or duſky colour approaching to black. Hence ſome of the Heathen gods were called *dii aquili*, q. d. *nigri*.

AQUIMINARIUM, in antiquity, a kind of luſtral veſſel, wherein the Romans carried their holy water for expiation and other religious offices.

AQUINO, a town in Italy, in the kingdom of Naples; the birth-place of the poet Juvenal. E. long. 14. 30. N. lat. 41. 32.

ARA THURIBULI, the altar of incenſe, in aſtronomy, a ſouthern conſtellation, not viſible in our hemiſphere, conſiſting, according to Ptolemy, of ſeven ſtars; and according to Sharp's Catalogue, annexed to that of Mr. Flamſtead, of nine ſtars.

ARA, in aſtronomy, a ſouthern conſtellation, containing eight ſtars.

ARAB, or ARABIAN HORSE. See EQUUS.

ARABESQUE, or ARABESK, ſomething done after the manner of the Arabians. *Arabeſque*, *Groteſque*, and *Moreſque*, are terms applied to ſuch paintings, ornaments of friezes, &c. wherein there are no human or animal figures, but which conſiſt wholly of imaginary foliages, plants, ſtalks, &c. The words take their riſe from hence; that the Moors, Arabs, and other Mahometans, uſe theſe kinds of ornaments; their religion forbidding them to make any images or figures of men or other animals.

ARABIA, a country of Aſia, bounded on the W. by the Red Sea and the iſthmus of Suez; on the N. E. by the river Euphrates, which divides it from Diarbec, or Diarbekar, the ancient Meſopotamia; on the E. by the gulfs of Perſia and Ormus; and on the S. by the Indian Ocean.

It lies between 35 and 60 degrees E. lon. and 12 and 30 N. lat. extending 1430 miles in length and 1200 in breadth. It is divided into three parts, Arabia Petrea, Deſerta, and Felix, or the Happy. Arabia Petrea is the ſmalleſt of the three, and, toward the N. is full of mountains, with few inhabitants, on account of its barrenneſs. It had its name from the town Petrea, its ancient capital, now deſtroyed. It differs little from Arabia Deſerta, ſo called from the nature of the ſoil, which is generally a barren ſand. However, there are great flocks of ſheep, and herds of cattle, near the Euphrates, where the land is good. In the deſert there are great numbers of oſtriches, and there is a fine breed of camels in ſeveral places. Arabia Felix is ſo called, on account of its fertility, with regard to the reſt. The Arabs in the deſert live wandering lives, removing from place to place, partly for the ſake of paſture, and partly to lie in wait for the caravans, which they often rob, as they travel over part of this deſert from Buſſarah to Aleppo, and from Egypt to Mecca, in order to viſit Mahomet's tomb. Arabia Felix produces frankincenſe, myrrh, balm of gilead, gum arabic, and more eſpecially coffee, of which they export prodigious quantities. The Arabs, who live in the deſert, have no houſes, but tents. The famous Mahomet was a native of this country; and his followers, ſoon after his death, conquered a great part of Aſia, Africa, and Europe, eſtabliſhing their religion wherever they came.

Gum ARABIC. See GUM.

ARABICI, a ſect who ſprung up in Arabia about the year 207, whoſe diſtinguiſhing tenet was, that the ſoul died with the body, and alſo roſe again with it. Euſebius, lib. vi. c. 38. relates, that a council was called to ſtop the progreſs of this riſing ſect; and that Origen aſſiſted at it, and convinced them ſo thoroughly of their error that they abjured it.

ARABIS, BASTARD TOWER-MUSTARD; a genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ*. The generic mark conſiſts in 4 nectiferous glands which lie on the inſide of each leaf of the calyx. There are 8 ſpecies; but none of them remarkable for their beauty or other properties. Only one of theſe, the thaliana or mouſe-ear, is a native of Britain. It is a low plant, ſeldom riſing more than four or five inches high, branching on every ſide, having ſmall white flowers growing alternately, which have each four petals in form of a croſs, that are ſucceeded by long ſlender pods filled with ſmall round ſeeds.

ARABISM, ARABISMUS, an idiom or manner of ſpeaking peculiar to the Arabs or the Arabic language.

ARABIST, a perſon curious of, and ſkilled in, the learning and languages of the Arabians; ſuch were Erpenius and Golius. The ſurgeons of the 13th century are called *Arabiſts* by Severinus.

ARABLE LANDS, thoſe which are fit for tillage, or which have been formerly tilled.

ARACAN, the capital of a ſmall kingdom to the north-eaſt of the bay of Bengal, ſituated in E. long. 93. 0. N. lat. 20. 30.

ARACHIS, in botany; a genus of the diadelphia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, *Papilionaceæ*. There is only one ſpecies, the hypogæa, an annual plant, and a native of Braſil and Peru. The ſtalks are long, trail upon the ground, and are furniſhed with winged leaves, compoſed of four hairy lobes each. The flowers are produced ſingly on long pedunclcs; yellow, of the pea kind, and each containing ten awl-ſhaped ſtamina, nine of which are tied together, and the upper one ſtands off. In the centre is an awl-ſhaped ſtylus, crowned with a ſimple ſtigma. The germen is oblong, and becomes an oval oblong pod, containing two or three oblong blunt ſeeds. —This plant is cultivated in all the American ſettlements for the ſeeds, which make a conſiderable part of the food of the ſlaves. The manner of perfecting them is very ſingular: for as the flowers fall off, the young pods are forced into the ground by a natural motion of the ſtalks, and there they are entirely buried, and not to be diſcovered without digging for them; whence they have taken the name of *ground-nuts*.

ARACHNE, in fabulous hiſtory, a young maid of Lydia, ſaid to have been the inventreſs of ſpinning.

ARACHNOIDES, in anatomy, an appellation given to ſeveral membranes; as the capſule of the cryſtalline humour of the eye, the external lamina of the pia mater, and one of the coverings of the ſpinal marrow.

ARACK, ARRACK, or RACK, a ſpirituous liquor imported from the Eaſt Indies, uſed by way of dram and in punch. The word *arack*, according to Mr. Lockyer, is an Indian name for ſtrong waters of all kinds; for they call our ſpirits and brandy *Engliſh arack*. But what we underſtand by the name *arack*, he affirms, is really no other than a ſpirit procured by diſtillation from a vegetable juice called *toddy*, which flows by inciſion out of the cocoa-nut tree, like the birch-juice procured among us. The toddy is a pleaſant drink by itſelf, when new, and purges thoſe who are not uſed to it: and, when ſtale, it is heady, and makes good vinegar. The Engliſh at Madras uſe it as leaven to raiſe their bread with. Others are of opinion, that the arack or arrack is a vinous ſpirit obtained by diſtillation, in the Eaſt Indies, from rice or ſugar, fermented with the juice of cocoa-nuts. The Goa arack is ſaid to be made from the toddy, the Batavia arack from rice and ſugar; and there is likewiſe a kind of ſhrub from which arack is made.

The manner of making the Goa arack is this: The operator provides himſelf with a parcel of earthen pots, with bellies and necks like our ordinary bird-bottles: he makes faſt a number of theſe to his girdle, and any way elſe that he commodiouſly can about him. Thus equipped, he climbs up the trunk of a cocoa-tree; and when he comes to the boughs, he takes out his knife, and cutting off one of the ſmall knots or buttons, he applies the mouth of the bottle to the wound, faſtening it to the bough with a bandage; in the ſame manner he cuts off other buttons, and faſtens on his pots, till the whole number is uſed: this is done in the evening, and deſcending from the tree, he leaves them till the next morning; when he takes off the bottles, which are moſtly filled, and empties the juice into the proper receptacle. This is repeated every night, till a ſufficient quantity is produced; and the whole being then put together, is left to ferment, which it ſoon does. When the fermentation is over, and the liquor or waſh is become a little tart, it is put into the ſtill, and a fire being made, the ſtill is ſuffered to work as long as that which comes over has any conſiderable taſte of ſpirit. This is afterwards rectified by repeated diſtillations to that very weak kind of proof-ſpirit which we find it. The arack we meet with, notwithſtanding its being of a proof-teſt, according to the way of judging by the crown of bubbles, holds but a ſixth, and ſometimes but an eighth part of alcohol, or pure ſpirit; whereas our other ſpirits, when they ſhow that proof, are generally eſteemed to hold one half pure ſpirit. There is a paper of obſervations on arack, in the *Melanges d'Hiſtoire Natur.* tome v. p. 302.

ARACK is alſo the name of a ſpirituous liquor made by the Tartars of Tungutia, of mare's milk, left to ſour, and afterwards diſtilled twice or thrice between two earthen pots cloſely ſtopped, whence the liquor runs through a ſmall wooden pipe. It is more intoxicating than brandy.

ARÆOMETER, an inſtrument wherewith to meaſure the denſity or gravity of fluids. The aræometer, or water-poiſe, is uſually made of glaſs; conſiſting of a round hollow ball, which terminates in a long ſlender neck hermetically ſealed at top: there being at firſt as much quickſilver put into it as will ſerve to balance or keep it ſwimming in an erect poſition.

The ſtem is divided into degrees as repreſented in fig. 1. Pl. 29. and by the depth of its deſcent into any liquor, the lightneſs of that liquor is concluded; for that fluid in which it ſinks leaſt muſt be heavieſt: and that in which it ſinks loweſt, lighteſt.

M. Homberg has invented a new aræometer, deſcribed in Phil. Tranſact. N° cclxii thus: *a* (fig. 2.) is a glaſs bottle, with ſo ſlender a neck that a drop of water takes up in it about five or ſix lines, or half of an inch. Near that neck is a ſmall capillary tube *d*, about ſix inches long, and parallel to the neck.—To fill the veſſel, the liquor is poured in at the mouth *b* (which is widened to receive a tunnel), till it run out at *d*, that is, till it riſe in the neck to the mark *c*, by which means you have always the ſame bulk or quantity of liquor; and conſequently, by means of the balance, can eaſily tell, when different liquors fill it, which weigh the moſt. Some regard, however, is to be had in theſe trials to the degree of heat and cold in the weather; becauſe ſome liquors rarefy with heat and condenſe with cold more than others, and accordingly take up more or leſs room.—By means of this inſtrument the ingenious author has made a table to ſhow the different weights of the ſame bulk of the moſt conſiderable chemical liquors both in ſummer and winter, as follows:

The aræometer full of	Weighed in ſummer. *oz. dr. gr.*	In winter. *oz. dr. gr.*
Quickſilver,	11 00 06	11 00 32
Oil of tartar,	01 03 08	01 03 31
Spirit of urine,	01 00 32	01 00 43
Oil of vitriol,	01 03 58	01 04 03
Spirit of nitre,	01 01 40	01 01 70
Spirit of ſalt,	01 00 39	01 00 47
Aquafortis,	01 01 38	01 01 55
Vinegar,	00 07 55	00 07 60
Spirit of wine,	00 06 47	00 06 61
River water,	00 07 53	00 07 57
Diſtilled water,	00 07 50	00 07 54

The inſtrument itſelf weighed, when empty, one dram twenty-eight grains. See HYDROMETER.

ARÆOPAGUS. See AREOPAGUS.

ARÆOSTYLE, in architecture, a term uſed by Vitruvius, to ſignify the greateſt interval which can be made between columns.

ARÆOTICS, in medicine, remedies ſuppoſed to rarefy the humours, and render them eaſy to be carried off by the pores of the ſkin.

ARAF, among the Mahometans. See ALARAF.

ARAFAH, the ninth day of the laſt month of the Arabic year, named *Dhoulhegiat*; on which the pilgrims of Mecca perform their devotions on a neighbouring mountain called *Araſat*.

ARAFAT, or GIBEL EL ORPHAT, *the mountain of knowledge*, a mountain in Arabia, near Mecca. The Mahometans ſay this was the place where Adam firſt met with and knew his wife Eve after their expulſion from Paradiſe, and after a ſeparation of 120 years. The pilgrims are clad in robes of humility and mortification, with their heads uncovered, and ſeem to be very much affected; begging earneſtly for remiſſion of ſins, and promiſing to lead a new life. They continue here 4 or 5 hours, and at half an hour after ſun-ſet, decamp to perform a religious duty called *Aſham nomas*. After this, they all receive the honourable title of *hadgees* conferred upon them by the imam or prieſt; and this being pronounced, the trumpet ſounds, and they all return to Mecca.

ARAGON. See ARRAGON.

ARAL, a great lake in the kingdom of Khowarazm, lying a little to the eaſtward of the Caſpian ſea.

ARAHUM, or HARAHUM, in ancient writers, denotes a place conſecrated or ſet apart for holy purpoſes. Hence the phraſe *in arabo jurare*, or *conjurare*, "to make oath in the church;" becauſe, by the Ripuarian laws, all oaths were to be taken in the church on the relics of the ſaints.

ARALIA, the ANGELICA TREE; a genus of the pentagynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 46th order, *Hederaceæ*. The eſſential characters are theſe: The involucrum is an umbella; the calyx is quinquedentated, and above the fruit; the corolla conſiſts of five petals; and the berry has five ſeeds. There are five ſpecies of Aralia, all natives of the Indies. The principal are, 1. The nudicaulis, which has a naked ſtalk, and grows three or four feet high; the leaves having two large trifoliate lobes, which are ſawed on their edges. The flower-ſtalks ariſe between theſe, immediately from the root, and are terminated by round umbels of ſmall four-leaved flowers of a whitiſh colour. The roots of this ſpecies were brought over from North America, and ſold here for ſarſaparilla, and it is ſtill uſed as ſuch by the inhabitants of Canada; though it is very different from the true ſort. 2. The ſpinoſa, with a prickly ſtem, is a very ornamental ſhrub, and a native of Virginia. It will grow, if the ſoil and ſituation agree, to about twelve feet; and the ſtem, which is of a dark brown colour, is defended by ſharp ſpines. The flowers are produced in large umbels from the ends of the branches, of a greeniſh yellow colour; and their general characters indicate their ſtructure. They appear about the end of July, but are not ſucceeded by ripe ſeeds in our gardens. This tree will what gardeners call *ſpawn*; i. e. after digging among the roots, young plants will ariſe, the broken roots ſending forth freſh ſtems; nay, if the roots are planted in a warm border, and ſhaded in hot weather, they will grow; but if they are planted in pots, and aſſiſted by a moderate warmth of dung, or tanner's bark, they will be pretty ſure of ſucceſs; ſo that the propagation of this tree is very eaſy. But the general method of propagating it, and by which the beſt plants may be had, is from ſeeds, which muſt be procured from America, for they do not ripen in Britain.

ARAMONT, a town of the late province of Languedoc in France. E. long. 4. 52. N. lat. 43. 54.

ARANEA, the SPIDER; a genus of inſects belonging to the order of aptera, or inſects without wings. All the ſpecies of ſpiders have eight legs, with three joints in each, and terminating in three crooked claws; eight eyes, two before, two behind, and the reſt on the ſides of the head. In the fore-part of the head, at the mouth, there is a pair of ſharp crooked claws or forceps: theſe ſtand horizontally; and, when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth. A little below the point of each claw, there is a ſmall hole, through which Lewenhoek ſuppoſes the ſpider emits a kind of poiſon; though this is poſitively contradicted by Dr. Mead. Theſe claws are the weapons with which they kill flies, &c. for their food. The belly or hinder part is ſeparated from the head and breaſt by a ſmall thread-like tube. The ſkin or outer ſurface is a hard poliſhed cruſt.

Spiders have five tubercles or nipples at the extremity of the belly, whoſe apertures they can enlarge or contract at pleaſure. It is through theſe that they ſpin a gluey ſubſtance with which their bellies are filled. They fix the end of their threads by applying theſe nipples to any ſubſtance, and the thread lengthens in proportion as the animal recedes from it. They can ſtop the iſſuing of the threads by contracting the nipples, and re-aſcend by means of the claws on their feet, much in the ſame manner as ſome men warp up a rope. When the common houſe-ſpider begins her web, ſhe generally chooſes a place where there is a cavity, ſuch as the corner of a room, that ſhe may have a free paſſage on each ſide, to make her eſcape in caſe of danger. Then ſhe fixes one end of her thread to the wall, and paſſes on to the other ſide, dragging the thread along with her (or rather the thread follows her as ſhe proceeds), till ſhe arrives at the other ſide, and there fixes the other end of it. Thus ſhe paſſes and repaſſes, till ſhe has made as many parallel threads as ſhe thinks neceſſary for her purpoſe. After this, ſhe begins again and croſſes theſe by other parallel threads, which may be named the *woof*. But, beſides this large web, ſhe generally weaves a ſmall cell for herſelf, where ſhe lies concealed watching for her prey. Betwixt this cell and the large web, ſhe has a bridge of threads, which, by communicating with the threads of the large one, both give her early intelligence when any thing touches the web, and enables her to paſs quickly in order to lay hold of it. There are many other methods of weaving peculiar to different ſpecies of ſpiders; but as they are all intended for the ſame purpoſe, it is needleſs here to give particular deſcriptions of them.

That darting out of long threads, however, by means of which ſome ſpecies convey themſelves to great diſtances, deſerves particular notice. Dr. Liſter tells us, that attending cloſely to a ſpider weaving a net, he obſerved it ſuddenly to deſiſt in the mid-work; and turning its tail to the wind, it darted out a thread with the violence and ſtream we ſee water-ſpout out of a jet; this thread, taken up by the wind, was immediately carried to ſome fathoms long, ſtill iſſuing out of the belly of the animal. By-and-by, the ſpider leaped into the air, and the thread mounted her up ſwiftly. After this diſcovery, he made the like obſervation in near thirty different ſorts of ſpiders; and found the air filled with young and old, failing on their threads, and doubtleſs ſeizing gnats and other inſects in their paſſage, there being often manifeſt ſigns of ſlaughter, legs and wings of flies, &c. on thoſe threads as well as in their webs below. It is ſcarcely credible to what height they will mount; yet it is preciſely true, and a thing eaſily to be obſerved by one that ſhall fix his eye ſome time on any part of the heavens, the white webs, at a vaſt diſtance, very diſtinctly appearing from the azure ſky; but this is in autumn only, and that in very fair and calm weather. In January 1670, ſpeaking of the height ſpiders are able to fly to, he ſays, "I took notice, that the air was very full of webs; I forthwith mounted to the top of the higheſt ſteeple on the Minſter (in York), and could there diſcern them yet exceedingly high above me." He further obſerves, that they not only thus ſhoot their threads upward, and mount with it in a line almoſt perpendicular; but alſo project them in a line parallel to the horizon, as may be ſeen by their threads running from one wall to another in a houſe, or from one tree to another in a field, and even from wall to wall acroſs gardens of conſiderable extent.

The matter of which the ſpider's threads are formed, we

have obſerved, is a viſcid juice, elaborated in the body of the animal, and emitted from papillæ ſituated at the extremity of the belly; which papillæ are furniſhed with numerous apertures that do the buſineſs of wire-drawers, as it were, in forming the threads. Of theſe apertures there are enough in the compaſs of the ſmalleſt pin's head to yield a prodigious quantity of diſtinct threads; ſo that there may threads come out at above a thouſand different places in every papilla; and conſequently the ſpider, having five papillæ, has holes for above five thouſand threads.

Such is the tenuity of the threads in the larger ſort of ſpiders. But if we examine the young produced by theſe, we ſhall find that they no ſooner quit their egg than they begin to ſpin. Their threads can ſcarcely be perceived, though the webs may; there being often 400 or 500 little ſpiders concurring in the ſame work. But there are even ſome kinds of ſpiders ſo ſmall at their birth, that they are not viſible without a microſcope. An infinity of theſe exiſt in a cluſter, and only appear like a number of red points; yet there are webs found under them, though well nigh imperceptible. What muſt be the tenuity of one of theſe threads? Mr. Lewenhoek has computed that 100 ſingle threads of a full grown ſpider are not equal to the diameter of a hair of his beard; and conſequently, if the threads and hair be both round, 10,000 ſuch threads are not bigger than ſuch a hair. He calculates further, that when young ſpiders firſt begin to ſpin, 400 of them are not larger than one that is of a full growth; allowing which, four millions of a young ſpider's threads are not ſo big as the ſingle hair of a man's beard.

Garden-ſpiders, particularly the ſhort-legged ſpecies, yield a kind of ſilk, which has by ſome been judged ſcarcely inferior to that of the ſilk-worm. Mr. Bon of Languedoc, about 70 years ago, contrived to manufacture from it a pair of ſilk ſtockings and mittens, of a beautiful natural grey colour, which were almoſt as handſome and ſtrong as thoſe made with common ſilk: and he publiſhed a diſſertation concerning the diſcovery. But M. Reaumur, being appointed by the Royal Academy to make a farther inquiry into this new ſilk work, raiſed ſeveral objections againſt it, which are recorded in the memoirs of the Academy for the year 1710, and which are principally theſe: that ſpiders are with difficulty managed, ſince they kill and eat one another; that their threads are weaker and leſs gloſſy than thoſe of the ſilk worm; and that, compared with the latter, the quantity of ſilk which they are able to produce is inconſiderable.

The act of generation among ſpiders varies in different ſpecies. As theſe inſects prey upon each other, except during the time of their amours, they dare not come within reach of one another but with the utmoſt caution. They may ſometimes be ſeen ſtretching out their legs, ſhaking the web, and tampering with each other by a ſlight touch with the extremity of their feet; then, in a fright, dropping haſtily down their thread, and returning in a few moments to make a freſh trial by feeling. When once both parties are well aſſured of the ſex they have to deal with, the approaches of their feet, in order to feel, become more frequent, confidence takes place, and the inſtant of amorous dalliance enſues. "We cannot," ſays Lyonnet, "but admire how careful they are not to give themſelves up blindly to paſſion, or venture on an imprudent ſtep, which might become fatal to them." A leſſon this to human kind. Liſter and Lyonnet, two accurate obſervers, ſay, that the extremity of thoſe arms, or claws, which the ſpider uſes to graſp his prey with, ſuddenly opens, as it were by a ſpring, and lets out a white body, which the male applies beneath the abdomen of the female to fulfil the wiſh of nature. In the water-ſpider, the ſexual organs are ſituated at the hinder parts of the male, are curved, and act as it were by a ſpring: thoſe of the females are diſtinct. Hence we ſee that nature by a thouſand varied methods accompliſhes her purpoſe.—Spiders frequently change their colour, which varies much, in reſpect to ſeaſon, ſex, age, &c. but they are in general more beautifully variegated in autumn; a ſeaſon when they arrive at their greateſt magnitude and vigour.

The ſpecies of aranea enumerated by naturaliſts amount to upwards of 50; of which it may here ſuffice to mention a few of the moſt remarkable. 1. The *calycina*, with a round pale yellow belly, and two hollow points. It lives in the cups of flowers, after the flower-leaves have fallen off; and catches bees and other flies, when they are in ſearch of honey. 2. The *avicularia*, has a convex round breaſt, hollowed tranſverſely in the middle. It is a native of America, and feeds upon ſmall birds, inſects, &c. The bite of this ſpider is as venomous as that of the ſerpent. 3. The *ocellata*, has three pair of eyes on its thighs. It is about the ſame ſize with the tarantula, of a pale colour, with a black ring round the belly, and two large black ſpots on the ſides of the breaſt. It is a native of China. 4. The *faccata*, has an oval belly, of a duſky iron colour. It lives in the ground, and carries a ſack with its eggs wherever it goes. This ſack it glues to its belly, and will rather die than leave it behind. 5. *Diadema* is the largeſt ſpider which this country produces. The abdomen is of an oval form, downy, and of a ruddy yellow colour, which is very variable in different ſeaſons; being ſometimes paler, at others very dark coloured. The upper part is beautifully adorned with black and white circles and dots, having a longitudinal band in the middle, compoſed of oblong and oval-ſhaped pearl-coloured ſpots, ſo arranged as to reſemble a fillet, ſimilar to thoſe worn by the eaſtern kings. The ground upon which this fillet and the white dots are laid, when viewed with a glaſs, and the ſun ſhining thereon, is beautiful and rich beyond all deſcription. There are varieties in colour of this ſpider when young; ſome have their abdomen purple ornamented with white dots, the legs yellow and annulated with a deeper colour; others have their abdomen of a fine red likewiſe ornamented with white, but the legs of a fine pale green colour, annulated with dark purple or black. It inhabits the birch-tree. 6. The *cucurbitana*, has a globular yellow belly, with a few black ſpots. It lives in the leaves of trees, and incloſes its eggs in a ſoft net. 7. The *labyrinthica*, with a duſky oval belly, a whitiſh indented line, and a forked anus. The web of this ſpecies is horizontal, with a cylindrical well or tube in the middle. 8. The *fimbriata*, has a black oblong belly, with a white line on each ſide, and duſky-coloured legs. It lives in water, upon the ſurface of which it runs with great ſwiftneſs. 9. The *holoſericea*, has an ovaliſh belly covered with a down-like velvet; at the baſe or under part, it has two yellow ſpots. It is found in the folded leaves of plants. 10. The *viatica*, or wanderer, is generally of a yellow colour more or leſs deep. Sometimes it is whitiſh and even rather green. The abdomen is large, broad, almoſt ſquare, with two bands of dark orange, which ariſing from the thorax deſcend obliquely on the ſides towards the middle. Between the bands are a few ſmall black dots forming a kind of triangle upon the middle of the abdomen. On the thorax are ſeen two longitudinal bands ſomewhat green, one on each ſide. The two foremoſt pair of legs are very long, and the hinder ſhort; which makes it walk like a crab. It is found upon plants, and is a lively, active, indefatigable hunter. Without any motion of the head, which is furniſhed with immoveable eyes, it perceives all the flies that hover round about, does not ſcare them, but ſtretches over them its arms furniſhed with feathers, which prove nets in which their wings entangle. It is ſaid to ſit on its eggs; which however it often carries about with it, wrapt up in a ball of white ſilk. 11. The *aquatica*, is of a livid colour, with an oval belly, and a tranſverſe line, and two hol-

lowed points. It frequents the freſh waters of Europe; but it is in ſome ſort amphibious. In the water its belly appears covered with a ſilver varniſh, which is only a bubble of air attached to the abdomen by means of the oily humours which tranſpire from its body, and prevent the immediate contact of the water. This bubble of air is made the ſubſtance of its dwelling, which it conſtructs under water: for it fixes ſeveral threads of ſilk, or ſome ſuch fine matter, to the ſtalks of plants in the water; and then aſcending to the ſurface, thruſts the hinder part of its body above water, drawing it back again with ſuch rapidity, that it attaches underneath a bubble of air, which it has the art of detaining under water, by placing it underneath the threads above-mentioned, and which it binds like a covering almoſt all around the air-bubble. Then it aſcends again for another air-bubble; and thus proceeds until it has conſtructed a large aerial apartment under water, which it enters into or quits at pleaſure. The male conſtructs for himſelf one near to the female; and when love invites, he breaks through the thread walls of the female's dwelling, and the two bubbles attached to the bellies of both unite into one, forming one large nuptial chamber. The female is ſometimes laid for a whole day together ſtretched on her back, waiting for the arrival of the male, without motion, and ſeemingly as if dead. As ſoon as he enters, and glides over her, ſhe ſeems to be brought to life again, gets on her legs and runs after the male, who makes his eſcape with all poſſible ſpeed. The female takes care of the young, and conſtructs ſimilar apartments on purpoſe for them. The figure of this ſpider has nothing remarkable; and will be overlooked among a crowd of curioſities, if the ſpectator be unacquainted with its ſingular art of conſtructing an aerial habitation under water, and thus availing itſelf of the properties of both elements. It lodges during the winter in empty ſhells, which it dexterouſly ſhuts up with a web. 12. The *faſciata*, with yellow bands round the belly, and duſky rings on the legs, is a native of Barbary, and is as large as one's thumb. It inhabits hedges and thickets; its webs have large meſhes, and it reſides in the centre. Its ſnares are ſpread for large flies, waſps, drones, and even locuſts; but the leſſer inſects eſcape through the meſhes. The animal which it entangles is ſoon bound with ſtrong threads; killed by the ſpider's jaws; and partly eat, if the ſpider is hungry: the reſt is concealed under ſome neighbouring dry leaves, covered with a kind of web and a blackiſh glue. Its neſt is of the ſize of a pigeon's egg divided horizontally, and ſuſpended by the threads of the inſect, which are of a ſilvery white, and ſtronger than ſilk. The young ones live in amity; but when grown up, are mortal enemies. They never meet but they fight with violence, and their battle only ends with the death of the weakeſt. The dead body is carefully ſtored in the larder. Twelve of theſe ſpiders, by way of experiment, were ſhut up together; and, after a battle of eight days, the ſtrongeſt only remained alive. 13. The *tarantula*, (ſee pl. 1.) has the breaſt and belly of an aſh-colour; the legs are likewiſe aſh coloured, with blackiſh rings on the under part; the fangs or nippers are red on the inner ſide, the reſt being blackiſh. Two of its eyes are larger than the reſt, red, and placed in the front; four other eyes are placed in a tranſverſe direction towards the mouth; the other two are nearer the back; and it has two antennæ or feelers. It is a native of Italy, Cyprus, Barbary, and the Eaſt Indies. It lives in bare fields, and its dwelling is about four inches deep, half an inch wide, and cloſed at the mouth with a net. At the bottom it is curved, and there the inſect ſits in wet weather, and cuts its way out if water gains upon it. Theſe ſpiders do not live quite a year: in July they ſhed their ſkin, and proceed to propagation; which from a mutual diſtruſt, as they frequently devour one another, is a work undertaken with great circumſpection. They lay about ſeven hundred and thirty eggs, which hatch in the ſpring; but the parent does not live to ſee her progeny, as ſhe expires early in the winter. The ichneumon fly is their moſt formidable enemy.

The bite of the tarantula is ſaid to occaſion an inflammation in the part, which in a few hours brings on ſickneſs, difficulty of breathing, and univerſal faintneſs. The idle ſtory of its effects being counteracted by muſic, though gravely admitted by the great Dr. Mead and other miſled philoſophers, is too ridiculous to relate at any great length. It is now well known to have been a trick played by certain impoſtors in Italy, in order to draw money from credulous travellers, who were eager to witneſs the ſuppoſed effects ariſing from the poiſon of this ſingular kind of ſpider. On this ſubject therefore we ſhall content ourſelves with relating the account given by Mr. Swinburn, who, when in the country of the tarantula, was deſirous of inveſtigating minutely every particular relative to that inſect. The ſeaſon indeed was not far enough advanced, and no *tarantati* (perſons bitten, or pretending to be bitten, by the tarantula) had begun to ſtir. He prevailed, however, upon a woman who had formerly been bitten, to act the part, and dance the tarantata before him. A great many muſicians were ſummoned, and ſhe performed the dance, as all preſent aſſured him, to perfection. At firſt ſhe lolled ſtupidly on a chair, while the inſtruments were playing ſome dull muſic. They touched, at length, the chord ſuppoſed to vibrate to her heart; and up ſhe ſprung with a moſt hideous yell, ſtaggered about the room like a drunken perſon, holding a handkerchief in both hands, raiſing them alternately, and moving in very true time. As the muſic grew briſker, her motions quickened, and ſhe ſkipped about with great vigour and variety of ſteps, every now and then ſhrieking very loud. The ſcene was far from pleaſant; and, at his deſire, an end was put to it before the woman was tired. Wherever the tarantati are to dance, he informs us, a place is prepared for them, hung round with bunches of grapes and ribbons. The patients are dreſſed in white, with red, green, or yellow ribbons, for thoſe are their favourite colours; on their ſhoulders they caſt a white ſcarf, let their hair fall looſe about their ears, and throw their heads as far back as they can bear. They are exact copies of the ancient prieſteſſes of Bacchus. The orgies of that god, whoſe worſhip, under various ſymbols, was more widely ſpread over the globe than that of any other divinity, were no doubt performed with energy and enthuſiaſm by the lively inhabitants of this warm climate. The introduction of Chriſtianity aboliſhed all public exhibitions of theſe heatheniſh rites, and the women durſt no longer act a frantic part in the character of Bacchantes. Unwilling to give up ſo darling an amuſement, they deviſed other pretences; and poſſeſſion by evil ſpirits may have furniſhed them with one. Accident may alſo have led them to a diſcovery of the tarantula; and upon the ſtrength of its poiſon, the Puglian dames ſtill enjoy their old dance, though time has effaced the memory of its ancient name and inſtitution: and this Mr. Swinburn takes to be the origin of ſo ſtrange a practice. If at any time theſe dancers are really and involutarily affected, he ſuppoſes it can be nothing more than an attack upon their nerves, a ſpecies of St. Vitus's dance: and he inclines the more to the idea, as there are numberleſs churches and places throughout theſe provinces dedicated to that ſaint.

ARANJUEZ, a town 20 miles diſtant from Madrid, in the province of New Caſtile. Here the king of Spain has a palace and gardens, reckoned the moſt delightful in the world, which are ſituated at the conflux of the rivers Tagus and Jarama.

ARARAT, the name of the mountain on which Noah's ark reſted, after the abatement of the waters of the univerſal

deluge. Concerning this mountain there are various conjectures; though it is almoſt univerſally allowed to be in Armenia Major.

ARASSI, a maritime populous town of Italy, in the territory of Genoa. E. long. 7. 20. N. lat. 44. 3.

ARATEIA, in antiquity, a yearly feſtival celebrated at Sicyon on the birth-day of Aratus, wherein divers honours were paid by a prieſt conſecrated to this ſervice, who for diſtinction's ſake wore a ribband beſpangled with white and purple ſpots. The arateia were ſolemnized with much pomp of muſic, the choriſters of Bacchus attending.

ARAVA, a fortreſs of Upper Hungary, in a country of the ſame name. E. long. 20. 0. N. lat. 49. 20.

ARAUCO, a fortreſs and a town of Chili, in South America. W. long. 51. 20. S. lat. 42. 30.

ARAW, a town of Swiſſerland, in Argow, ſeated on the river Aar. E. long. 18. 0. N. lat. 47. 25.

ARAXES, now the Aras, a river of Armenia Major, which takes its riſe in a mountain called *Albos*.

ARBALEST, or Cross Bow. See Cross-*Bow*.

ARBELA, now Irbil, a city of Aſſyria; E. long. 44. 5. N. lat. 35. 15. It is famous for the deciſive battle fought in its neighbourhood between Alexander the Great and Darius Codomannus.

ARBERG, a town of Swiſſerland, in the canton of Bern, ſeated on the river Aar. E. lon. 17. 15. N. lat. 47. 0.

ARBITER, in the civil law, implies a judge nominated by the magiſtrate, or choſen voluntarily by two contending parties, in order to decide their differences. The civilians make a difference between *arbiter* and *arbitrator*, though both found their power on the compromiſe of the parties; the former being obliged to judge according to the cuſtoms of the law; whereas the latter is at liberty to uſe his own diſcretion, and accommodate the difference in the manner that appears to him moſt juſt and equitable.

ARBITRARY *Puniſhment*, in law, denotes ſuch puniſhments as are by ſtatute left to the diſcretion of the judge. It is a general rule in arbitrary puniſhments that the judge cannot inflict death. Hence all puniſhments that are not capital have acquired the name of *arbitrary puniſhments*, even although they be expreſsly pointed out by ſtatute.

ARBITRATION is where the parties, injuring and injured, ſubmit all matters in diſpute, concerning any perſonal chattels or perſonal wrong, to the judgment of two or more arbiters or arbitrators; who are to decide the controverſy. If theſe do not agree, it is uſual for another perſon to be called in as umpire, to whoſe ſole judgment it is then referred; or frequently there is only one arbitrator originally appointed. The deciſion, in any of theſe caſes, is called an *award*, and thereby the queſtion is as fully determined, and the right transferred or ſettled, as it could have been by the agreement of the parties or the judgment of a court of juſtice.

ARBITRATOR, a private extraordinary judge, choſen by the mutual conſent of parties, to determine any controverſy. See Arbiter and Arbitration.

ARBOIS, a ſmall populous town of France, in the department of Jura, and late province of Franche Compté. E. lon. 5. 40. N. lat. 46. 55.

ARBON, an ancient town in Swiſſerland, on the ſouth banks of the lake Conſtance, in Thurgaw. E. lon. 9. 30. N. lat. 4. 38.

ARBOR, in botany, a tree. Trees are by Linnæus claſſed in the 7th family of the vegetable kingdom, and are diſtinguiſhed from ſhrubs in that their ſtems come up with buds on them; but this diſtinction holds not univerſally, there being rarely any buds on the large trees in India.

Arbor, in mechanics, the principal part of a machine which ſerves to ſuſtain the reſt; alſo the axis or ſpindle on which a machine turns, as the *arbor* of a crane, windmill, &c.

Arbor *Dianæ*. See Chemistry.

Arbor *Vitæ*. See Thuya.

ARBORESCENT, an epithet applied to ſuch objects as reſemble trees.

Arborescent *Star-fiſh*, in zoology, a ſpecies of aſterias. See Asterias.

ARBORIBONZES, in modern hiſtory, prieſts of Japan, who live an erratic life, and ſubſiſt on alms. They dwell in caverns, and cover their heads with bonnets made of the bark of trees.

ARBORIST, a perſon ſkilled in that part of botany which treats of trees.

ARBOUR, in gardening, a kind of ſhady bower, formerly in great eſteem; but of late rejected on account of its being damp and unwholeſome. They are generally made of lattice-work; and covered with elms, limes, horn beams; or with creepers, as honeyſuckles, jaſmines, or paſſion flowers, &c.

ARBROATH. See Aberbrothic.

ARBURG, a town of Swiſſerland, in the canton of Bern, on the river Aar. E. long. 17. 55. N. lat. 47. 10.

ARBUSCULA is uſed by Bradley to denote a little or dwarf tree, above the rank of ſhrubs, but below that of trees; ſuch, *e. g.* as the elder.

ARBUSTUM implies a number or multitude of trees planted for the ſake of fruit. But the term has been more peculiarly applied to a place planted with trees for faſtening vines to, which are hence called by Columella *arbuſtive*.

Arbustum is ſometimes alſo uſed to denote an orchard, or field wherein trees are planted at ſuch diſtance that there is room for ploughing and growing corn between.

ARBUTHNOT (Dr. John), was born in Kincardinſhire, near Montroſe, and was educated in phyſic at Aberdeen. His talents and worth recommended him to the men of wit and learning of his day; and he entered into particular connection with Pope and Swift, with whom he joined in publiſhing ſeveral volumes of miſcellanies; among which are the well-known *Memoirs of Martinus Scriblerus*, a ſatire of infinite humour on the abuſes of human learning. In 1715, he aſſiſted Pope and Gay in the *Three hours after marriage*; a dramatic performance, which was brought upon the ſtage without ſucceſs. In 1727, he publiſhed *Tables of ancient coins, weights, and meaſures*; a work of great uſe, and real erudition. In 1732, his valuable tract concerning *The nature and choice of aliments* appeared; which, the year after, was followed by his remarks on *The effects of air on human bodies*. A conſtitutional aſthma had diſtreſſed him at different periods of his life, and proved fatal to him in 1734.

ARBUTUS, the strawberry-tree; a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is divided into five parts; the corolla is ovated; and the fruit is a berry with five cells. The *ſpecies* are, 1. The unedo, or common ſtrawberry-tree, a native of Italy, Spain, and alſo of Ireland; and now very common in our gardens. Of this ſpecies there are four varieties, viz. the oblong-fruited, the round-fruited, the red-flowered, and the double-bloſſomed. One deſcription is nearly common to them all; and their inconſiderable variation is almoſt ſufficiently ſhown in their reſpective appellations.

The oblong-fruited ſort will grow to be a middling ſized tree in ſome countries: with us it may be kept down to any ſize. The main ſtems are covered with a light brown bark. The younger branches are of a kind of purple colour, whilſt the laſt year's ſhoots are of a fine red, and a little hairy. The leaves grow alternately on the branches, and are of an oblong oval

figure. They ſtand on ſhort foot-ſtalks; and the oldeſt leaves make a contraſt with the younger by having their foot-ſtalk and mid-rib of a fine ſcarlet colour. They are ſmooth, and beautifully ſerrated. Their upper ſurface, as in moſt trees, is of a ſtronger green than their under; and the young twigs are garniſhed with them in plenty. Theſe are beauties in common to moſt trees, in ſome degree or other; but almoſt every thing elſe of this tree that preſents itſelf to conſideration is ſingular: The time of its flowering will be in November and December, when it is rather ſingular to ſee a tree in the open ground in full blow; and the fruit ripens by that time twelvemonth after. The manner and nature of the fruit, which reſembles very large red-ſtrawberries, give it alſo a ſingular and delightful look; and this is heightened as they appear all over the tree among the flowers; for the time of its being ripe, is when the flowers for the ſucceeding crop are fully out. The flowers themſelves make no great figure; they are of a kind of whitiſh-yellow colour; and are ſucceeded by the above-mentioned ſtrawberry-fruit, which will require a revolution of twelve months before it perfectly arrives at its maturity and colour. The flowers of the firſt ſort are larger than thoſe of the ſecond; and the fruit is oval, and much larger than our common ſcarlet ſtrawberry. The method of propagating the varieties of the unedo is by layers and cuttings: the ſpecies itſelf may be raiſed from ſeed.

The ſecond ſpecies is the andrachne, which will grow to a larger ſize than the arbutus. The leaves are ſmooth, and nearly of the ſame figure as the preceding ſort; though they are larger, and have their edges undivided. The flowers grow like the other ſorts, are of the ſame colour, and they are ſucceeded by large, oval, ſcarlet fruit. It is called the *Oriental Strawberry tree*, becauſe this ſort grows plentifully in many parts of the Eaſt, and is uſeful to the inhabitants for many purpoſes in life. The andrachne may be propagated in the ſame manner as the arbutus; but the plants muſt be preſerved in pots for three or four years till they have obtained ſtrength; and may be then planted in a warm ſituation, and on a dry ſoil, for this ſpecies will not thrive on wet ground.

Beſides the above, there are three other ſpecies of arbutus, viz. the acadienſis, a native of Acadia; the alpina, or mountſtrawberry-tree, a native of Britain; and the uva urſi, a plant lately diſcovered in the Highlands of Scotland, and which formerly was thought not to be a native of Britain.

ARCADE, in architecture, is uſed to denote any opening in the wall of a building formed by an arch.

ARCADI, or ARCADIANS, the name of a learned ſociety at Rome.

ARCADIA, an inland diſtrict in the heart of Peloponneſus. It is mountainous, and fitter for paſture than corn; and therefore chiefly celebrated by bucolic or paſtoral poets, who feign Pan, the god of ſhepherds, to be the guardian of it.

ARCANGIS, in the Turkiſh armies, an inferior kind of infantry, which ſerve as *enfans perdus*, and to haraſs and pillage the enemy's frontiers. The Arcangis are an order inferior to the Janiſaries; and when any of them diſtinguiſh themſelves, are uſually preferred to the rank of Janiſaries. They have no pay, but ſubſiſt on their plunder.

ARCANUM, among phyſicians, any remedy, the preparation of which is concealed to enhance its value.

ARCBOUTANT, in building, an arched buttreſs. See BUTTRESS.

ARCH, in geometry, any part of the circumference of a circle, or curved line, lying from one point to another, by which the quantity of the whole circle or line, or ſome other thing ſought after, may be gathered.

ARCH, a concave or hollowed piece of building, conſtructed in ſuch a manner that the ſeveral ſtones of which it is compoſed keep one another in their places. The terms *arch* and *vault* properly differ only in this, that the arch expreſſes a narrower, and the vault a broader, piece of the ſame kind. The principal difference in the form of arches is, that ſome are circular, and others elliptical; the former having a larger or ſmaller part of a circle, the other of an ellipſis. What are called *ſtrait arches*, are thoſe frequently uſed over doors and windows, the upper and under edges of which are ſtrait and parallel, and the ends and joints all pointing toward a centre. The ſpace between two piers of a bridge is called an *arch*, becauſe uſually arched over.

Triumphal ARCHES are magnificent entries into cities, erected to adorn a triumph, and perpetuate the memory of the action. The arches of Titus and Conſtantine make at this time a great figure among the ruins of ancient Rome.

ARCH, in compoſition, ſignifies *chief*, or the *firſt* claſs; as archangel, archbiſhop, &c.

ARCHÆUS, or ARCHEUS. See ARCHEUS.

ARCHANGEL, an angel occupying the eighth rank in the celeſtial hierarchy. See ANGEL and HIERARCHY.

ARCHANGEL, a city of Ruſſia, in the province of Dwina, ſituated on the eaſt ſide of the river Dwina, about ſix miles from the White Sea, in E. long. 40. 21. N. lat. 64. 30.

ARCHBISHOP, the name of a church dignitary of the firſt claſs. Archbiſhops were not known in the eaſt till about the year 320; and though there were ſome ſoon after this who had the title, yet that was only a perſonal honour, by which the biſhops of conſiderable cities were diſtinguiſhed. It was not till of late that archbiſhops became metropolitans, and had ſuffragans under them. Athanaſius appears to be the firſt who uſed the title *Archbiſhop*, which he gave occaſionally to his predeceſſor.

The archbiſhop, beſides the inſpection of the biſhops and inferior clergy in the province over which he preſides, exerciſes epiſcopal juriſdiction in his own dioceſe. He is guardian of the ſpiritualities of any vacant ſee in his province, as the king is of the temporalities; and exerciſes eccleſiaſtical juriſdiction in it. He is intitled to preſent by lapſe to all the eccleſiaſtical livings in the diſpoſal of his dioceſan biſhop, if not filled within ſix months. He has likewiſe a cuſtomary prerogative, upon conſecrating a biſhop, to name a clerk or chaplain to be provided for by ſuch biſhop; in lieu of which it is now uſual to accept an option. He is ſaid to be enthroned when veſted in the archbiſhopric; whereas biſhops are ſaid to be inſtalled.

The eccleſiaſtical government of England is divided into two provinces, viz. Canterbury and York. Canterbury hath the following ſuffragan biſhoprics appertaining to it, St. Aſaph, Bangor, Bath and Wells, Briſtol, Chicheſter, Lichfield and Coventry, St. David's, Ely, Exeter, Glouceſter, Hereford, Landaff, Lincoln, London, Norwich, Oxford, Peterborough, Rocheſter, Saliſbury, Wincheſter, and Worceſter. To York appertaineth the biſhoprics of Carliſle, Cheſter, and Durham; to which may be added the biſhopric of Sodor and Man, whoſe biſhop is not a Lord of Parliament.

The archbiſhop of Canterbury had, till the year 1152, juriſdiction over Ireland as well as England, and was ſtyled a *patriarch*, and ſometimes *alterius orbis papa*, and *orbis Britannici pontifex*. Matters were done and recorded in his name thus, *Anno pontificatûs noſtri primo*, &c. The firſt archbiſhop of Canterbury was Auſtin, appointed by king Ethelbert, on his converſion to Chriſtianity, about the year 598. He was alſo *legatus natus*. He even enjoyed ſome ſpecial marks of royalty; as to be patron of a biſhopric, which he was of Rocheſter; and to make knights, coin monies, &c. He is ſtill the firſt peer of England, and the next to the royal family; having

precedence of all dukes and all great officers of the crown. It is his privilege, by cuſtom, to crown the kings and queens of this kingdom. He may retain and qualify eight chaplains; whereas a duke is by ſtatute allowed only ſix. He has, by common law, the power of probate of wills and teſtaments, and granting letters of adminiſtration. He has alſo a power to grant licences and diſpenſations in all caſes formerly ſued for in the court of Rome, and not repugnant to the law of God. He accordingly iſſues ſpecial licences to marry, to hold two livings, &c. and he exerciſes the right of conferring degrees. He alſo holds ſeveral courts of judicature; as, court of arches, court of audience, prerogative court, and court of peculiars.—The archbiſhop of York has the like rights in his province as the archbiſhop of Canterbury. He has precedence of all dukes not of the royal blood; and of all officers of ſtate, except the lord high chancellor.

Scotland, whilſt epiſcopacy prevailed in that country, had two *archbiſhops*, of St. Andrew's and Glaſgow; of which the former was accounted the metropolitan; and, even before it arrived at the dignity of an archbiſhopric, reſiſted with great ſpirit all the attempts of the archbiſhops of York in England to become the metropolitans of Scotland.—*Ireland* has four archbiſhops; viz. of Armagh, Dublin, Caſhel, and Tuam; of whom the former is primate of all Ireland.

ARCHBISHOPRIC, in eccleſiaſtical geography, a province ſubject to the juriſdiction of an archbiſhop.

ARCHBUTLER, one of the great officers of the German empire, who preſents the cup to the emperor on ſolemn occaſions. This office belongs to the king of Bohemia.

ARCHCHAMBERLAIN, an officer of the empire, much the ſame with the great chamberlain in England. The elector of Brandenburg was appointed by the golden bull archchamberlain of the empire.

ARCHCHANCELLOR, an high officer who, in ancient times, preſided over the ſecretaries of the court. Under the two firſt races of the kings of France, when their territories were divided into Germany, Italy, and Arles, there were three archchancellors: and hence the three archchancellors ſtill ſubſiſting in Germany; the archbiſhop of Mentz (being archchancellor of Germany), the archbiſhop of Cologn, and the archbiſhop of Treves.

ARCHCHANTOR, the preſident of the chantors of a church.

ARCHCOUNT, a title formerly given to the earl of Flanders, on account of his great power and riches.

ARCHDEACON, an eccleſiaſtical dignitary or officer next to a biſhop, whoſe juriſdiction extends either over the whole dioceſe, or only a part of it. He is uſually appointed by the biſhop himſelf; and hath a kind of epiſcopal authority, originally derived from the biſhop, but now independent and diſtinct from his. He therefore viſits the clergy; and has his ſeparate court for puniſhment of offenders by ſpiritual cenſures, and for hearing all other cauſes of eccleſiaſtical cognizance. There are 60 archdeacons in England.

ARCHDEACON'S *Court*, is the moſt inferior court in the whole eccleſiaſtical polity. It is held in the archdeacon's abſence, before a judge appointed by himſelf, and called his *official*; and its juriſdiction is ſometimes in concurrence with, ſometimes in excluſion of, the biſhop's court of the dioceſe. From hence, however, by the ſtatute 24 Hen. VIII. c. 12. there lies an appeal to that of the biſhop.

ARCHDRUID, the chief or pontiff of the ancient druids of a nation. See DRUID.

ARCHDUKE, a title peculiar to the Houſe of Auſtria; all the ſons of which are archdukes, and daughters archducheſſes. See DUKE.

ARCHERS, a kind of militia or ſoldiery armed with bows and arrows. The word is formed of *arcus* a bow; whence *arcuarius*, and even *arquis*, and *arquites*, as they are alſo denominated in the corrupt ſtate of the Latin tongue.

Archers were common in former times, but are now laid aſide, except in the eaſtern countries; where companies of them ſtill ſubſiſt in their armies, and with which terrible execution took place at the battle of Lepanto. In France, the officers who uſed to attend the lieutenants de police and proveſts to make ſeizures, arreſts, &c. were called *archers*; though their arms were only halberts or carabines. Thus they had *archers* of the *grand prevôt de l'hôtel*; of the *prevôt des marchands*; the city *archers*; the *archers du guet*, or of the watch, &c.—Small parties of *archers*, called alſo *gens de marchauſſée*, continually patrolled the great roads, to clear them of robbers.

ARCHERY, the art or exerciſe of ſhooting with a bow and arrow. With moſt of the ancient nations, the bow was the principal implement of war, and by the expertneſs of the archers alone was often decided the fate of battles and of empires. Even in this iſland archery was greatly encouraged in former times, and many ſtatutes were made for its regulation; whence it was that the Engliſh archers in particular became the beſt in Europe, and procured many ſignal victories. The *Artillery Company* of London, though they have long diſuſed the weapon, are the remains of the ancient fraternity of bowmen or archers. Artillery *(artillérie)* is a French term ſignifying *archery*; as the *king's bowyer* is in that language ſtyled *artillier du roy*: And from that nation the Engliſh ſeem to have learnt at leaſt the croſs-bow archery. We therefore find that William the Conqueror had a conſiderable number of bowmen in his army at the battle of Haſtings, when no mention is made of ſuch troops on the ſide of Harold; and it is ſuppoſed, that theſe Norman archers ſhot with the arbaleſt (or croſs-bow), in which formerly the arrow was placed in a groove, being termed in French a *quadrel*, and in Engliſh a *bolt*. Of the time when ſhooting with the long-bow firſt began among the Engliſh, at which exerciſe they afterwards became ſo expert, there appear no certain accounts.

An act in the 5th year of Edward IV. directs, that every Engliſhman, and Iriſhman dwelling with Engliſhmen, ſhall have an Engliſh bow of his own height, which is required to be made of yew, wych, hazel, aſh, or awburne, or any other reaſonable tree according to their power. The next chapter alſo directs that butts ſhall be made in every townſhip, which the inhabitants are obliged to ſhoot up and down every feaſt-day, under the penalty of a halfpenny when they ſhall omit this exerciſe.

During the reign of Henry VIII. ſeveral ſtatutes were made for the promotion of archery. The 8th Eliz. c. 10. regulates the price of bows, and the 13th Eliz. c. 14. enacts, that bow-ſtaves ſhall be brought into the realm from the Hanſe-towns and the Eaſtward; ſo that archery ſtill continued to be an object of attention in the legiſlature.

Charles I. appears, from the dedication of a treatiſe intitled *The Bowman's Glory*, to have been himſelf an archer: and in the 8th year of his reign he iſſued a commiſſion to the chancellor, lord-mayor, and ſeveral of the privy-council, to prevent the fields near London being ſo incloſed as "to interrupt the neceſſary and profitable exerciſe of ſhooting," as alſo to lower the mounds where they prevented the view from one mark to another.

So lately as the year 1753 targets were erected in the Finſbury-fields, during the Eaſter and Whitſun-holidays; when the beſt ſhooter was ſtyled Captain for the enſuing year, and the ſecond, Lieutenant.

In the uſe of the bow, great dexterity as well as ſtrength ſeems to have been requiſite. Though we hear of arrows at Cheviot Chace which were a yard long, yet is it by no means to

be ſuppoſed that the whole band made uſe of ſuch, or could draw them to the head. The regulation of the Iriſh ſtatute of Edward IV. viz. that the bow ſhall not exceed the height of a man, is allowed by archers to have been well conſidered; and as the arrow ſhould be half the length of the bow, this would give an arrow of a yard in length to thoſe only who were ſix feet high. A ſtrong man of this ſize in the preſent times, cannot eaſily draw above 27 inches, if the bow is of a proper ſtrength to do execution at a conſiderable diſtance. At the ſame time it muſt be admitted, that as our anceſtors were obliged by ſome of the old ſtatutes to begin ſhooting with the long-bow at the age of ſeven, they might have acquired a greater ſlight in this exerciſe than their deſcendants, though the latter ſhould be allowed to be of equal ſtrength.

As the ſhooting with the long-bow was firſt introduced in England, and practiſed almoſt excluſively for nearly two centuries, ſo it hath occaſioned a peculiar method of drawing the arrow to the ear and not to the breaſt. That this is contrary to the uſage of the ancients is very clear from their reliefs, and from the tradition of the Amazons cutting off one of their breaſts, as it occaſioned an impediment to their ſhooting. The Finſbury archer is therefore repreſented in this attitude of drawing to the ear, both in the *Bowman's Glory*, and in the ſilver badge which was given by Catharine of Portugal to the Artillery Company.

As to the diſtance to which an arrow can be ſhot from a long-bow with the beſt elevation of 45 degrees, that muſt neceſſarily depend much both upon the ſtrength and ſlight of the archer; but in general the diſtance was reckoned from eleven to twelve ſcore yards. The butts for exerciſe, as above-noticed, were directed to be diſtant upwards of 220 yards. There is indeed a tradition, that an attorney of Wigan in Lancaſhire (named Leigh) ſhot a mile in three flights; but the ſame tradition ſtates, that he placed himſelf in a very particular attitude, which cannot be uſed commonly in this exerciſe. According to Neade, an archer might ſhoot ſix arrows in the time of charging and diſcharging one muſket.

The archers conſider an arrow of from 20 to 24 drop weight to be the beſt for flight or hitting a mark at a conſiderable diſtance, and that yew is the beſt material of which they can be made. They were armed anciently with flint or metal heads, latterly with iron; and of theſe there were various forms and denominations. By an act of parliament made the 7th of Henry IV. it was enacted, that for the future all the heads for arrows and quarrels ſhould be well boiled or braſed, and hardened at the points with ſteel; and that every arrow-head or quarrel ſhould have the mark of the maker: workmen diſobeying this order, were to be fined and impriſoned at the king's will, and the arrow-heads or quarrels to be forfeited to the crown. Arrows were reckoned by ſheaves, a ſheaf conſiſting of 24 arrows. They were carried in a quiver, called alſo an *arrow-caſe*, which ſerved for the magazine; arrows for immediate uſe were worn in the girdle. In ancient times phials of quicklime, or other combuſtible matter, for burning houſes or ſhips, were fixed on the heads of arrows, and ſhot from long bows. This has been alſo practiſed ſince the uſe of gunpowder. Neade ſays, he has known by experience, that an archer may ſhoot an ounce of fire-work upon an arrow 12 ſcore yards. Arrows with wild-fire, and arrows for fire-works, are mentioned among the ſtores at Newhaven and Berwick, in the 1ſt of Edward VI. The force with which an arrow ſtrikes an object at a moderate diſtance, may be conceived from the account given by king Edward VI. in his journal; wherein he ſays, that 100 archers of his guard ſhot before him two arrows each, and afterwards all together; and that they ſhot at an inch board, which ſome pierced quite through and ſtruck into the other board; divers pierced it quite through with the heads of their arrows, the boards being well ſeaſoned timber: their diſtance from the mark is not mentioned.

Though archery continued to be encouraged by the king and legiſlature for more than two centuries after the firſt knowledge of the effects of gun-powder, yet by the latter end of the reign of Henry VIII. it ſeems to have been rather conſidered as a paſtime. Since that period the employment of it for warlike purpoſes has long ceaſed in Europe, and the bow and arrow ſo formidable in the days of our anceſtors have been only ſeen in the hands of children. As a manly exerciſe, however, the faſhion of archery has of late years been revived in various ſocieties in Britain; particularly the Toxophilite, Woodmen of Arden, the Royal Company of Archers in Scotland, &c. which are countenanced by the firſt of our nobility, but their meetings are merely for the purpoſe of conviviality and recreation.

ARCHES-COURT, in Engliſh eccleſiaſtical polity, is a court of appeal, belonging to the archbiſhop of each province. The judge is called *dean of the arches*, becauſe he anciently held his court in the church of St. Mary *le bow* (*Sancta Maria de arcubus*), though all the principal ſpiritual courts are now holden at Doctors' Commons. His proper juriſdiction is only over the 13 peculiar pariſhes belonging to the archbiſhop of London; but the office of dean of the arches having been for a long time united with that of the archbiſhop's principal office, he now, in right of the laſt-mentioned office, receives and determines appeals from the ſentences of all inferior eccleſiaſtical courts within the province. And from him there lies an appeal to the king in chancery (that is, to a court of delegates appointed under the king's great ſeal), by ſtatute 25th Hen. VIII. c. 19. as ſupreme head of the Engliſh church, in the place of the biſhop of Rome, who formerly exerciſed this juriſdiction; which circumſtance alone will furniſh the reaſon why the popiſh clergy were ſo anxious to ſeparate the ſpiritual court from the temporal.

ARCHETYPE, the firſt model of a work, which is copied after to make another like it.—Among minters, it is uſed for the ſtandard weight by which the others are adjuſted.—The archetypal world, among Platoniſts, means the world as it exiſted in the idea of God before the viſible creation.

ARCHEUS, from αρχη, the principal, chief, or firſt mover; a ſort of primum mobile ſet up by Helmont, to ſuperintend the animal œconomy, and preſerve it. It is akin to Plato's *anima mundi*.—Hippocrates uſes the words αρχαιη φυσις, to ſignify the former healthy ſtate before the attack of a diſeaſe.

ARCHIACOLYTHUS, from αρχος *chief*, and ακολυθος *miniſter*, an ancient dignity in cathedral churches, the miniſters whereof were divided into four orders or degrees, viz. prieſts, deacons, ſubdeacons, and acolythi; each of which had their chiefs. The chief of the acolythi was called *archiacolythus*.

ARCHIATER, ARCHIATRUS, properly denotes chief phyſician of a prince who retains ſeveral. The word is formed of αρχη *principium*, chief; and ιατρος *medicus*, a phyſician.

ARCHIDAPIFER, from αρχος, and *dapifer* ſewer, or chief ſewer, is a great officer of the empire. The elector of Bavaria is archidapifer. The palatine of the Rhine at one time pretended this office was annexed to his palatinate; but he has ſince withdrawn his claim.

ARCHIEROSYNES, in the Grecian antiquity, a high prieſt veſted with authority over the reſt of the prieſts, and appointed to execute the more ſacred and myſterious rights of religion.

ARCHIGALLUS, in antiquity, the high-prieſt of Cybele, or the chief of the eunuch prieſts of that goddeſs, called *Galli*.

ARCHIGERONTES, from αρχος and γερων *old*, in antiquity, the chiefs or maſters of the ſeveral companies of artificer

at Alexandria. Some have miſtaken the archigerontes for the arch-prieſts appointed to take the confeſſions of thoſe who were condemned to the mines.

ARCHIGUBERNUS, Archigubernета, or Archigubernites, in antiquity, the commander of the imperial ſhip, or that which the emperor was aboard of. Some have confounded the office of archigubernus with that of *præfectus claſſis*, or admiral, but the former was under the command of the latter. Potter takes the proper office of the archigubernета to have been, to manage the marine affairs, to provide commodious harbours, and order all things relating to the ſailing of the fleet, except what related to war.

ARCHIL, Archilla, Rocella, Orsielle, is a whitiſh moſs which grows upon rocks, in the Canary and Cape Verd iſlands, and yields a rich purple tincture, fugitive indeed, but extremely beautiful. This weed is imported to us as it is gathered. Thoſe who prepare it for the uſe of the dyer, grind it betwixt ſtones, ſo as to thoroughly bruiſe, but not to reduce it into powder; and then moiſten it occaſionally with a ſtrong ſpirit of urine, or urine itſelf mixed with quick-lime: in a few days it acquires a purpliſh red, and at length a blue colour. In the firſt ſtate it is called *Archil;* in the latter, *Lacmus* or *Litmaſe*. The dyers rarely employ this drug by itſelf, on account of its dearneſs and the periſhableneſs of its beauty. The chief uſe they make of it is, for giving a bloom to other colours, as pinks, &c. This is effected by paſſing the dyed cloth or ſilk through hot water lightly impregnated with the archil. The bloom thus communicated ſoon decays upon expoſure to the air. Mr. Hellot informs us, that by the addition of a little ſolution of tin, this drug gives a durable dye; that its colour is at the ſame time changed towards a ſcarlet; and that it is the more permanent in proportion as it recedes the more from its natural colour.

Prepared archil very readily gives out its colour to water, to volatile ſpirits, and to ſpirit of wine. A ſolution of archil in water, applied on cold marble, ſtains it of a beautiful violet, or purpliſh blue colour, far more durable than the colour which it communicates to other bodies. It ſinks deep into the marble, ſometimes above an inch; and at the ſame time ſpreads upon the ſurface, unleſs the edges be bounded by wax or ſome ſuch ſubſtance. It ſeems to make the marble ſomewhat more brittle.—Linnæus informs us, in the Swediſh Tranſactions for the year 1742, that the true archil moſs is to be found on the weſtern coaſts of England. It has been for ſome time paſt prepared at Leith, from a ſpecies found in the Highlands of Scotland.

ARCHILOCHIAN, a term in poetry, applied to a ſort of verſes, of which Archilochus was the inventor, conſiſting of ſeven feet; the four firſt whereof are ordinarily dactyles, though ſometimes ſpondees; the three laſt trochees, as in Horace.—*Solvitur acris hyems, grata vice veris & Favoni.*

ARCHIMANDRITE, in eccleſiaſtical hiſtory, was a name given by the ancient Chriſtians to what we now call an *abbot*. Father Simon obſerves, that the word *mandrite* is Syriac, and ſignifies a ſolitary monk.

ARCHIMEDES, a celebrated geometrician, born at Syracuſe in the iſland of Sicily, and related to Hiero king of Syracuſe. He was remarkable for his extraordinary application to mathematical ſtudies; in which he uſed to be ſo much engaged, that his ſervants were often obliged to take him from them by force. He had ſuch a ſurpriſing invention in mechanics, that he affirmed to Hiero, if he had another earth, whereon to plant his machines, he could move this which we inhabit. He is ſaid to have formed a glaſs ſphere, of a moſt ſurpriſing workmanſhip, wherein the motions of the heavenly bodies were repreſented. He diſcovered the exact quantity of the ſilver which a goldſmith had mixed with the gold in a crown he had made for the king. Being ſubject to great abſence of mind and an habit of intenſe thinking, it is ſaid, that his refuſal to obey the commands of Marcellus delivered to him by a Roman ſoldier, coſt him his life, 208 years before the Chriſtian æra.

ARCHIPELAGO, a conſiderable part of the Mediterranean Sea, having Romania on the North, Natolia on the Eaſt, Macedonia, Livadia, and the Morea, on the Weſt, and the iſle of Candia on the South. It is partly in Europe, and partly in Aſia, containing the iſlands of Rhodes, Negropont, Lemnos, Tenedos, Sciros, Metelen, Scio, Samos, Patmos, Paros, Antiparos, Cerigo, Santorin, Andros, Tina, Naxia, Milo, Delos, Argentiera, &c.

Archipelago, *Northern*, four principal groups of iſlands, between the Eaſt coaſt of Kamtſchatka and the Weſt coaſt of America.

ARCHIPHERACITÆ, miniſters in the Jewiſh ſynagogues appointed to read and interpret the Perakim, or titles and heads of the law and the prophets.

ARCHPRESBYTER, or Arch-Priest, a prieſt eſtabliſhed in ſome dioceſes, with a ſuperiority over the reſt. He was anciently choſen out of the college of preſbyters at the pleaſure of the biſhop. Theſe arch-preſbyters were much of the ſame nature with deans in the cathedral churches, as the college of preſbyters anſwers to the chapter. See Presbyter.

ARCHISYNAGOGUS, chief of the ſynagogue; the title of an officer among the Jews, who preſided in their ſynagogues and aſſemblies. Their number was not fixed, nor the ſame in all places; there being 70 in ſome, and in others only one. They are ſometimes called *princes* of the ſynagogue, and had a power of excommunicating ſuch as deſerved that puniſhment.

ARCHITECT, a perſon ſkilled in architecture, who forms plans or deſigns for buildings, conducts the work, and directs the ſeveral artificers employed in it.

ARCHITECTURE,

THE art or ſcience of erecting edifices, whether for habitation or defence, and hence ſubdivided into civil, military, and naval.

Civil architecture, called abſolutely, and by way of eminence, architecture, teaches how to conſtruct all kinds of buildings, as palaces, churches, private dwellings, &c.; and the rules to be obſerved in it are, ſolidity, convenience, and beauty; to which ſome add, order, diſpoſition, proportion, decorum, and œconomy. Solidity implies the choice of a good foundation and ſound materials; convenience conſiſts in ſo ordering the parts of an edifice, that they may not embarraſs one another; beauty aſſigns to each part and to the whole a form pleaſing to the eye; order gives to each part ſuitable dimenſions, and regulates its proportions with regard to the whole; and diſpoſi-

tion is the agreeable union of all the parts together: proportion is the relation that the whole work bears to its ſeveral parts, and which every one ſeparately bears to the whole; decorum teaches a neceſſary regard to deſign, cuſtom, and nature; and œconomy, to avoid uſeleſs expence, though it may alſo have a reference to thoſe arrangements in building, which fall under a term that is nearly ſynonimous.

With reſpect to the origin of architecture, and the ſeveral periods to which its advances towards perfection are to be referred, it would be a waſte of time to enter into an enquiry of any great length. Architecture has been generally divided into Antient, Gothic, and Modern; and as that of the antients has been univerſally reputed the ſtandard of beauty and grandeur, we ſhall dwell principally on thoſe hiſtorical points that relate to it, though it is not intended that the other parts of the ſubject ſhall paſs wholly unnoticed.

When we conſider architecture as improved by the Greeks about the time of Pericles, its perfection and beauty, how conſpicuouſly it exhibited the liberality, ſplendour, and magnificence of thoſe concerned in erecting ſtructures, the remains of which aſtoniſh us; and how highly flattering it was to the mind of man in an age of ſplendour, to raiſe edifices which ſhould ſtrike beholders with admiration; it excites little ſurpriſe that every attention ſhould have been given to the ſtudy of architecture, and that its profeſſors ſhould have received the moſt liberal encouragement from men of taſte and genius.

We now proceed, however, to our more immediate deſign, which is, to give a ſhort hiſtorical account of the five orders of architecture of the antients; which muſt be conſidered as the baſis of true proportion.

The great antiquity of building is ſelf-evident:—"When men firſt felt the inclemencies of the ſeaſons, it had its beginning, and has ſpread wherever the ſeverities of climate demand ſhelter or ſhade: it is to be traced in the Indian's hut, and the Greenlander's cave; and ſhews in thoſe barbarous parts of the globe, from what mean original it roſe to its preſent glory." Perhaps the neighbourly aſſiſtance required in erecting the meaneſt fence againſt the inclemency of the weather, was the firſt movement of civil ſociety: thus a number of habitations were formed together, and men, in conſequence, had mutual converſation and intimacy. It is eaſy to conceive, that, in this early ſtate of ſociety, genius had expanded but little; the firſt efforts were ſmall, and the ſtructure ſimple; perhaps no more than a number of trees leaning together at the top (in the form of a cone), interwoven with twigs, and plaſtered with mud, to exclude the weather. In this early period, we may alſo ſuppoſe each deſirous to render his own habitation more convenient than his neighbour's, by improving on what had been already done; and thus in time, obſervation, aſſiſting that natural ſagacity inherent even in uncultivated minds, led men to conſider the inconveniences of the round ſort of habitation, and to invent others more ſpacious and convenient in the form of a ſquare.

This improvement introduced the neceſſity of ſupports for the croſs beams, which were to ſuſtain the roof; and the trunks of trees were ſo ready an application, that we cannot ſuppoſe they heſitated long in their choice. Thus from the nature of things aroſe the idea of what we now call columns, which have from time to time undergone many changes, and at laſt have produced thoſe elegant pillars which we term the orders of architecture. See the repreſentations of primitive huts in Pl. 17.

From the earlieſt antiquity the Egyptians have been conſidered as the inventors of arts; and in the time of their proſperity all nations ſought and ſtudied their philoſophy and their ſciences; ſo that being learned in the arts of the Egyptians became proverbial. Among other arts derived from them, antiquity will juſtify us in numbering architecture; but this is to be underſtood as meaning only that ſpecies of original architecture, where the ſtrength of the fabric was more regarded than its elegance or ſymmetry. Of this kind are the pyramids; the ruins alſo of a magnificent temple at Luxor (the ancient Thebes), of which there remain more than 130 columns, all of conſiderable magnitude, and ſome ſo large as ten feet in diameter, with neat, not to ſay elegant ſculpture; beſides ſeveral other remains in the ſame neighbourhood. At Komonbu, and other parts of Egypt, there exiſt other relics of magnificent works of architecture, as ſhewn by Norden. From theſe wonders which ſtill remain, it can only be conjectured what have been deſtroyed.

We have already ſaid it is not to our purpoſe, to enter into a long detail of the riſe and progreſs of architecture, yet we think it fair to conclude from the above, that from Egypt, where all cotemporary nations ſought the arts and ſtudied the ſciences, the Greeks derived their firſt ideas of building, but which were ſo changed and improved by being thus tranſplanted, that ſcarcely can it be known from what ſtock they had their origin. The ſublime and penetrating genius of the Greeks, anxious to add elegance to convenience, diſregarded the maſſive and ponderous architecture of the Egyptians; whoſe ignorance of the arch made it abſolutely neceſſary for them to have ſmall ſpaces between their columns, and to burthen their edifices with large and ſtrong architraves.

This therefore may be conſidered as the track by which architecture roſe to elegance; for certainly the ſtructures of Egypt are much more ancient than thoſe of Greece; and as it may be conſidered the beſt character of buildings that they provide for the comfort and convenience of man, ſo it muſt be allowed that the Greeks firſt rendered them productive of grace, regularity, and beauty: for, to the fine eye, ſkilful hand, and ſublime genius of that nation is architecture indebted for its rules of decorum, elegance of deſign, and taſte of ornament, which began to arrive at perfection under the foſtering care of Pericles; which period, including the reign of Alexander the Great, muſt be conſidered as its climax of grace, elegance, and beauty, in Greece.

It is a moſt indubitable fact, that the mind of man is influenced by modes of government; and certain it is, that the Greeks, with their independence, loſt alſo their ſuperior vigour of genius; and what remained was, with the ſpoils of their cities, carried to Rome. Hence it is that, from this period, the Romans are to be conſidered as the encouragers and patroniſers of architecture. From this period alſo its progreſs was great and rapid, though little was done that could be remarked for its novelty; but the rules of the Greeks were applied to ſtructures ſo numerous, and of ſuch wonderful extent, that we doubt which moſt to admire, the original inventors of theſe ſublime rules, or thoſe who applied them to ſuch ſtupendous buildings.

There are ſome authors, deeply read in ancient hiſtory, who have attempted to prove, that, from the Etruſcans, and not from the Egyptians, the Greeks imbibed their firſt ideas of architecture. The Etruſcans (or Tuſcans) certainly were well ſkilled in building, and from theſe the Romans in their early ſtate ſought help in all their large works. The remains of the temple of Jupiter Capitolinus, the Cloaca Maxima, &c. the work of Tuſcan artiſts, ſhew them to have well underſtood the ſcience and the practice of uſeful and elegant architecture. Neither when we inſpect the antique vaſes, of undoubted Etruſcan workmanſhip, can we deny them to have poſſeſſed taſte and elegance. But we leave theſe arguments to be more fully diſcuſſed by others; as it is enough for us to have ſhewn, that the Greeks completed the ſcience of architecture, by uniting the uſeful and the agreeable in all their deſigns.

Any attempt to produce an authority or origin for every

ſpecies of ornament which belongs to the different orders, would be engaging in a fruitleſs ſort of enquiry. It may not be amiſs, however, to beſtow a few remarks on ſuch particular parts as may, with ſome degree of certainty, have their origin pointed out. The *Plinth*, it is very reaſonable to imagine, was, at firſt, ſimply a ſquare tile or ſtone, placed under the trunk of the tree or primitive column, to prevent rotting, to which it was expoſed from the conſtant moiſture of the earth; it alſo ſerved as a more firm and ſolid footing to the column. There are inſtances of ſeveral buildings of conſiderable elegance and extent which have no plinth to the columns; ſuch as the temple of Erictheus at Athens, the temple of Veſta at Tivoli, and ſome other places; and in all the Doric temples. The *Torus*, or ſwell above the plinth, may have originated from the root or lower part of the tree being thicker than the part above, which alſo fixed it more firmly on the plinth; or, as by ſome it is conjectured to have been, only a rope or bandage round the trunk, to prevent its ſplitting: or, according to Vitruvius, it repreſents the ſhoe. The idea of the *Capital* may have originally been ſuggeſted by ſome tree, whoſe arms ſpreading juſt above where it was neceſſary the upper parts ſhould be cut off, to be of a proper length, the ſwell of the arms very likely gave the firſt idea of the ſwell of the capital, which was alſo attended with this advantage; by being broader on the top, it was better formed for receiving the works above. The *Abacus* was certainly no more than a tile or ſtone, placed with intent to throw off the water, and prevent its ſinking into the column, which would have endangered the duration of the building. The *Aſtragals* and *Fillets* were bandages to bind the column. The *Architrave* we may conceive to be the beams or ties neceſſary to hold or unite the columns together. The *Frieze* was a neceſſary addition when height within was wanted. The *Cornice*, and its ornaments, were the ends or outer edge of the timbers, rafters, &c. neceſſary to ſupport the roof. The *Denteles*, *Triglyphs*, *Modillions*, &c. from the above ſource alſo, were accidental hints improved, when to uſefulneſs was wiſhed to be added ornament; and which became permanent, when ſtructures of wood gave place to more elegant and durable ones of ſtone.

The ORDERS, as now executed by architects, are five, viz. the *Tuſcan*, the *Doric*, the *Ionic*, the *Corinthian*, and the *Compoſite*; which are diſtinguiſhed from each other by the column with its baſe and capital, and by the entablature. The *Tuſcan* order is characteriſed by its plain and robuſt appearance, and is therefore uſed only in works, where ſtrength and plainneſs are wanted; it has been uſed with great effect and elegance in that durable monument of ancient grandeur, the Trajan column at Rome; indeed, general conſent has eſtabliſhed its proportions for ſuch purpoſes, beyond all others. The *Doric* poſſeſſes nearly the ſame character for ſtrength as the Tuſcan, but is enlivened by its peculiar ornaments; the triglyph, mutule, and guttæ or drops, under the triglyph: theſe decorations characterize the Doric order, and in part are inſeparable from it. Its proportions recommend it where united ſtrength and grandeur are wanted. The *Ionic* partakes of more delicacy than either of the former, and therefore, as well as on account of its origin, is called Feminine, and not improperly ſuppoſed to have a matronic appearance. It is a medium between the maſculine Tuſcan and Doric, and the virginal ſlenderneſs of the Corinthian: the boldneſs of the capital, with the beauty of the ſhaft, makes it eligible for porticos, frontiſpieces, entrances to houſes, &c. Denteles were firſt added to the cornice of this order. The *Corinthian* poſſeſſes more delicacy and ornament than any other order; the beauty and richneſs of the capital, and the delicacy of the pillar, render it the moſt ſuitable in thoſe edifices, where magnificence and elegance are required. On this account, it is frequently uſed for the internal decoration of large ſtate rooms; in which it has a chaſte appearance, though at the ſame time ſuperb. The *Compoſite* order is the ſame as the Corinthian in its proportions, and nearly alike in ornamental properties. The addition of the modern Ionic volute to the capital, gives a bolder projection. It is applicable in the ſame manner and in the ſame caſes as the Corinthian. (See the plates of the different orders).

Having thus far ſpoken of the origin of ancient architecture, it becomes neceſſary to take ſome notice of that which has been named the *Gothic*. On the decline of this art among the Romans, and when the empire was entirely over-run by the Goths, the latter naturally introduced their own methods of building. Like the ancient Egyptians, the Goths ſeem to have been more ſtudious to amaze people with the greatneſs of their buildings than to pleaſe the eye with the regularity of their plans, or the propriety of their ornaments. They corrected themſelves, however, a little by the models of the Roman edifices which they ſaw before them: but theſe models themſelves were faulty; and the Goths being totally deſtitute of genius, neither architecture nor any other art could be improved by them.

Thoſe ancient buildings in this iſland, which have gone under the indiſcriminate denomination of *Gothic*, our modern antiquaries have, more accurately, divided into *Saxon*, *Norman*, and *Saracenic*, or that ſpecies vulgarly, though improperly, called *modern Gothic*.

It has been maintained by ſome, that the Saxon churches, after they began to be built with ſtone, conſiſted only of upright walls, without pillars or arches, the conſtruction of which it is alleged they were entirely ignorant of. But it is highly improbable that the Saxons could be ignorant of ſo uſeful a contrivance as the arch. Many of them, built by the Romans, they muſt have had before their eyes; and it is not to be believed, that once knowing them and their convenience, they would neglect to uſe, or, having uſed, would relinquiſh them. Beſides, as it appears from undoubted authorities they procured workmen from the Continent to conſtruct their capital buildings "according to the Roman manner," this alone would be ſufficient to confute that ill-founded opinion; and at the ſame time prove, that what we commonly call *Saxon* is in reality Roman architecture.

The ſtyle of building practiſed all over Europe was of this ſort; and it continued to be uſed by the Normans, after their arrival here, till the introduction of what is called the *modern Gothic*, which did not happen till about the end of the reign of Henry II. ſo that there ſeems to be little or no ground for a diſtinction between the Saxon and Norman architecture. The ancient parts of moſt of our cathedrals are of this early Norman work, the characteriſtic marks of which are theſe:—The walls are very thick, generally without buttreſſes; the arches, both within and without, as well as thoſe over the doors and windows, ſemicircular, and ſupported by very clumſy columns, with a kind of regular baſe and capital. In ſhort, plainneſs and ſolidity conſtitute the ſtriking features of this method of building. Yet the architects of thoſe days ſometimes deviated from this rule. Their capitals were adorned with carvings of foliage, and even animals; and their maſſive columns exhibited ſmall half columns united to them, and their ſurfaces ornamented with ſpirals, ſquares, lozenge net-work, and other figures, either engraved or in relievo. Various inſtances of theſe may be ſeen in the cathedral of Canterbury, particularly the under croft, the monaſtery at Lindisfarn, or Holy Iſland, the cathedral at Durham, and the ruined choir at Orford in Suffolk. The columns 1, 1, 1, 1, pl. 18. are at the monaſtery of Lindisfarn, or Holy Iſland. Thoſe 2, 2, 2, belong to the ruined chancel at Orford in Suffolk. Fig. 3. is at Chriſt-Church, Canterbury. Fig. 4. is a column with

two remarkable projections like claws, in the ſouth aiſle of Romſey-church, Hampſhire.

The marks by which we diſtinguiſh the Saracenical architecture are its numerous and prominent buttreſſes, its lofty ſpires and pinnacles, its large and ramified windows, its ornamental niches and canopies, its ſculptured ſaints, the delicate lacework of its fretted roofs, and the profuſion of ornaments indiſcriminately laviſhed. But its moſt diſtinguiſhing characteriſtics are the ſmall cluſtered pillars and pointed arches formed by the ſegments of two interſecting circles (ſee Pl. 18.); which arches, though adopted laſt, are of a more ſimple and obvious conſtruction than the ſemicircular ones. To what country or people the *modern Gothic*, or the ſtyle of building with pointed arches which is ſo called, owes its origin, ſeems by no means ſatisfactorily determined. Some have imagined it may poſſibly have taken its riſe from thoſe arcades which we ſee in the early Norman or Saxon buildings or walls, where the wide ſemicircular arches croſs and interſect each other, and form at their interſection a narrow and ſharp-pointed arch. But it is more generally conjectured to be of Arabian extraction, and to have been introduced into Europe by ſome perſons returning from the Cruſades in the Holy Land. Sir Chriſtopher Wren was of that opinion, and it has been ſubſcribed to by moſt writers who have treated on the ſubject.

Another conjecture, and one in ſupport of which ſome plauſible arguments have been adduced, is, that this ſtyle of architecture was introduced into Spain by the Moors, and from that country paſſed by the way of France into Britain. According to Mr. Groſe, however, the only corroborating circumſtance in favour of this opinion, is the Moſque at Cordua in Spain, where, if Mr. Swinburn's views are to be truſted, though moſt of the arches are of a ſemi-circular or horſeſhoe faſhion, there are ſome pointed arches formed by the interſection of two ſegments of a circle. But we ſhall here leave this difficult point to be decided by others, and proceed to ſpeak of the progreſs of architecture in ancient Britain.

It appears from hiſtory, that before the Roman invaſion, the natives of Britain had no better lodgings than thickets, dens, and caves. Some of the caves, which were their winter habitations, and places of retreat in time of war, were formed and rendered ſecure and warm by art, like thoſe of the ancient Germans, which are thus deſcribed by Tacitus: "They are uſed to dig deep caves in the ground, and cover them with earth, where they lay up their proviſions, and dwell in winter for the ſake of warmth. Into thoſe they retire alſo from their enemies, who plunder the open country, but cannot diſcover theſe ſubterranean receſſes." Some of the ſubterraneous, or *earth-houſes*, as they are called, are ſtill remaining in the weſtern iſles of Scotland and in Cornwall. The ſummer habitations of the moſt ancient Britons were very ſlight; and, like thoſe of the Finnians, conſiſted only of a few ſtakes driven into the ground, interwoven with wattles, and covered over with the boughs of trees.

When Julius Cæſar invaded Britain, the inhabitants of Cantium (Kent), and of ſome other parts in the ſouth, had learned to build houſes a little more ſubſtantial and convenient. They daubed the wattled walls with clay to fill up the chinks and make them warmer; and they alſo whitewaſhed the clay, after it was dry, with chalk. Inſtead of the boughs of trees, they thatched theſe houſes with ſtraw, as a much better ſecurity againſt the weather. They next formed the walls of large beams of wood, inſtead of ſtakes and wattles. This ſeems to have been the mode of building in Britain when it was firſt invaded by the Romans. "The Britons (ſays Diodorus Siculus, who was cotemporary with Cæſar) dwell in wretched cottages, which are conſtructed of wood, covered with ſtraw." Theſe wooden houſes were not ſquare but circular, with high tapering roofs, with an aperture at the top for the admiſſion of light and the emiſſion of ſmoke.

When the Britons were invaded by the Romans, they had nothing among them anſwering to our ideas of a city or town, conſiſting of a great number of contiguous houſes, regular ſtreets, lanes, &c. Their dwellings, like thoſe of the ancient Germans, were ſcattered about the country, and generally ſituated on the brink of ſome rivulet for the ſake of water, and on the ſkirt of ſome wood or foreſt for the convenience of hunting and paſture for cattle. As theſe inviting circumſtances were more conſpicuous in ſome parts of the country than others, the princes and chiefs made choice of theſe places for their reſidence; and a number of their friends and followers, for various reaſons, built their houſes as near to them as they could with convenience. This naturally produced an ancient Britiſh town, which is deſcribed by Cæſar and Strabo as "a tract of woody country, ſurrounded by a mound and ditch," for the ſecurity of its inhabitants againſt the incurſions of their enemies. Again, it is ſaid, "The foreſts of the Britons are their cities; for when they have incloſed a very large circuit with felled trees, they build within it houſes for themſelves and hovels for their cattle. Theſe buildings are very ſlight, and not deſigned for long duration." The palaces of the Britiſh princes were probably built of the ſame materials, and on the ſame plan, with the houſes of their ſubjects, and differed from them only in ſolidity and magnitude.

Though the communication between this iſland and the continent was more free and open after the firſt Roman invaſion than it had been before, and ſome of the Britiſh princes and chieftains even viſited Rome, then in its greateſt glory; it does not appear that the Britons made any conſiderable improvements in their manner of building for at leaſt 100 years after that invaſion. For when the renowned Caractacus was carried priſoner to Rome, A. D. 52, and obſerved the beauty and magnificence of the buildings in that proud metropolis of the world, he is ſaid to have expreſſed great ſurpriſe, "that the Romans, who had ſuch magnificent palaces of their own, ſhould envy the wretched cabins of the Britons." As ſoon, however, as the Romans began to form ſettlements and plant colonies in this iſland, a ſudden and ſurpriſing change enſued in the ſtate of architecture. For that wonderful people, who were as induſtrious as they were brave, made haſte to adorn every country that they conquered. They not only built a prodigious number of ſolid, convenient, and magnificent ſtructures for their own accommodation, but they exhorted, encouraged, and inſtructed the Britons to imitate their example. Indeed this was one of the arts which Agricola, the moſt excellent of the Roman governors, employed to civilize the Britons, and reconcile them to the Roman government.

Not, however, very long after this period, architecture and all the arts connected with it began to decline very ſenſibly in Britain, and in all the provinces of the weſtern empire. This was partly owing to the building of Conſtantinople, which drew many of the moſt famous architects and other artificers into the eaſt, and partly to the irruptions and depredations of the barbarous nations. But it was owing undoubtedly to the final departure of the Romans that the almoſt total deſtruction of architecture took place in this iſland. For the people they left behind, having neither ſkill nor courage to defend their numerous towns, forts, and cities, ſuffered them firſt to be plundered, and then deſtroyed, by their ferocious invaders. By this means, the many noble ſtructures with which Provincial Britain had been adorned by the art and induſtry of the Romans, were ruined or defaced in a very little time; and the un-

fortunate Britons were quite incapable of repairing them, or of building others in their room. That long ſucceſſion of miſeries in which they were involved by the Scots, Picts, and Saxons, deprived them of the many uſeful arts which they had learned from their former maſters, and lodged them once more in foreſts, dens, and caves, like their ſavage anceſtors.

The moſt wanton and extenſive devaſtations were thoſe committed by the Anglo-Saxons; among whom it ſeems to have been a maxim to deſtroy all the towns and caſtles which they took from their enemies, inſtead of preſerving them for their own uſe. It cannot be ſuppoſed, that a people who wantonly demoliſhed ſo many beautiful and uſeful ſtructures had any taſte for the arts by which they had been erected. The truth is, that the Anglo-Saxons at their arrival in this iſland were almoſt totally ignorant of theſe arts; and, like all the other nations of Germany, had been accuſtomed to live in wretched hovels, built of wood or earth, and covered with ſtraw or the branches of trees: nor did they much improve in the knowledge of architecture for 200 years after their arrival. During that period, maſonry was quite unknown and unpractiſed in this iſland; and the walls even of cathedral churches were built of wood. The firſt cathedral of York was built of the ſame materials; and a church of ſtone was eſteemed a kind of prodigy, in thoſe times, that merited a place in hiſtory.

Maſonry was reſtored, and ſome other arts connected with it introduced into England, towards the end of the 7th century, by two clergymen, who were great travellers, and had often viſited Rome, where they had acquired ſome taſte for architecture. Theſe were, the famous Wilfrid biſhop of York, and afterwards of Hexham, and Benedict Biſcop, founder of the abbey of Wercmouth. Wilfrid, who was one of the moſt ingenious, active, and magnificent prelates of the 7th century, was a great builder, and erected ſeveral ſtructures at York, Ripon, and Hexham, which were the admiration of the age in which he flouriſhed. The cathedral of Hexham, which was one of theſe ſtructures, has ſome veſtiges ſtill remaining. It was built by maſons and other artificers brought from Rome by the munificence of its generous founder. Benedict Biſcop was the cotemporary and companion of Wilfrid in ſome of his journeys, and had the ſame taſte for the arts. He made no fewer than ſix journeys to Rome, chiefly with a view of collecting books, pictures, ſtatues, and other curioſities, and of perſuading artificers of various kinds to come from Italy and France and ſettle in England. But though the art of building edifices of ſtone, with windows of glaſs and other ornaments, was thus introduced by theſe two prelates in the latter part of the 7th century, it does not ſeem to have flouriſhed much for ſeveral centuries after. It appears from many incidental hints in our ancient hiſtorians, that ſtone buildings were ſtill very rare in the eighth and ninth ages; and that when any ſuch buildings were erected, they were the objects of much admiration.

In the other parts of this iſland architecture was, as might naturally be expected, in a ſtill leſs flouriſhing ſtate. After the ancient Britons had retired to the mountains of Wales, in conſequence of the incurſions of the Danes, the ſpirit of architecture ſeems to have been almoſt totally extinct. Such was its poverty at this period, that a royal reſidence or palace in Wales, with all its offices, was valued at five pounds and eighty pence of the money of that age, equal in quantity of ſilver to ſixteen pounds of our money, and in efficacy to one hundred and ſixty. Even the caſtles in Wales that were built for the ſafety of the country, were conſtructed of the ſame materials as thoſe of which their palaces conſiſted; namely, of wands, with their barks peeled off wrought into wicker in the manner of our baſkets. Such were the flimſy materials which formed the ſide-walls of edifices deſigned for defence even againſt the attacks of an enemy, and whence it was that the laws required the king's vaſſals to come to the building of theſe caſtles with no other tool than an axe.

By the Scots and Picts of this age, the arts of building do not ſeem to have undergone much improvement. In the beginning of the eighth century, however, they began to make ſome advances, as appears from ſome edifices yet remaining in Scotland. Theſe buildings are all circular, and ſo extremely various in ſtyle, that they rather ſeem to be the works of different ages and nations, than of one age and country. The largeſt of theſe ſtructures are of an extraordinary taſte of architecture, and are deſcribed in nearly the following manner by a modern antiquary, who viewed them with great attention. "Having arrived at the barrack of Glenbeg, I was conducted to the remains of theſe ſtupendous fabrics, ſeated about two miles from thence in a valley called Glenbeg, in which four of them anciently ſtood. The firſt I met with is called Malcolm's Caſtle; the ſecond, Caſtle Chonel. About a quarter of a mile further, upon the bank of a rivulet, which paſſes through the middle of the glen, ſtands that called Caſtle Tellve. I found it compoſed of ſtones without cement; not laid in regular courſes after the manner of elegant buildings, but rudely and without order. Thoſe toward the baſe were pretty large; but thoſe on the top ſcarcely exceeded the thickneſs of a common brick. I was ſurpriſed to find no windows on the outſide, nor any manner of entrance into the fabric, except a hole towards the weſt at the baſe." "But (continues he) to give a more complete idea of theſe buildings, I ſhall deſcribe the fourth, called Caſtle Troddan, which is by far the moſt entire of any of that country, and from whence I had a very clear notion how theſe fabrics were originally contrived. The area of this makes a complete circle; and there are four doors in the inner wall, which face the four cardinal points of the compaſs. Theſe doors are each 8½ feet high and five feet wide, and lead from the area into the cavity between the two walls which run round the whole building. The perpendicular height of this fabric is exactly 33 feet; the thickneſs of both walls, including the cavity between, no more than 12 feet; and the cavity itſelf is hardly wide enough for two men to walk abreaſt; the external circumference is 178 feet. The whole height of the fabric is divided into 4 parts or ſtories ſeparated from each other by thin floorings of flat ſtones, which knit the two walls together, and run quite round the building; and there have been winding ſtairs of the ſame flat ſtones aſcending betwixt wall and wall up to the top. Over each door are nine ſquare windows, in a direct line above each other, for the admiſſion of light; and between every row of windows are three others in the uppermoſt ſtory riſing above a cornice, which projects out from the inner wall and runs round the fabric." From the foregoing deſcription of theſe ſingular edifices it plainly appears, that they were deſigned, both for the purpoſe of defence and lodging; and conſidering the times in which they were erected, they ſeem to have been pretty well calculated for both theſe purpoſes.

The ſtone edifices of the other kind, which were probably erected in this period, and of which ſome few are ſtill to be ſeen in Scotland, are not ſo large as the former, but more artificial. They are ſlender, lofty, circular towers, of fine ſtone, laid in regular rows between 40 and 50 feet in external circumference, and from 70 to 100 feet high, with one door ſome feet diſtant from the ground. They are exactly ſimilar to the round tower of Ardmore, and ſeveral others, in Ireland.

It is therefore probable that they were both built at the ſame time, which was the 10th century, and for the ſame purpoſe, which ſome believe was for the confinement of penitents, while they were performing penance. Others are of opinion, that the original intention of theſe towers was, that from them the people might be called to public worſhip, by the ſound of a

horn or trumpet, anſwering the end of a church bell, which had not then been invented.

In the 12th century, architecture received very great improvements, in conſequence of the religious zeal of the clergy, who inſpired all ranks of people with an ardour for pulling down the old churches, and building more elegant and ſplendid ones in their ſtead.

A writer in the time of Henry I. ſays, "By this means the ancient edifices that had been raiſed in the days of Edgar, Edward, and other Chriſtian kings, were demoliſhed, and others of greater magnitude and magnificence, and of more elegant workmanſhip were erected in their room, to the glory of God."

The ſacred architecture of the Anglo-Normans in the beginning of this period, did not differ much in its ſtyle and manner from that of the Anglo-Saxons: their churches being in general plain, low, ſtrong, and dark; the arches both of the doors and windows ſemicircular, with few or no ornaments. By degrees, through much practice, our architects, who were all monks or clergymen, improved in their taſte and ſkill, and ventured to form plans of more noble, light, and elevated ſtructures, with a great variety of ornaments; which led to that bold magnificent ſtyle of building, commonly, though perhaps not very properly, called *the later Gothic*. It is not improbable that our monkiſh architects were aſſiſted in attaining this ſtyle of building by models from foreign countries, or by inſtructions from ſuch of their own number as had viſited Italy, France, Spain, or the Eaſt.

Its firſt appearance in England was towards the latter end of the reign of Henry II. But it was not at once thoroughly adopted, ſome ſhort ſolid columns and ſemicircular arches being retained and mixed with the pointed ones. In the reign of Henry III. however, this manner of building ſeems to have gained a complete footing; the circular giving way to the pointed arches, and the maſſive columns giving place to the ſlender pillars: and ſuch was their paſſion for this new taſte, that many of their ſtrong ancient buildings were pulled down, and re-conſtructed after the model of this new architecture. The preſent cathedral church of Saliſbury was begun early in this reign, and finiſhed in the year 1258. Its ſtyle is Saracenic, and according to ſir Chriſtopher Wren, is one of the fineſt productions of architecture of the age in which it was built. It is built on one entire plan, and at one time, by which it diſtinguiſhes itſelf from ſome other cathedrals, which have been built at different periods, and in various ſtyles.

From this time till Henry VIII. the faſhionable pillars in churches were of Purbec marble, very ſlender and round, encompaſſed with marble ſhafts a little detached, having each a capital adorned with foliage, which joining, formed one elegant capital for the whole pillar. The windows were long and narrow, with painted arches and painted glaſs. In this century, lofty ſteeples, ſpires, and pinnacles, were much the taſte in building churches.

In the 14th century, pillars conſiſted chiefly in an aſſemblage of ſhafts not detached, but united, forming one ſolid and elegant column. Their windows, eſpecially thoſe of the eaſt and weſt ends were large, and divided by ſtone mullions running into ramifications above, and forming numerous compartments in various fanciful ſhapes. Thoſe windows were filled with ſtained glaſs of the moſt lively colours, on which were repreſented kings, ſaints, and martyrs, and their hiſtories, producing a ſtriking effect. Yet, notwithſtanding the perfection to which architecture had attained in theſe inſtances, it is here to be remarked, that this art, as it applied to common dwelling-houſes, did not receive a proportionate degree of improvement, if any at all: for even in the city of London, towards the end of the 12th century, the houſes of mechanics and common burgeſſes were built of wood and covered with ſtraw or reeds. That moſt numerous and uſeful body of men were in fact in a ſtate of great depreſſion in theſe times, when the arts of popery were practiſed to render them the ſervile inſtruments of the prieſthood, conſequently little attention was paid to the convenience, much leſs to the elegance of their dwellings.

In the 15th century, or near the cloſe of the reign of Henry VII. a new kind of low pointed arch grew much into uſe. It was deſcribed from four centres (ſee Plate 18.), was very round at the haunches, and the angle at the top was very obtuſe. This ſort of arch is to be found in every one of cardinal Wolſey's buildings; alſo at Weſt Sheen; an ancient brick gate at Mile End, called *King John's Gate*; and in the great gate of the palace of Lambeth. From this time Gothic architecture began to decline; and was ſoon after ſupplanted by a mixed ſtyle, if one may venture to call it ſo; wherein the Grecian and Gothic, however diſcordant and irreconcileable, are jumbled together. Concerning this mode of building, Mr. Warton, in his obſervations on Spenſer's Fairy Queen, has the following anecdotes and remarks:

"Although the Roman or Grecian architecture did not begin to prevail in England till the time of Inigo Jones, yet our communication with the Italians, and our imitation of their manners, produced ſome ſpecimens of that ſtyle much earlier. Perhaps the earlieſt was Somerſet Houſe in the Strand, built about the year 1549, by the duke of Somerſet, uncle to Edward VI."

In the year 1613, the magnificent portico of the ſchools at Oxford was erected, in which, along with the old Gothic ſtyle, the architect has affectedly diſplayed his extraordinary ſkill in the Grecian and Roman architecture; and has introduced all the five orders together.

In the 15th and 16th centuries, when learning of all kinds began to revive, the chaſte architecture of the Greeks and Romans ſeemed, as it were, to be recalled into life. The firſt improvements of it began in Italy, and even owed their exiſtence to the many ruins of the ancient Roman ſtructures that were to be found in that country, from whence an improved method of building was gradually brought into the other countries of Europe: and though the Italians for a long time retained the ſuperiority, as architects, over the other European nations, yet as men of genius from all quarters conſtantly viſited Italy for the purpoſe of improvement in architecture, as well as the other arts, ſince that period they have been equalled, if not ſurpaſſed, by architects of other nations, and even of our own country.

PART I.

GENERAL PRINCIPLES OF ARCHITECTURE.

SECT. I. *Of Compoſition and Harmony in Building.*

ARCHITECTURE being a uſeful and fine art, leads us to apply the practice of it in three different ways; firſt, for utility; ſecondly, for ornament; and thirdly, for the conſtruction of ſuch buildings, or parts of buildings, as require both effect in ornaments and uſefulneſs of parts.

Buildings, intended ſolely for utility, ought in every part to correſpond with that deſign. Any material deviation from uſefulneſs for the ſake of ornament ought to be ſtrictly avoided. Works of entire uſefulneſs are conſidered as a mean to ſome end, and the nearer they approach to a perfect mean for

obtaining that end, the more will ſuch ſtructures gain our applauſe though every beauty of ornament be neglected. On the other hand, in ſuch works as are merely calculated for ornament, beauty alone ought to be regarded. In this caſe, the art of which we are treating is capable of exciting a variety of agreeable feelings; as veneration, admiration, grandeur and aſtoniſhment. The principal difficulty, however, is to combine the qualities of uſefulneſs and agreeable effect in ornamental ſtructures. The moſt practicable method is to prefer utility to ornament in proportion as the character of the building will admit of it. In palaces, and ſuch buildings as are capable of a variety of uſeful contrivance, regularity ought to be preferred; but in dwelling-houſes that are on too ſmall a ſcale for variety of contrivance, regularity ſhould give place to uſefulneſs, ſo far at leaſt as the former ſtands in direct oppoſition to the latter.

In conſidering attentively the beauty of viſible objects, we diſcover two kinds. The firſt may be termed *intrinſic* beauty, becauſe it is diſcovered in a ſingle object, without relation to another. The ſecond may be termed *relative* beauty, being founded on a combination of relative objects. Architecture admits of both kinds.

There is a ſort of beauty or harmony in the whole character of a building with relation to its intended occupier. Vitruvius, Palladio, and other ancient writers, have been careful to inculcate this doctrine, as abſolutely neceſſary to be obſerved by a good architect. Indeed it is founded on ſelf-evident principles; for all will admit, that the appearance of a palace ought to convey an idea of the majeſty and grandeur which are peculiar to monarchs, ſo that a common obſerver may pronounce, on the firſt view of ſuch an edifice, that it is deſtined to be the habitation of ſo dignified a perſonage. Nature herſelf is a precedent for this doctrine. The vaulted canopy of the heavens, and all their richly ornamented ſpheres, conſtitute a glorious temple that moſt accurately beſpeaks the character of its divine poſſeſſor. The like conformity ſhould appear in temples made with hands, and in thoſe inferior ſtructures erected by art for the accommodation of the various claſſes of human ſociety. Palladio has a remark to the following effect: If the architect is employed to build a houſe for any public officer of the nation, ſuch as an ambaſſador, or prime miniſter, &c. he ſhould introduce porticos, galleries, and magnificent halls, richly adorned, in order that ſuch as attend on buſineſs, or viſit the poſſeſſor, may be agreeably intereſted and amuſed while they wait. In all caſes, regard is to be paid to the dignity, rank, or profeſſion of the occupier, rather than to his wealth. But if a building is deſtined to ſome particular and public profeſſion, then we ſhould regard the public uſe for which it is intended, without confining our ideas to the quality of any individual proprietor. A playhouſe muſt have a gay and ſplendid ſtyle: a heathen temple, though theſe are now far removed from us, is conſidered as a houſe dedicated to ſome divinity; and therefore in conformity to its deſtination, it muſt be elevated, magnificent and grand; and as the dark myſteries of the heathen theology required ſomething gloomy to give them an air of reality and ſanctity, theſe temples were contrived to produce a ſomewhat dark and gloomy appearance. But we by no means ought to infer from this, that our churches ſhould be ſo managed; for we do not believe, with a certain architect, that dimneſs, obſcurity, and gloom, produce that tone of mind which is favourable to humility and devotion. The ſtyle of a church ought to be grave, bold, and magnificent, affording a proper quantity and equal diſtribution of light to every part uſed in the time of worſhip. The appearance and ſtyle of a monument ought to be ſolemn and gloomy, ſo ornamented as to awaken the memory of the deceaſed in the minds of ſurviving friends. Courts of juſtice, ſenate-houſes, or the like, have alſo their proper ſtyle, which will always be obſerved by good architects.

Sect. II. *Of the Beauty of Proportion.*

The proportions of a door are determined by the uſe to which it is deſtined. The door of a dwelling-houſe, which ought to correſpond to the human ſize, is confined to ſeven or eight feet in height, and three or four in breadth. Thoſe proportions aſſigned to a ſtable or coach-houſe, are different. The door of a church ought to be wide, to afford an eaſy paſſage to a multitude; and its height ſhould therefore be in proportion, that its appearance may pleaſe the eye. The ſize of windows ought always to be in proportion to the dimenſions of the room they are intended to illuminate; for if the apertures, or openings, be not large enough to convey light in an equal diſtribution to every part of the room, the whole will have a deformed appearance. Nothing can be more diſagreeable, than to ſee a profuſion and glare of light in one part of a room, whilſt the other is under a ſtrong ſhade; ſuch contrary effects always prove diſadvantageous to the appearance of furniture and other ornament, common to good apartments. Steps of ſtairs ſhould likewiſe receive a ſuitable proportion, and be accommodated to the human figure, without relation to the magnitude of any other part of the building; and therefore in ſmall and in larger houſes they are alike in ſize, becauſe men are nearly alike in ſtature. The proportions of rooms are either intrinſic or relative, though in moſt caſes both are included. The intrinſic proportion of a room is its length, breadth, and height; which being properly adjuſted, we pronounce it of a beautiful proportion, without regard to any other part of the building. But the relative beauty of proportion is as the whole area of the room is to the magnitude of the houſe of which it compoſes a part. A room may be well proportioned as to itſelf, but may, at the ſame time, be either too large or too ſmall for the whole edifice. In a ſumptuous building, the capital rooms ought to be large, otherwiſe they will not be proportioned to the ſize of the whole; and for the ſame reaſon a very large room is improper in a ſmall houſe; yet every houſe ought to have both large and ſmall rooms, in proportion to itſelf. Yet in things thus related, the mind requires not a preciſe or ſingle proportion, rejecting all others; on the contrary, different proportions are ſometimes equally agreeable to contemplate. It is only when a proportion becomes looſe and diſtant, that the agreeableneſs abates and at laſt vaniſhes. With regard to the proportion the height of a room ſhould bear to the length and breadth, it muſt be rather uncertain in ſome caſes, ariſing from that deception to which the eye is ſubject when its height exceeds 16 or 17 feet; yet if a proper optical allowance be made, we do not think the attainment of a beautiful proportion ſo hazardous or arbitrary a taſk as ſome architects would inſinuate. A room 48 feet in length, and 24 in breadth and height, is well proportioned; but it is well known, that were we to reduce thoſe to 12 and 24, a room would approach too near the appearance of a gallery. Yet it is evident that, if the proportion be ſo adjuſted as to be in the medium between theſe two, a room cannot produce a bad effect as to its ſize. For inſtance, if the height and breadth be 18 feet each, and the length 36 feet, this proportion of a room is by architects termed harmonic, or agreeable to the eye, anſwering to diapente, one of the chords in muſic, which includes the interval from 1 to 5, and is agreeable to the ear.

Upon this principle there are ſeven proportions aſſigned to rooms, which are termed harmonies or agreeables. The cube, cube and half, double cube, the ſubduple of 4, 3, and 2—ditto of 5, 4, and 3—ditto of 6, 4, and 3—and laſtly, of 3, 2, and 1. Upon this ſcale, if the height of the room be 18 feet,

as before, it is of the cube form when its width and length are the ſame, or more properly when the floor, cieling, and ſide-walls are all of one dimenſion. The 2d, or cube and half proportion, will be 27 feet long and 18 broad; the 3d, or double cube proportion, 36 feet by 18 broad; the ſubduple of 4, 3, and 2, produce 36 feet in length and 27 in breadth; ditto of 5, 4, and 3, produce 30 feet by 24 broad; ditto of 6, 4, and 3, produce 36 by 24 broad; ditto of 3, 2, and 1, produce 54 by 36 broad.

To find the produce of theſe ſubduples proceed thus: In every caſe divide the given height of the room by the ſmalleſt numbers, 3, 2, or 1, as may be required. Again, multiply the quotient by the middle numbers 4, 3, or 2, and the produce will be the width of the room. Laſtly, multiply the ſaid quotient by the largeſt numbers 4, 5, 6, or 3, and the produce will give the length of the room of the 1ſt ſub-duplicate, 4, 3, and 2.

EXAMPLE.

Diviſor. Dividend. Quotient.
2) 18 (9

3 middle number multiplied
quotient 9 mult. by the largeſt number 4 — 27 ft. width of the room.

36 ft. length of the room.

If we propoſe 12 feet for the height of the room, proceed as above. Yet it ſhould be obſerved, that the double cube proportion of a room upon this ſcale would be 12 feet in height and width, and 24 in length, which, though admitted by a certain architect amongſt the number of the harmonic proportions for rooms, yet is condemned by him as approaching to the form of a gallery; which is certainly a ſelf-contradiction, and tends to unſettle and render indeterminate the very doctrine he advances. On the other hand, the cube form, though admitted into the number of harmonic proportions, would as often be pronounced by the judgment of ſight too broad. This however is to be underſtood only when a room is of large dimenſions; for, when ſmall, it is quite agreeable and convenient. It is evident, then, that the double and ſingle cube are the two extreme proportions for rooms, and that each of them requires a certain ſcale of magnitude to render them beautiful and uſeful; the former being applicable to a large room, the latter to a ſmall one.

It is alſo evident, that the doctrine of harmonic proportions of rooms is not quite perfect, otherwiſe there could be no exceptions taken in any caſe. Not ſo in the proportion of ſounds; every chord is alike pleaſing upon any ſcale; and though ſome of the chords are leſs perfect than others, yet all of them produce harmony to every ear capable of the ſweet ſenſation of muſic. We therefore are diſpoſed to conclude, that though there exiſts a conſiderable agreement between the doctrine of ſounds and the dimenſions of a room, yet they are not perfectly parallel, conſequently the judicious architect will make his own exceptions. With reſpect to the figure of rooms little need be ſaid, as it is ſelf-evident that thoſe of four ſides with right angles are beſt adapted for the reception of light and the diſtribution of furniture. Thoſe, however, of the circular or regular polygonal kind are preferable, when the light comes in by an aperture in the roof or ceiling.

SECT. III. *Of the external Proportions of Houſes.*

AN ingenious author on this ſubject has the following remark: "To ſee, on a conſiderable eminence, the length of a front trifling, and the height diſproportioned, would be as abſurd as to behold a front in a vale long and extended, and elevated only one ſtory. Proportion (ſays he) requires our niceſt choice, which muſt be dependent upon rules; for as the jarring of inſtruments by blind chance cannot poſſibly pleaſe the ear, ſo the diſproportion of the parts of any object muſt naturally ſhock the eye; and in both, unerring rules muſt ſo proportion the ſounds, and diſpoſe the parts, as the whole may be in complete harmony. Nature has taught mankind, in muſic, certain rules for proportions of ſounds; ſo architecture has its rules dependent on thoſe proportions, or at leaſt ſuch proportions as are in arithmetical harmony; and thoſe we take to be dependent on nature. The ſquare in geometry, the uniſon or circle in muſic, and the cube in building, have all an inſeparable proportion, the parts being equal, and the ſides and angles, &c. give the eye and ear harmonic pleaſure." Yet even this theory, when applied to the whole fabric, gives way to exceptions; for the cube muſt not exceed 50 feet; the cube and half 60 feet; and the double cube 80 feet front. The general rule is as follows: If the cube be 50 feet front, the depth and height will be the ſame. The cube and half is when the front is 60 feet long; the depth and height each 40 feet. The double cube of 60 feet will be 30 feet deep and 30 feet high. In the country where gentlemen's houſes are detached, and are eaſily viewed in front and depth by an approaching traveller, a ſtrict regard to proportion becomes neceſſary; for if the cube form be adopted in very large houſes, it will appear uncouth and heavy; whilſt, on the other hand, it is equally diſagreeable to ſee a dwelling houſe approach to the appearance of a lofty tower. Very high dwelling-houſes prove exceedingly inconvenient; and therefore, where beauty of proportion is connected with utility, they ought rather to aſſume the figure of a parallelopipedon reſting on its larger baſe. Hence that form of building which rather ſpreads upon the ground than riſes in height, is always preferred. In towns the houſes being generally attached to each other, they unitedly compoſe a regular ſtreet or ſquare; in which caſe, the proportions of an individual front are leſs obvious, and their depth in this reſpect immaterial. The great object of concern is the uniformity of the whole when completed; or of one individual houſe with the whole. In theſe ſituations, the proportions of houſes, and the length and extent of ſtreets, are rather ſubject to acts of parliament than to architectural laws.

There are four different rates into which the proportions of houſes in town are divided or claſſed by the legiſlature. The firſt rate, or houſes of the largeſt ſize, are ſuch as exceed nine ſquares of building; thoſe of the ſecond rate are from five to nine ſquares; thoſe of the third from three and a half to five ſquares; and of the fourth, not exceeding three ſquares and an half. Their height is regulated in like manner, and the thickneſs of their walls and chimneys. Under ſuch reſtrictions the architect muſt often proceed under great diſadvantages, and muſt occaſionally call forth the good quality of docility recommended by Vitruvius.

SECT. IV. *Of the Situation and internal Diviſion of Houſes.*

THIS is certainly a ſubject highly worthy of the notice and choice of an architect. It muſt be obvious that a riſing ground is much better ſuited for a magnificent palace than a concealed valley; and that it would be incongruous and abſurd to erect a ſumptuous building on a wild, uncultivated, and barren ground, deſtitute of water, woods, hills, or other natural beauties, which nature has aſſigned to various and even extenſive portions of the earth.

Where ſuch ſituations are left to the choice of the architect,

it becomes him to apply his taſte in fixing the preciſe ſituation or bearings of his intended work, in the execution of which he muſt attend to the four cardinal points. In the firſt place he muſt obſerve, that every internal diviſion or room may receive a due degree of light and heat, ſuited to its intended uſe, and the different ſeaſons in which it is more particularly to be occupied. Here the ſkilful architect muſt exerciſe ſeveral of thoſe qualifications enumerated by the famous Vitruvius, as eſſentially requiſite to the formation of his character. And indeed whatever qualifications are abſolutely neceſſary in the proper choice of the ſituation and plan of a town or city, the ſame will be wanted to complete a country reſidence. The firſt and grand objects of human concern in this life are health, pleaſure, and convenience; and whatever contribute to theſe muſt be ſtudied with great care.

Hence the neceſſity of a ſituation beſt adapted for good air, a ſufficient ſupply of wholeſome water at a convenient diſtance for family uſe, fertile grounds, whoſe produce in ſummer may impregnate and render ſalubrious the element in which we breathe. Directly oppoſed to theſe conſiderations are marſhy, low, and barren lands, where even the hardy brute animal will ſcarcely thrive. Stagnant waters muſt more eſpecially be avoided.

Palladio ſays, the infallible marks of a good ſituation for health are where the cattle thrive, and the inhabitants look ruddy and cheerful. In fixing on the preciſe ſpot of ground, that which is moderately elevated, if it be contiguous to ſome river, will be beſt adapted for health, pleaſure, and moſt probably for convenience too. In ſuch a ſituation, the air acquires a conſtant motion and free circulation, by which it purifies itſelf as water does by a current, and becomes more ſalutary to the human frame. And nothing can ſo much contribute to the excellence of a proſpect as a river, eſpecially a winding one; the beauty of which will, in idea, be heightened by its utility as the means of ſupplying water for family uſe. Theſe moſt eſſential preliminaries being ſettled, the architect proceeds to conſider in what direction his front and flank are to be placed with reſpect to the ſouth or north points. This, in many inſtances, will be cloſely connected with the internal diviſion of the houſe, which aſſigns to each room its particular uſe and ſeaſon. Cool drawing-rooms are ſuitable for ſummer; and for this purpoſe they ſhould be large, and ſituated towards the north, or ſo as to be ſcreened from the ſcorching beams of the ſun. Warm drawing-rooms are adapted for winter; and therefore theſe ſhould be ſmall, and have a place towards the ſouth, or where the reviving rays of the ſun can have free intercourſe. Rooms appropriated for ſpring and autumn may be in a medium ſituation to theſe, and ſhould have their windows to look into the different gardens or green walks. Libraries, ſtudies, breakfaſt and other morning rooms, ſhould have the ſame ſort of proſpect, as being moſt conformable to morning exerciſes. Finally, if the houſe be built on ſo large and magnificent a ſcale as to admit the ſame variety in all the different apartments, then the dining-parlours, bed-rooms, &c. will be ſubject to the ſame laws of ſituation, and anſwerable to the different ſeaſons of the year.

It has been a queſtion, whether or not the principal rooms ſhould lie neareſt the grand entrance, as being beſt ſuited to give them their full effect. We ſhall not decide upon this nice point, but will cite the reaſons of a certain writer why they ought not. "A large and ſpacious room, which is generally the firſt that receives us, is a bad contrivance in ſeveral reſpects. In the firſt place, when immediately from the open air we ſtep into ſuch a room, its ſize is apparently diminiſhed by contraſt; and looks little, compared with the great canopy of the ſky. In the next place, when it recovers its grandeur, as it ſoon does, it gives a minute appearance to the reſt of the houſe; paſſing from it, every apartment looks little. In the third place, by its ſituation it ſerves only for a waiting-room, and a paſſage to the principal apartments. Rejecting therefore this form, a hint may be taken from the climax in writing for another that appears more ſuitable: a handſome portico, proportioned to the ſize and faſhion of the front, leads into a waiting-room of a larger ſize, and this to the great room, all by a progreſſion of ſmall to great."

The ſeveral offices, which have a place in the plan of houſes now deſcribed, ſhould be ſo arranged, as to appear to compoſe an inferior part of the whole building, not totally detached, yet in ſuch order as to keep the more offenſive ones as remote as poſſible from the principal parts of the houſe. This indeed is the true doctrine of nature; for if we compare the ſeveral parts of a building to the various members which compoſe an animal frame, we ſee that the moſt beautiful parts are moſt conſpicuous, whilſt thoſe that are leſs comely either recede from the view, or are quite concealed.

Sect. IV. *Of the various Ornaments which contribute to give a peculiar Expreſſion or an apparent Uſefulneſs to Buildings.*

It has been doubted whether a building can admit of any ornaments but ſuch as are uſeful, or at leaſt have the appearance of being ſo. But conſidering architecture no leſs as a fine than an uſeful art, both kinds may be properly introduced. A private houſe, and other edifices, where uſe is the chief aim, admit not indeed of any ornaments but ſuch as have the appearance of utility. But temples, triumphal arches, and ſuch buildings as are chiefly intended for ſhow, may be highly ornamented without any regard to their ſeeming uſefulneſs. Hence it is that a threefold diviſion of ornaments has been ſuggeſted. Theſe are, 1ſt, Ornaments that are beautiful without relation to uſe; ſuch as ſtatues, vaſes, &c. 2d, Objects in themſelves not beautiful, but poſſeſſing the beauty of utility, by impoſing on the ſpectator, and appearing to be uſeful; ſuch as blind windows. 3d, Where things are beautiful in themſelves, and at the ſame time aſſume the appearance of uſe; ſuch as pilaſters. With regard to the firſt, we naturally require that a ſtatue ſhall be ſo placed as that it may be ſeen in every direction, and at various diſtances, by having an opportunity of receding or advancing as we pleaſe. Statues placed in the niches of fronts of houſes, or on the tops of their walls and roofs, ought not to be admitted. Their proper places are in large halls, and in paſſages that lead to a grand ſtair-caſe, &c. To adorn the top of the wall with a row of vaſes, is an unhappy conceit, by placing a thing, whoſe natural deſtination is utility, where it cannot have even the leaſt appearance of it. Now, firmneſs and ſolidity being the proper expreſſions of a pedeſtal, and, on the contrary, lightneſs and delicacy of carved work, the pedeſtal, whether of a column or of a ſtatue, ought to be ſparingly ornamented. The ancients never ventured on any bolder ornament than the baſſo relievo.

With reſpect to ornaments of the *ſecond* kind, it is a great blunder to contrive them ſo as to make them appear uſeleſs. A blind window, therefore, when neceſſary for regularity, ought to be ſo diſguiſed as to appear a real window: when it appears without diſguiſe, it is diſguſtful, as a vain attempt to ſupply the want of invention; it ſhows the irregularity in a ſtronger light, by ſignifying that a window ought to be there in point of regularity, but that the architect had not ſkill ſufficient to connect external regularity with internal convenience.

As to the *third*, it is an error to ſink pilaſters ſo far into the wall, as to remove totally, or moſtly, the appearance of uſe. They ſhould always project ſo much from the wall, as to have the appearance of ſupporting the entablature over them.

From ornaments in general, we descend to a pillar, the chief ornament in great buildings. The destination of a pillar is to support, really, or in appearance, another part termed the *entablature*. With regard to the form of a pillar, it must be observed, that a circle is a more agreeable figure than a square, a globe than a cube, and a cylinder than a parallelopipedon. This last, in the language of architecture, is saying, that a column is a more agreeable figure than a pilaster; and for that reason it ought to be preferred, when all other circumstances are equal. Another reason concurs, that a column annexed to a wall, which is a plain surface, makes a greater variety than a pilaster Besides, pilasters at a distance are apt to be mistaken for pillars; and the spectator is disappointed when, on a nearer approach, he discovers them to be only pilasters.

It has been disputed, whether any new order can be added to the Doric, Ionic, and the Corinthian. Some hold the affirmative, and give for instances the Tuscan and Composite; others maintain, that these properly are not distinct orders, but only the original orders, with some slight variation. The only circumstances that can serve to distinguish one order from another, are the form of the column, and its destination. To make the first a distinguishing mark, without regard to the other, would multiply orders without end. Destination is more limited, and it leads us to distinguish three kinds of orders; one plain and strong, for the purpose of supporting plain and massy buildings; one delicate and graceful, for supporting buildings of that character; and between these a third, for supporting buildings of a mixed nature. So that, if destination alone is to be regarded, the Tuscan is of the same order with the Doric, and the Composite with the Corinthian.

The ornaments of these three orders ought to be suited to the purposes for which they are intended. Plain and rustic ornaments would not be a little discordant with the elegance of the Corinthian order, and sweet and delicate ornaments not less with the strength of the Doric.

With respect to buildings of every kind, one rule, dictated by utility, is, that they be firm and stable. Another, dictated by beauty, is, that they also appear so to the eye: for every thing that appears tottering, and in hazard of tumbling down, produces in the spectator the painful emotion of fear, instead of the pleasing emotion of beauty; and accordingly it should be the great care of the artist, that every part of his edifice appear to be well supported. Some have introduced a kind of conceit in architecture, by giving parts of buildings the appearance of falling; of this kind is the church of St. Sophia in Constantinople: the round towers in the uppermost stories of Gothic buildings are in the same false taste.

The most considerable ornaments used in architecture are the five orders of columns, pediments, arches, balusters, &c. of which we shall now speak.

PART II.

OF THE FIVE ORDERS OF ARCHITECTURE.

SECT. I. *Of the several Parts and Members of an entire Order.*

THE principal parts of an entire order are three; the pedestal, shaft, and entablature. These principal parts are again subdivided as follows: the pedestal contains the plinth *a* (see Tuscan order, Pl. 19), the dado *b*, and the cornice *c*. The column includes a base *d*, a shaft *e*, and a capital *f*. The entablature consists of an architrave *g*, a frieze *h*, and a cornice *i*.

Thus, in every entire order, there are three principal parts; and each of these is again subdivided into three smaller parts, which, in all, make nine. The origin of these names is explained in the following manner:

The *plinth* takes its appellation from πλινθος, a brick or flat square stone on which columns in the most early state of architecture are supposed to have stood.

The *dado*, or *dye*, is so called because it is of a cubic form.

The *cornice* is derived from *coronis*, a top or summit; because the cornice is the extreme end or finishing of the pedestal.

The *base* of the column is from βασις, a foundation or footing for the column.

The *shaft*, that long and straight part of a column comprehended between the base and capital, is so named from σκαπτω to dig, in the manner of a well, round and deep, whose inside resembles the shape of a pillar.

The *capital*, from κεφαλη, or *caput*, the head, which the capital is to a column.

The *architrave*, from αρχος chief or principal, and *trabs* a beam, because the architrave is the chief support to the whole entablature.

The *frieze* is so called from φιβρον a border or fringe, or which some of the ancients used to call ζωφορος; because their friezes were usually enriched with the figures of animals.

The *cornice* of the *entablature*, or the crowning part of the entire order, needs no other explanation than that already given.

These nine principal parts of a complete order, the dado and shaft excepted, are composed of small members, which constitute all that simple and pleasing variety of mouldings which adorned the works of the ancients. The names of these mouldings allude to their forms, and their forms are adapted to the purposes for which they were intended. (See Pl. 25.) The names of these members, with their origin and use, are as follows. (See References to the Doric Order, Pl. 19.)

Fig. 1. The *fillet*, from the French word *fil*, thread.
2. The *cymatium*, or *cyma recta*, from κυμαιον a wave; because this member resembles the swelling and concavity of a wave.
3. The *cyma reversa*, the preceding member inverted.
4. The *corona*, or crown, because it is the principal member of the cornice, and serves as a shelter to the smaller mouldings of the entablature.
5. The *ovolo*, from *ovum* an egg; because this member by the ancients was frequently carved in the form of eggs.
6. The *cavetto*, from *cavus* hollow.
7. *Capital*, or upper fillet of the triglyph.
8. *Triglyph*, from τριγλυφος *three engravings*, compounded of τρι *three*, and γλυφω to *carve* or *engrave*; in conformity to which, the triglyph has two entire channels and two half ones, with three spaces between.
9. The *metope*, from μετοπη, the *space* between one aperture or hole to another; the triglyphs being supposed to be joists that fill the apertures: hence the space between the triglyphs, which forms an exact square, is termed the *metope*.
10. The *frieze* we have already explained.
11. The *band*; the same as *fillet*.

Fig. 12. The *drops*, *guttæ*, are of a conical figure.
13. *Architrave*. See the foregoing explanation.
14. The *facia*, or face, of which there are two in the architrave.
15. The *abacus*, from αβαξ, a shelf or table; or, as some suppose, a tile, on which the ancient Greek mathematicians strewed dust, to draw their geometrical schemes on. The word seems to have been introduced into architecture on the invention of the Corinthian capital, which took its rise from an acanthus growing round a basket.
16. The *ovolo* of the capital, which in this situation must be considered the basket round which the acanthus grew.
17. *Annulets*; because these small fillets encompass the capital, like rings joined to each other. The moderns, in place of these, generally have a small cavetto.
18. *Colorino*, *collar*, or neck of the capital.
19. The *astragal*, from αστραγαλος, a bone of the heel; or, the curvature of the heel, which this member resembles. The hollow which follows is termed αποφυγη *escape*, because this part of the column appears to fly off.
20 and 22. Upper and lower *torus*, from τορος a *cable*, which this moulding somewhat resembles.
21. The *scotia*, from σκοτια *darkness*; because of the strong shadow which its concavity produces, and which is increased by the projecting torus above.

The other references have already been explained: therefore we shall now proceed to take notice of the members or parts of other Doric entablatures which are not found in this. In some of the Doric entablatures (see Pl. 22) are *mutules*, from *mutuli*, modillions, which are placed perpendicularly over each triglyph, and are of the same width; and whose projection in the corona is the same, forming a perfect square. In others are *dentils*, as in the theatre of Marcellus at Rome. These are so named from *dentelli* teeth, which they resemble; and the flat member on which these dentils are placed is termed *denticulus*. The capitals of the Ionic, Corinthian, and Composite (see Pl. 20) have each of them *volutes*, so called from *volvendo*, to roll round, as on a staff. Some call the volutes the *horns* of the capital, because they resemble the twisting of rams horns.

After this enumeration of all the members or distinct parts of the different orders, it may be proper to observe, that those parts which are termed *mouldings* are only 8 in number (see Plate 25) viz. The fillet or cincture to bind the parts. The astragal also and torus, resembling ropes or cables, are strong binders and fortifiers of the parts with which they are connected. The ovolo is strong at its extremities, and is therefore fit to support projecting parts. The cyma recta, inversa, and cavetto, are covering mouldings, which serve to shelter the other smaller members. There are various methods of describing the contours of these; but the simplest, and perhaps the best, is to form them of quadrants of circles, as is shewn in the plate.

An assemblage of what are called essential parts and mouldings is termed a *profile*. The most perfect profiles are such as are composed of few mouldings, varied in form and size; and so disposed, that the straight and curved ones succeed each other alternately. When ornaments are employed in mouldings, some of them should be left plain, in order to give a proper repose: for when all are ornamented, the figure of the profile is lost.

Sect. II. *Of the Diminution of Columns.*

In effecting the diminution of the shaft of a column, the ancients adopted a variety of methods; beginning sometimes from the foot of the shaft, and at others from one quarter, or one third of its height; the lower part being perfectly cylindrical. The former of these was most in use amongst the ancients, and, being the most natural and graceful, ought to have the preference, though the latter has been more universally practised by modern artists.

The first architects, says M. Auzoult, probably made their columns in straight lines, in imitation of trees; so that their shaft was a frustum of a cone: but finding this form abrupt and disagreeable, they made use of some curve, which, springing from the extremities of the superior and inferior diameters of the column, swelled beyond the sides of the cone, and by that means gave a more pleasing figure to the contour.

Vitruvius, in the second chapter of his third book, mentions this practice, but in so obscure and cursory a manner, that his meaning has not been understood; and several of the modern architects, intending to conform themselves to his doctrine, have made the diameters of their columns greater in the middle than at the foot of the shaft. Leon Baptista, Alberti, and others of the Florentine and Roman architects, have carried this to a very great excess; for which they have been justly blamed, as it is neither natural, reasonable, nor beautiful.

M. Auzoult observes that a column, supposing its shafts to be the frustum of a cone, may have an additional thickness in the middle, without being swelled there beyond the bulk of its inferior parts; and supposes the addition mentioned by Vitruvius to signify nothing but the increase towards the middle of the column, occasioned by changing the straight line, which at first was in use, for a curve.

This supposition is extremely just, and founded on what is observed in the works of antiquity; where there is no instance of columns thicker in the middle than at the bottom, though all have the swelling hinted at by Vitruvius, all of them being terminated by curves; some granite columns excepted, which are bounded by straight lines; a proof, perhaps, of their antiquity, or of their having been wrought in the quarries of Egypt by bungling and unskilful workmen.

M. Blondel, in his book intitled *Resolution des quatre principaux Problemes d'Architecture*, teaches various manners of diminishing columns; the best and simplest of which is by means of the instrument which Nicomedes invented to describe the first conchoid: for this, being applied at the bottom of the shaft, performs at one sweep both the swelling and the diminution; giving such a graceful form to the column, that it is universally allowed to be the most perfect practice hitherto discovered. The columns in the Pantheon, accounted the most beautiful among the antiques, are made in this manner; as appears by the exact measures of one of them to be found in Desgodetz's Antiquities of Rome.

To have an accurate idea of the operation, it will be necessary, first to describe Vignola's method of diminution, on which it is grounded. Having determined the height of the shaft, draw a line indefinitely from D (Pl. 18) through C, perpendicular to the axis OP of the column; take then ID, half the inferior or largest diameter of the column, and place one foot of the compasses exactly on the extremity of the superior or smallest diameter, as at R, and depress the other, till it come into the axis or centre line of the shaft, as at S under O; through these two points draw a line indefinitely and produced till it cut the line DC, as at A; from A, the centre, draw any number of lines through the axis OP, as S, *r*, S, *r*, &c.; and on each of these place half the larger diameter of the shaft set off from the axis or perpendicular line OP, through which points, thus found, if a curve line be drawn, it will describe the swelling and proper diminution of the column.

Though this method be sufficiently accurate for practice, especially if a considerable number of points be found, yet, strictly speaking, it is defective; as the curve must either be

drawn by hand, or by applying a flexible ruler to all the points; both of which are liable to variations. Blondel, therefore, to obviate this objection, after having proved the curve paſſing from O to R through the points *r*, *r*, to be of the ſame nature with the firſt conchoid of the ancients, employed the inſtrument of Nicomedes to deſcribe it: the conſtruction of which is as follows. This inſtrument is made of wooden lathes in the triangular form deſcribed by PO, PC, and ABR (Pl. 18) the baſe and perpendicular of which are joined together at P, and has a ſtay: the upright OP has a groove cut in it (ſee the fig.). To the lath ABR at S is fixed a button (ſee the fig.), which paſſes along the groove from P to O; in the moving lath ABR is a common groove, cut through from A to B; and at A, in the lath DC, is fixed a button at the centre A, as deſcribed in the firſt method. The length of the groove AB muſt exceed the difference of the length AS to AP; conſequently, as the button S works in the groove OP, the groove AB permits it to move forward to P, by which the former ſwelling and diminution will be moſt correctly performed when a pencil is fixed at R, at a diſtance from the button S equal to half of the largeſt diameter of the column. It muſt be owned, however, that if the centre were moved conſiderably towards P, that this method would not deſcribe a perfect curve or an agreeable diminution; for in this caſe, the curve at the top of the ſhaft will proportionally approach to a ſtraight line, and at laſt almoſt become an inverted curve. This, however, is no reaſonable objection to the uſe of the inſtrument when applied to the diminution of columns; for the greateſt quantity of diminution that can in any caſe be allowed, will not have the leaſt perceptible effect on the curve; and therefore we may venture to affirm, that no other method yet diſcovered, nor any other inſtrument that can be invented by man, is likely to exceed it. It is farther to be obſerved, that Nicomedes's inſtrument may be made to anſwer ſhafts of any dimenſions, by making the reſpective grooves capable of extenſion by the uſe of ſliders and moveable centres, which any architect is capable of contriving. In the remains of antiquity the quantity of diminution is various; but ſeldom leſs than one eighth of the inferior diameter of the column, nor more than one ſixth. The laſt of theſe is eſteemed the moſt perfect by Vitruvius; and is generally adopted by modern architects.

Sect. III. *Of the Origin, Character, Uſe, and Proportions of the Tuſcan Order.*

This order had its name and origin in Tuſcany, one of the moſt conſiderable of the Italian ſtates, which was firſt inhabited by the ancient Lydians from Aſia. This people firſt built temples of this order, and dedicated them to their idols in their new ſettlements. It is the moſt ſolid and ſimple of all the orders. It is compoſed of few parts, devoid of ornaments, and ſo maſſy, that it ſeems capable of ſupporting the heavieſt burden. There are no remains of a regular Tuſcan order among the antiques: the doctrine of Vitruvius concerning it is obſcure; and the profiles of Palladio, Scamozzi, Serlio, de l'Orme, and Vignola, are all imperfect. Vignola's is however preferred by moſt architects; and accordingly, a profile nearly approaching to it is given in Plate 21.

This order, on account of its ſtrong and maſſive proportions, has obtained the name of the ruſtic order; in conformity to which character, it is generally employed in farm-houſes, ſtables, and ſuch-like edifices. It is however ſometimes uſed in ſuperior buildings, where ornaments are not required, but where ſtrength is the principal object. The proportion of the Tuſcan column, with its pedeſtal and entablature, is as follows:—Divide the whole height of the entire column into five equal parts, one of which is for the height of the pedeſtal; and the remaining four are aſſigned for the baſe, ſhaft, capital, and entablature. The whole height being divided into 5 equal parts, one is given for the entablature, and the remaining four being divided into 7 equal parts, one is for the inferior diameter of the ſhaft *. Take half of the inferior diameter for the height of the baſe, including the plinth; and the ſame for the height of the capital, excluſive of the aſtragal. Take the inferior diameter, and divide it into 60 equal parts, which are called minutes, and by which the ſmaller parts of the column are proportioned in their height and projections, as ſpecified in the upright and horizontal ſcales attached to the profile, from which the ſeveral proportions of each moulding muſt be learned. A module is conſidered by ſome to be only half a diameter; but others extend it to a whole one, which we have adopted as the moſt ſimple and entire. Palladio uſes the whole diameter in every order except the Doric. Vitruvius alſo employs the large module, reckoning the proportion of the column by the lower or inferior diameter of the ſhaft; and we do not ſee that either the ſemidiameter or the 20 minutes contrived by ſome will more nearly anſwer to the different parts of the column.

Sect. IV. *Of the Intercolumniation of the Orders.*

Columns are either engaged or inſulated; and when inſulated or detached from the wall, they are either very near, or at a conſiderable diſtance from it. When they are placed at a conſiderable diſtance from the wall, they are deſtined to ſupport the entablature; and their diſtance from each other ſhould be conſiſtent both with their real and apparent ſolidity. Engaged columns are attached to the wall, and are not limited in their intercolumniations, as they depend on the breadth of the arches, doors, windows, niches, or other decorations placed in them.

The ancients uſed five different ſpecies of intercolumniations, which, according to Vitruvius and Palladio, are as follows:

The *pycnoſtyle*, of which the interval is one and a half of the inferior diameter of the column.

The *ſyſtyle*, whoſe interval or ſpace is two diameters.

The *euſtyle*, two diameters and a quarter.

The *diaſtyle*, 3 diameters—and

The *araeoſtyle*, 4 diameters.

The three firſt of theſe were uſed by the Grecians, in the Doric, Ionic and Corinthian orders; but the diſtances of the triglyphs of the Doric determined the intercolumniations of that order, which we ſhall deſcribe in its place.

The ancient Romans preferred the *euſtyle* in moſt caſes, as being the beſt medium of the too little and too great intervals of columns; but in their Tuſcan works, they uſed a ſpace equal to four and ſometimes ſix diameters, which intercolumniation was admiſſible in this order, ſince the architrave was uſually formed of ſome kind of timber, when the other parts of the entablature were of ſtone. Palladio ſays, this intercolumniation of the Tuſcan order was adapted to farm-houſes and other ruſtic works, as it afforded a paſſage for carts, and was attended with the leaſt expence. In ſtructures built entirely of ſtone, they however uſed a ſhorter interval, more ſuitable to the length of their marble blocks, and more agreeable to the ponderous fabric which they occaſionally ſupported; for which reaſon the diaſtyle and euſtyle modes were ſometimes applied to this order. The moderns have indeed adopted theſe two as their general rule, and apply them to every order except the Doric. The araeoſtyle, however, is ſometimes, by a modern contrivance authoriſed by a few examples of the ancients, in-

* In maſſive buildings, a more heavy entablature may be uſed, as was cuſtomary amongſt the ancients. They divided the whole height aſſigned to the baſe, ſhaft, capital, and entablature, into 4 equal parts, and gave one to the entablature. The profiles of Vignola and Palladio have this proportion.

troduced in porticos and periſtyles. This mode of the araeoſtyle is from Perrault, and is managed by placing 2 columns together at the angles, ſo cloſe as to admit the two capitals nearly into contact. This manner, which is termed grouping, takes off from the exceſſive width of this kind of interval, whilſt it adds to it both real and apparent ſtrength, as is exemplified in St. Paul's church in London, and in the palace of the Louvre at Paris.

Sect. V. *Of Arches and their Ornaments.*

Arches are not ſo magnificent as colonnades; but they are more ſolid and leſs expenſive. They are proper for triumphal entrances, gates of cities, of palaces, of gardens, and of parks, and, in general, for all openings that require an extraordinary breadth.

There are various manners of adorning arches. Sometimes their piers are ruſticated; ſometimes they are adorned with pilaſters, termini, or caryatides; and ſometimes they are made ſufficiently broad to admit niches or windows. The circular part of the arch is either ſurrounded with ruſtic key-ſtones, or with an archivolt enriched with mouldings; which, in the middle, is ſometimes interrupted by a conſole, or maſk, ſerving at the ſame time as a key to the arch, and as a ſupport to the architrave of the order. The archivolt is ſometimes ſupported by an impoſt, at the head of the pier; and at others by columns placed on each ſide of it, with a regular entablature, or architrave and cornice. There are likewiſe inſtances of arcades without piers, the arches being turned on ſingle columns as in the temple of Faunus at Rome, &c. But this practice ought to be ſeldom imitated, as it is neither ſolid nor handſome.

When, however, arcades are employed to ornament domeſtic apartments, the breadth of the pier need not exceed one quarter of the opening of the arch. When arches are cloſed up to receive doors, windows, or niches, the receſs ſhould be ſufficient to contain all the projections of what is placed therein, otherwiſe their appearance is clumſy, and will become too principal, which produces a bad effect in the compoſition.

When arches are large, the key-ſtone ſhould never be omitted, but cut in the form of a conſole, and carried cloſe under the ſoffit of the architrave, which, on account of its extraordinary length, requires a ſupport in the middle. The impoſts of arches ſhould never be omitted; at leaſt, if they be, a platform ought to ſupply their place. If columns are employed without pedeſtals in arcades, they ſhould always be raiſed on a plinth. In arches of great magnitude, the circular part ought not to ſpring immediately from the impoſt, but take its riſe at ſuch a diſtance above it as is neceſſary in order to have the whole curve ſeen at the proper point of view.

The void or aperture of arches ſhould never be higher, nor much lower, than double their breadth; the breadth of the pier ſhould ſeldom exceed two-thirds, nor be leſs than one-third of the breadth of the arch; and the angular pier ought to be broader than the others, by one-half, one-third, or one-fourth: the impoſt ſhould not be more than one-ſeventh, nor leſs than one-ninth of the aperture; and the archivolt muſt not be more than one-eighth, nor leſs than one-tenth of it. The breadth of the conſole muſt, at the bottom, be equal to that of the archivolt; and its ſides muſt be drawn from the centre of the arch: the length of it muſt not be leſs than one and a half of its ſmalleſt breadth, nor more than double. The thickneſs of the pier depends on the breadth of the portico; for it muſt be ſtrong enough to reſiſt the preſſure of its vault. But with regard to the beauty of the building, it ſhould not be leſs than one quarter of the breadth of the arch, nor more than one-third. Theſe are the general dimenſions of arches.

The proportions peculiar to the Tuſcan arch, of which we have given an example, without pedeſtals, are as follows: In height, their aperture is 7 diameters and a quarter, in width 4, and from centre to centre of the columns, 6 diameters. According to the preceding remarks, the archivolt and impoſts are half a diameter, and from the top of the archivolt to the underſide of the architrave ſhould not be leſs than 15 minutes. The breadth of the key-ſtone at the bottom is equal to its archivolt; and its ſpreading ſides are determined by lines drawn from the centre of the arch, as is ſhewn in the plate. The plinth is one diameter in height, and the proportions of the column and entablature are the ſame with the Tuſcan profile, Plate 21. For the proportions of the moulding of the archivolt and impoſts, ſee Plate 24.

The Tuſcan arch with pedeſtals is in width $4\frac{1}{2}$, and in height 8 diameters and a quarter; and from centre to centre of each pier is $6\frac{1}{4}$. In every other particular they are ſubject to the preceding rules.

Sect. V. *Of the Origin, Character, Uſe, and Proportions of the Doric Order.*

This order owed its name to the Dorians, a people who inhabited one of the Grecian diſtricts; and from whom it doubtleſs received the proportions and derived moſt of the parts by which it has been diſtinguiſhed from orders of later date.

The Doric, as to its character, is by architects conſidered grave, robuſt, and of maſculine aſpect: hence it is figuratively termed the *Herculean* order.

The ancients employed this order in their temples dedicated to Juno, Minerva, Mars, and Hercules, whoſe grave and heroic diſpoſitions ſuited well the ſolemn character of this order. It may be properly uſed in colonnades, porticos, halls, gates of cities, and public buildings erected in memory of heroes, or famous perſonages. In moſt of the antiques, the Doric column is executed without a baſe. Vitruvius indeed makes it without one; the baſe, according to him, having been firſt employed in the Ionic order, in imitation of the ſandals worn on women's feet. Scamozzi blames this practice, and moſt of the moderns are of his way of thinking. The remarks of Le Clerc, in oppoſition to De Chambre, are however worthy of notice. The latter aſſerts, that the Doric column is after the model of a ſtrong man, who is conſtantly repreſented barefooted. He alſo obſerves, that the baſe to a column is the ſame as a ſhoe to a man, and therefore cenſures the uſe of a baſe as improper and unchaſte. Le Clerc admits, that the moſt ancient Dories were deſtitute of baſes, though he conſiders it difficult to aſſign any good reaſon for it. "But I muſt own, (ſays he) I cannot conſider a column without a baſe, in comparing it to a man, but I am at the ſame time ſtruck with the idea of a perſon without feet rather than ſhoes: for which reaſon I am inclinable to believe, either that the architects of antiquity had not yet thought of employing baſes to their columns, or that they omitted them in order to have the pavement clear; the angles and projections of baſes being ſtumbling-blocks to paſſengers, and ſo much the more troubleſome, as the architects of thoſe times frequently placed their columns very near each other: ſo that had they been made with baſes, the paſſages between them would have been extremely narrow and inconvenient; and it was doubtleſs for the ſame reaſon that Vitruvius made the plinths of his Tuſcan column round; that order, according to his conſtruction, being particularly adapted to ſervile and commercial purpoſes, where convenience is preferable to beauty. However this be, perſons of good taſte will grant, that a baſe not only gives a graceful turn to the column, but is likewiſe of real uſe, ſerving to keep it firm on its plan; and that if columns without baſes are

now ſet aſide, it is a mark of the wiſdom of our architects, rather than an indication of their being governed by prejudice, as ſome adorers of antiquity would inſinuate." In conformity to the arguments of this celebrated author, and agreeably to the practice of Palladio and of our modern architects, we have introduced an attic baſe to this order; yet, in ornamental temples, for gardens, &c. we are decidedly of opinion, that the Grecian ſtyle ſhould be copied ſtrictly and preſerved chaſte, according to the remains of antiquity, as diſcovered by both ancient and modern architects, who have with great diligence and expence explored their ruinous piles, to obtain accurate meaſurements of the ſeveral parts; particularly our countryman James Stuart, eſq. who, in three folio volumes, has preſented to public view the antiquities of Athens, in which we have a clear diſplay of pure Grecian architecture. In theſe we ſee, as well as in other works, that the Doric column was without a baſe, but its ſhaft decorated with a number of channellings or flutings peculiar to itſelf: for in the other orders, an interval or fillet is introduced between each fluting, but in this it is otherwiſe. Hence Scamozzi's cenſure of this manner of fluting as imperfect, in conſequence of the projecting angles which ſeparate each flute, which renders the ſhaft tender and more ſubject to decay. The force of this objection however will be greatly abated, when it is conſidered, that theſe flutings are ſhallow, having their centre from the ſummit of an equilateral triangle, whoſe ſides are equal to the width of the flute; conſequently, it is little more than one quarter of the depth of the other kinds of fluting which are perfect ſemicircles. It is alſo to be obſerved, that the Grecian temples were compoſed of hard ſtone or marble, not ſubject to decay, and preſerved from outward violence by a religious or rather a ſuperſtitious care: and without ſome ſort of care, even the angles of the Ionic or Corinthian fluting will become an eaſy prey to the injuries of outward violence.

The other members which mark the peculiar feature of this order are the triglyph and mutule. The mutules are conſidered as a memorial or imitation of the primitive huts (ſee Plate 17.), whoſe beams are ſeen to project outwardly under the roof; but the triglyph is thought by ſome to be emblematical of the uſe of the firſt temple erected according to this order, which was dedicated to Apollo, to whoſe harp the triglyph bears ſome ſort of reſemblance. The metope, or ſpaces between the triglyphs, have been variouſly enriched. Palladio has introduced ox's ſculls, with lighted torches hanging from each horn, and placed alternately with pateras, expreſſive of the ſacrificial offerings performed to the heathen deities.

Other ornaments may, however, be introduced with propriety, both in public and private buildings. In the latter, creſts, and badges of dignity, heads, vaſes, or pateras, encircled with garlands of oak or laurel, are very ſuitable; in military ſtructures, heads of Mars, Meduſa, or the Furies, may be admitted. But ſome architects object to the introduction of ſwords, ſpears, or ſuch-like weapons, as being of too large dimenſions for ſuch ſmall compartments, and which, to repreſent in miniature, would be too trifling, and inconſiſtent with the dignity of ſuch works. When this order is employed in churches and other religious edifices, the metope may have cherubs, chalices, doves, garlands of palm and olive, and other devices, emblematical of moral virtues: but the moſt elevated parts of all theſe ſhould project little more than the triglyph. This rule was ſtrictly obſerved by the ancients, who ſeldom gave their ornaments more projection than that of the borders in which they were incloſed. Agreeably to this idea, the ſoffits of the corona (ſee Plate 22.) have their ornaments within the thickneſs of the borders which receive them.

Of the principal parts which compoſe this order, the following are the proportions, as appear in its profile, in Plate 21. The whole height of the entire order is divided into five equal parts, one of which is the height of the pedeſtal; and the remaining four, which are aſſigned to the column and entablature, are likewiſe to be divided into five. One of theſe belongs to the entablature, and the remaining four being divided into eight equal parts, one of them will be the inferior diameter of the column. Or we may expreſs it thus: The whole height of the order, including its pedeſtal, is twelve modules and a half, reckoning the module a whole diameter. The pedeſtal is two and a half; the baſe, ſhaft, and capital eight; and the whole entablature two modules. Dividing the large diameter into ſixty equal parts, called minutes; thirty are given to the baſe, thirty to the capital, thirty to the architrave, forty-five to the metope, and forty-five to the height of the cornice, including the upper-fillet or capital of the triglyph. In this order, when the mutules are introduced in the entablature, as in the example referred to, one module is aſſigned for the projection of the cornice, which, in this reſpect, exceeds any of the other orders. The projection of the mutules is equal to their width, being thirty minutes: the width of the triglyphs is exactly the ſame, and their diſtance from each other equal to the height of the metope, which, by this diviſion, forms a perfect ſquare. The ſides of the channels of the triglyphs are at right angles with each other. The manner of dividing and drawing them, together with the conic drops, may be learned from Plate 22. The ſoffit of the mutule, and that of the corona, are frequently ornamented; the former with conical drops, ſimilar to thoſe under the triglyphs, and the latter with roſes in ſquare and lozenge compartments. (See Plate 22.) The proportions of the ſmaller parts, and of the ſeveral mouldings which compoſe the whole, muſt in this, and in every other order, be learned from their reſpective profiles.

Sect. VI. *Of the Intercolumniation and Arches of the Doric Order.*

The intercolumniation of this order is often attended with peculiar difficulty, ariſing from the ſtrict regard that is ever paid to the due width of the triglyph, and the perfectly ſquare form of the metopes, or their intervals. Beſides, that it is abſolutely requiſite, that a triglyph ſhould be placed exactly over the centre of every column. For theſe reaſons, the mutules and triglyphs have been omitted in capital works, both ancient and modern, as in the Coliſeum at Rome, and the Royal Hoſpital at Greenwich.

Palladio has, however, given one inſtance of an ancient temple with angular triglyphs. This ſtructure, which he terms the *Temple of Piety*, is mentioned by Vitruvius, with an eye to the difficulty occaſioned by the triglyphs being thus placed; which reduces the intercolumniation of the two angular columns to one diameter and a quarter, which is leſs than the pycnoſtyle. The next intercolumniation is ſtill greater, approaching nearly to the picroſtyle, as is evidently neceſſary to bring the triglyph over the centre of the third column from the angle. The next, which is the centre intercolumniation, and faces the entrance of the temple, is rather more than euſtyle, or two diameters and a quarter; and has, in the metopes, ditriglyph. But the intervals between the triglyph are much too narrow for their height, ſo as to produce an unfavourable effect. The other ſpaces are monotriglyph, and are perfect. The regular intercolumniation of the Doric order is the monotriglyph, or pycnoſtyle, which admits of one between two columns. The ditriglyph, or euſtyle, admits two; and the araeoſtyle is tritriglyph, or conſiſting of three; but the moſt perfect of theſe is the ditriglyph.

When the capitals and baſes of coupled Doric columns have their proper projections, and are at any diſtance from each

other, the metope between them will be rather too wide; but that may be avoided by confining the projections, or making the triglyph one minute more than it really ſhould be, and placing or removing its centre a minute within the axis of the column, which trifling differences will not be perceived without the niceſt examination.

In ſmall buildings, ſuch as temples and other ſimilar ornaments for gardens, the intercolumniations may be determined, without paying a ſtrict regard to the general rules for the diſtances of columns; always obſerving, however, that ſuch works muſt have an interval that will admit of an eaſy paſſage between them.

Doric arches, without pedeſtals (ſee Plate 23.), are ſeven diameters and three-fourths high, and in width four diameters and 15 minutes. The piers are two modules in front, and in thickneſs, one module, 22½ minutes; or in proportion to their diſtance from the wall. From centre to centre of each pier is 6 diameters and 15 minutes. Arches of this order, with pedeſtals, have their apertures, in height, 9 diameters and 30 minutes; and in their width, 5 diameters, 15 minutes. The piers are 2 diameters, 15 minutes wide in front; and from centre to centre of each, is 7 diameters, and 15 minutes.

SECT. VII. *Of the Origin, Character, Uſe, and Proportions of the Ionic Order, with the Manner of deſcribing its Volutes.*

THE Ionic order owes its invention to the people of Ionia, who inhabited a Grecian diſtrict, and is ſaid to have been firſt employed in the decorations of the Temple of Diana, at Epheſus.

The Ionic column is more ſlender and graceful than the Doric. Its ornaments are truly elegant, being in a ſtyle of compoſition between the richneſs of the Corinthian and the plainneſs of the Tuſcan orders. Its general appearance being ſimple, yet graceful and majeſtic, in figurative language, it has been compared to a ſedate matron, in decent, rather than in rich attire.

The ancients uſed the Ionic order in the temples dedicated to Diana, Juno, Apollo, Fortune, Concord, and other deities. It may be employed in palaces or private houſes, in halls of juſtice, colleges, or libraries; and, in ſhort, as ſays Le Clerc, in all places conſecrated to peace and tranquillity.

In forming the profile, and in adjuſting the proportions of this order, moſt of the modern architects have, in a great degree, imitated the columns, capitals and entablatures, in the Temple of Manly Fortune and Concord; in the Theatre of Marcellus, and the Coliſeum at Rome. Amongſt the ancients, the form of the Ionic profile appears to have been more poſitively determined than that of any other order: for in all the antiques at Rome, except in the Temple of Concord, it is exactly the ſame.

The proportions of the principal parts of the Ionic column are as follow: The height of the entire order is divided into five equal parts. One of theſe parts is aſſigned to the height of the pedeſtal; and the remaining four are divided into ſix, for the column and entablature. One of theſe is appropriated to the entablature, and the remaining four are for the column, including its capital and baſe. Theſe four being divided into equal parts, one is aſſigned for the inferior diameter. The cornice is 44 minutes in height, and its projection the ſame. The drip in the underſide of the corona is channelled out one minute deep, and two minutes from the front; and before the cyma reverſa, one minute. The ſhaft of the column is ſometimes fluted and ſometimes plain. Twenty, or twenty-four, are the number of flutes allotted, not only to this, but to every other order. In general, however, 24 are preferable. The plan of the flutes may be rather more than a ſemicircle, as they will then appear more diſtinct. The fillets, or intervals between them, muſt not be broader than one-third of the flutes, nor leſs than one-fourth: and it ſhould farther be obſerved, that in the capital of rich compoſitions over each flute, is placed an ove or egg. For the other particulars, recourſe muſt be had to the plate. In exterior works, when the building is large, the entablature may be enlarged to one-fourth of the whole height of the column without its pedeſtal, as was ſometimes practiſed by the ancients. Palladio, however, makes no diſtinction of this nature; but allows only one-fifth part of the height of the column in all caſes.

The volute, which is a very principal member of this column, is executed in various forms. The Grecian volute has a double fillet winding round to its eye, which, by the partings or ſpaces between, produces a variety of light and ſhade, and affords to the whole convolution additional grace and beauty. We are not of opinion, however, that the necking is any additional beauty to the capital, as is ſuppoſed by ſome architects: for the aſtragal certainly takes off from that pleaſing ſimplicity, and pure elegance of the Roman capital, which is uninterrupted by any projecting moulding, till we view the eaſy turn of the volute itſelf. Upon theſe principles, we prefer the Roman capital (ſee its Profile). Both the Grecian and Roman capitals are ſquare on the front, but have quite a different appearance when viewed on their ſides (ſee the Plan in Plate 22). It might therefore be eligible, when the decoration is to be continued in flank as well as in front, to ſubſtitute the angular capital, uſed by Michael Angelo, Scamozzi, and other modern architects, in imitation of thoſe in the Temple of Concord. This capital is alike on all ſides; and therefore, occaſions no difficulty in the management of angular pilaſters or columns: its abacus is drawn in the ſame manner as that of the Corinthian order.

The manner of drawing the volute, according to Goldman's method, is as follows: (ſee Plate 25.) Draw the perpendicular F A, termed the cathetus, and make its length equal to 15 minutes. On the centre deſcribe a circle, whoſe diameter is 3½ minutes. Draw next a geometrical ſquare, having its ſides equal to the radius of the circle, as 1, 2, 3, 4. From the angles 2, 3, draw diagonals to the centre at C. Divide the ſide of the ſquare 1, 4, into 6 equal parts, as at 5, 9, 12, 8; and from theſe points draw parallel lines to the diagonals, as ſhewn in the eye of the volute; whence will be obtained 12 centres, by which every arch compoſing the volute may be accurately drawn, each of them coinciding with the other. Thus, on the centre 1, fix one foot of the compaſs, and extend the other to F; and with this opening, deſcribe the arch F G. On the centre 2, with the other foot extended to G, deſcribe the arch G H. On the centre 3, extending it to H, deſcribe the arch H I; and on the fourth centre deſcribe the arch I K, which completes one revolution. Proceed then in the ſame way, to the centres 5, 6, 7, 8, for the ſecond revolution; and to 9, 10, 11, 12, for the third revolution. Thus it appears, that the whole convolution conſiſts of 12 quadrants of circles of ſo many different diameters.

To graduate the fillet, conſtruct a triangle at O, of which the ſide F A is equal to that part of the cathetus, contained from A to F; and the ſide V F, equal to half the ſide of the ſquare in the eye of the volute *a*, C, 1. Draw then the line S T, at a diſtance from V F, equal to the breadth of the fillet at F S, which may be 2 minutes, or 1 and ¾ths. Take the ſpace S T, and place it each way from the centre of the volute, as from C to 3. Divide S T into three equal parts, as at 1, 2, 3, in the eye of the volute, and from theſe points draw parallel lines to the diagonals, which will find 12 new centres; and proceeding from one to the other, as was done in drawing the exterior

contour, the regular diminution of the fillet may be accurately performed.

With reſpect to the intercolumniation of this and the ſucceeding orders, what has been obſerved on the ſubject, in a former ſection, may ſuffice: and as to the arches peculiar to each order, all that is neceſſary, after what has been remarked on the two preceding orders, is a careful inſpection of the plates, where we have marked the peculiar proportions in ſo many whole diameters, or parts of a diameter or module.

Sect. VIII. *Of the Origin, Character, Uſe, and Proportions of the Compoſite Order.*

This order had its origin amongſt the ancient Romans, and Serlio is ſaid to have been its inventor. In its ſtyle of compoſition, it partakes of the Ionic and Corinthian orders, but moſtly of the latter; particularly in the leaves of its capital. Some architects, however, do not incline to ſpeak well of this order, merely on the principle of its being a compoſition from the others. But this, in itſelf, is not a ſufficient ground for objection, ſince the ſame may be ſaid of the Tuſcan order, which is a compoſition from the rude ſtate of the Doric. On the other hand, we freely acknowledge, that the Compoſite order is ſo complete an imitation of the Corinthian, that at firſt ſight, the little difference between them will even deceive the eye of a tolerable judge. This at once pronounces the compoſition at leaſt defective, if not bad; for why are two orders of architecture ſcarcely to be diſcriminated, but by the eye of a ſkilful architect? In confirmation of this, it may further be obſerved, that this is not the caſe with any other of the orders. The mereſt novice in architecture, can at firſt view diſtinguiſh the Tuſcan order from the Doric, and the Ionic from the Corinthian, as the parts which principally characterize each are ſtrikingly different. However, taking it as it is, in conformity to the beaten path of cuſtom, its affinity to the Corinthian order does certainly entitle it to be claſſed in the rank of the rich, delicate and virginal orders. Conſiſtently with this character, it was uſed in temples conſecrated to female deities: and the all-conquering Romans, to expreſs their dominion over thoſe nations that invented the orders of which this is compoſed, uſed it more frequently in their triumphal arches, than in any other buildings. Where elegance and magnificence are to be united, it may be employed with propriety, and is adapted for buildings intended to commemorate any ſignal event, or to celebrate the virtues and actions of legiſlators and conquerors: becauſe the capitals and other ornaments may be compoſed of emblems and alluſive repreſentations, agreeably to the practice of the ancients.

This order is generally placed laſt of the five, on account of its being a compound of thoſe of the lateſt invention. But, according to this reaſoning, the Doric ſhould be firſt in order, as it was certainly the moſt ancient. There are, however, two reaſons, which have induced us to place this order as the fourth. The firſt is, that when this order is employed, where orders are upon orders, as in large and magnificent ſtructures, it holds this place in their arrangement over each other; in which we ſee, firſt the Tuſcan, then the Doric, afterwards the Ionic; fourthly, the Compoſite, and laſtly, the Corinthian. The ſecond reaſon we aſſign, is, the degree of richneſs and delicacy, which is obſervable in regular gradation through the whole: for as they decreaſe in ſtrength, they increaſe in richneſs of ornament, by which their elevation from the ground is always regulated. On this ſubject, ſir William Chambers has the following remark. "Moſt authors give the laſt place to the Compoſite order, as being the laſt invented, and a compound; which of courſe ought to be preceded by all the ſimples. I have followed Scamozzi's method, his arrangement appearing to me the moſt natural: for his orders ſucceed each other, according to their degrees of ſtrength; and in the progreſſion that muſt abſolutely be obſerved whenever they are employed together."

The general proportions of this order are as follow: The height of the entire order is divided into five equal parts, one of which is appropriated for the height of the pedeſtal, and the remaining four, for the column and entablature. Theſe four parts being again divided into ſix; one is for the entablature, and the remaining five, for the height of the column, including its baſe and capital. The height of the column is divided into 10 equal parts, one of which is given to the inferior diameter. The baſe is 30 minutes, the capital 70 in height, adorned with acanthus leaves, and volutes, drawn by the ſame method as thoſe of the Ionic: and the plan of the capital is the ſame with that of the Corinthian order.

The ſoffit of the corona i divided into ſquare compartments cut out of the ſolid, decorated with roſes whoſe relief muſt not project more than the borders which incloſe them. In rich compoſitions, the ſoffits of the modillions are alſo ornamented; but their relief is not to exceed the horizontal ſurface, which would greatly injure the effect of the modillion, and render the appearance of the profile of the entablature leſs pleaſing.

Sect. IX. *Of the Origin, Character, Uſe, and Proportions of the Corinthian Order.*

The city of Corinth gave birth to this fineſt of all architectural compoſitions, in which we ſee proportion, ſimplicity, elegance, and richneſs, combined to a degree almoſt exceeding imagination, and which we are perſuaded will never be ſurpaſſed, whilſt architecture has an exiſtence. This order is, and will continue to be, a perpetual memorial of the exquiſite taſte and genius of an ancient Grecian people. Scamozzi calls it the *virginal order*, an epithet truly characteriſtic of the delicacy and tenderneſs of compoſition apparent in the whole. Conformably to the whole of its character, the ancients employed it in works of magnificence, grandeur, and delicacy. It obtained a place in palaces, public ſquares, banqueting rooms, theatres, and the apartments of young ladies. It was alſo generally uſed in temples dedicated to female deities, and ſometimes in thoſe of Jupiter, Mars, and Mercury.

The moſt perfect model of the Corinthian order is generally allowed to be ſhewn in the three columns in the Campo Vaccino at Rome, the remains, as it is ſuppoſed, of the temple of Jupiter Stator.

The baſe of the column may be either Attic or Corinthian, ſince both are beautiful. The entablature is generally much enriched, particularly by the ancients, who introduced in the frieze repreſentations of various figures, (ſee Pl. 20). A very full diſplay of theſe may be found in Stewart's Antiquities of Athens. When the entablature is thus enriched, the columns are fluted, and the flutings may be filled with cablings, one third, from the bottom, of the whole height of the ſhaft, as in the inſide of the Pantheon. In moſt of the antiques at Rome, the capital of this order is decorated with olive-leaves; the acanthus being ſeldom employed but in the Compoſite.

The general proportions of this order are as follow: The whole height of the entire order is divided into 5 equal parts, and one is given for the height of the pedeſtal. The remaining four are divided into ſix equal parts; one is aſſigned for the entablature, and the remaining five are aſſigned to the height of the column including its baſe and capital; which are again divided into equal parts, one of which is for the inferior dia-

meter. The base is 30 minutes, and the capital 70 in height. The cornice is 48 minutes, both in height and projection.

The soffit of the corona is worked in square compartments, as in the Composite; but the soffit of the modillion is ornamented with an olive-leaf, the same as in the capital. The breadth of the modillion is 10 minutes and a half; and the space between each modillion twice their width.

The abacus of the capital is sometimes plain, and sometimes fluted, as in this profile. In some capitals the volutes rise higher than the underside of the abacus, but the capital looks best when they are bounded by its under surface.

To determine the plan of a capital according to the ancients, draw a geometrical square whose sides are one diameter and a half. To this square draw diagonals; and on these, place from the centre, or their intersection, a space equal to one diameter, through which point lines being drawn at right angles with the diagonals, will determine both the projection and thickness of the volutes. For the curvature of the abacus, extend the compasses from one angle to the other of the side of the abacus; and with this opening, intersect two arches described from the angles of each horn of the abacus, and the point of intersection will be the centre, by which, with the same opening of the compasses, the concavity of the abacus will be accurately drawn. See the Plan in Plate 19.

Sect. X. *Of Pilasters in general.*

Pilasters differ from columns only in their plan; which is a square, as that of columns is round. Their bases, capitals, and entablatures, have the same parts, with the same heights and projections, as those of columns: they are also distinguished in the same manner, by the names of *Tuscan*, *Doric*, *Ionic*, *Corinthian*, and *Composite*.

The column is undoubtedly more perfect than the pilaster. However, they may be employed with great propriety on many occasions. Some authors declaim against pilasters, because, according to them, they do not admit of diminution. But this is a mistake; there are many instances, in the remains of antiquity, of their being diminished. Scamozzi always gave his pilasters the same diminution as his columns: Palladio and Inigo Jones have likewise diminished them in many of their buildings.

Pilasters are employed in churches, galleries, halls, and other interior decorations, to save room; for, as they seldom project beyond the solid wall above one quarter of their diameter, they do not occupy near so much space as columns. They are likewise used in exterior decorations; sometimes alone, instead of columns, on account of their being less expensive; and sometimes they accompany columns, being placed behind them to support the architraves, where they enter the building, as in the Pantheon at Rome; or, in the same line with them, to fortify the angles, as in the Portico of Septimius.

When pilasters are used alone, they should project one quarter of their diameter beyond the walls. When placed behind columns, especially if they be very near them, they need not project above one eighth of their diameter. But, when placed on a line with columns, their projection must be regulated by that of the columns; and consequently, it can never be less than a semidiameter, even when the columns are engaged as much as possible.

The shafts of pilasters are frequently adorned with flutings, in the same manner as those of columns; the plan of which may be a trifle more than a semicircle: their number must be seven on each face, which makes them nearly of the same size with those of columns. The intervals, or fillets, must either be one third or one fourth of the fluting in breadth.

The capitals of pilasters are profiled nearly in the same manner as those of columns.

Sect. XI. *Of Attics.*

These very properly follow the pilasters; being nothing more than square pillars with their cornices. They had their origin in Athens, where it was for many ages a rule in building to conceal the roof. For this purpose, nothing served so well as a kind of low or little order ranged in a continued line, singly, or with the interruption of balusters; which, rising above the rest of the work and before the roof, hid it perfectly, and placed something agreeable in view. The place of Attics, therefore, is at the uppermost extremity of a building, to which they serve as a crown, or very properly make a finishing for the other orders when they have been used in the structure. They must never stand under any thing except such ornaments as are placed at the very top. These Attics should never exceed in height one third of the height of the order on which they are placed, nor be less than one quarter of it. The base, dye, and cornice, of which they are composed, may bear the same proportions to each other as those of pedestals do; and the base and cornice may be composed of the same mouldings as those pedestals. Sometimes the Attic is continued throughout; at others, it projects, and forms a pilaster over each column of the order. The breadth of this pilaster is seldom made narrower than the upper diameter of the column below it, and never broader. Its projection may be equal to one quarter of its breadth.

Sect. XII. *Of Persians, Caryatides, and Termini.*

Besides columns and pilasters, it is sometimes customary to employ representations of the human figure, to support entablatures in buildings. The male figures are called *Persians*; and the female, *Carians*, or *Caryatides*. (See Pl. 28.)

The *Persians* are so called from a victory gained over the Persians by Pausanias, who having brought home spoils and trophies to the Athenians, they fixed upon Persian figures for those which should support entablatures, and thus kept in mind that there were once Persian slaves in Athens. To represent these conquered people in the lowest state possible, they loaded them with the heaviest entablature, viz. that of the Doric order. In process of time, however, other figures besides those of Persians were introduced, and other entablatures put over them; but the name was still retained.

The proper Caryatides are women dressed in long robes, after the Asiatic manner; and the origin of the device was as follows.—The Carians had been long at war with the Athenians; but being at length totally vanquished, their wives were led away captives; and, to perpetuate the memory of this event, trophies were erected, in which figures of women dressed in the Caryatic manner, were used to support entablatures like the Persians; and though other female figures were afterwards used in the same manner, the name of *Caryatides* was always retained.

The ancients made frequent use of Persians and Caryatides, and delighted in diversifying them a thousand ways. The modern artists have followed their example; and there is a great variety of compositions of this kind to be met with in different parts of Europe.

Indecent attitudes, distorted features, and all monstrous productions, ought to be avoided, of which there are many examples in Gothic buildings. On the contrary, the attitudes should be simple and graceful, the countenance always pleasing, though varied and strongly marked agreeably to the nature of the object represented. See Plate 28.

The Caryatides, or female figures, should never much exceed the human size. But the Persians or male figures may be of any size; and the larger the better, as they will strike the

beholder with greater awe and aſtoniſhment. Perſians may be uſed with propriety in arſenals, galleries of armour, &c. under the figures of captives, heroic virtues, &c. Their entablature ought to be Doric, and bear the ſame proportion to them as to columns of the ſame height. The entablature for Caryatides ought to be either Ionic or Corinthian, according as the character of the figures is more or leſs delicate.

Termini are ſometimes employed, inſtead of Perſians or Caryatides, to ſupport the entablatures of monuments, chimney-pieces, and ſuch like compoſitions. Theſe figures owe their origin to the ſtones uſed by the ancients to mark the limits of particular poſſeſſions. Numa Pompilius, to render theſe inviolable, conſecrated the terminus into a deity, and inſtituted feſtivals and ſacrifices to his honour. In a ſhort time, what was formerly only large upright ſtones, were repreſented in human ſhape, and afterwards introduced as ornaments to temples and other buildings. The termini are now principally uſed as ornaments for gardens and fields.

Sect. XIII. *Of Pediments.*

Pediments, among the Romans, were uſed only as coverings to their ſacred buildings, till Cæſar obtained leave to cover his houſe with a pointed roof, after the manner of temples, In the remains of antiquity we meet with two kinds of pediments, the triangular and the circular. The former of theſe are promiſcuouſly applied to cover ſmall or large bodies: but the latter, being of a heavier figure, are never uſed but as coverings to doors, niches, windows, or gates.

As a pediment repreſents the roof, it ſhould never be employed but as a finiſhing to the whole compoſition.

The ancients introduced but few pediments into their buildings, uſually contenting themſelves with a ſingle one to adorn the middle or principal part. But ſome of the moderns, and particularly the Italians, have been ſo immoderately fond of them, that their buildings frequently conſiſt of ſcarcely any thing elſe.

The girder being a neceſſary part in the conſtruction of a roof, it is an impropriety to intermit the horizontal entablature of a pediment, by which it is repreſented, to make room for a niche, an arch, or a window.

In regular architecture, no other form of pediments can be admitted beſides the triangular and circular. Both of them are beautiful; and when a conſiderable number of pediments are introduced, as when a range of windows are adorned with them, theſe two figures may be uſed alternately, as in the niches of the Pantheon, and in thoſe of the temple of Diana at Niſmes.

The proportion of pediments depends upon their ſize; for the ſame proportions will not do in all caſes.

When the baſe of the pediment is ſhort, its height muſt be increaſed; and when the pediment is long, the height muſt be diminiſhed. The beſt proportion for the height is from one-fifth to one-fourth of the baſe, according to the extent of the pediment, and the character of the body it covers. The materials of the roof muſt alſo be attended to; for if it be covered with tiles, it will be neceſſary to raiſe it more than one quarter of the baſe, as was the cuſtom of the ancients in their Tuſcan temples.

The tympan is always on a line with the front of the frieze; and when large, admits of various ornaments.

Sect. XIV. *Of Gates, Doors, and Piers.*

There are two kinds of entrances, *viz.* doors and gates. The former ſerve only for the paſſage of perſons on foot; but the latter likewiſe admit horſemen and carriages. Doors are uſed as entrances to churches and other public buildings, to common dwelling-houſes, and apartments: and gates ſerve for inlets to cities, fortreſſes, parks, gardens, palaces, &c. The apertures of gates being always wide, they are generally made in the form of an arch, that figure being the ſtrongeſt. But doors, which are generally of ſmall dimenſions, are commonly parallelograms, and cloſed horizontally. The general proportion for the apertures, both of gates and doors, whether arched or ſquare, is, that the height be about double the breadth.

The moſt common, and indeed almoſt the only ornaments for gates are the piers by which they are ſupported, and which were originally no more than bare poſts into which the hinges of the gate were driven. Though this, however, is the only proper uſe of piers, it muſt be concealed as much as poſſible, and they muſt ſeem as if placed there only for ornament. (See Pl. 27). As they are to be fixed to the wall before the houſe, ſo they muſt alſo be proportioned to it; and as they are to be ſeen in the ſame view with the front of the houſe, their correſpondence with it is equally neceſſary. They are to be placed on a plinth, and ſomething muſt be allowed by way of ornament and finiſhing at the top. All the luxuriance of fancy may be employed in the decoration of piers: but it will be proper to obſerve this general rule, that the pier being an inferior building, it muſt never be richer than the front of the houſe. If, for inſtance, the front of the houſe is ornamented with columns of the Doric order, the Ionic muſt not be uſed in the piers; and it will be found better to omit columns altogether, than to make uſe of the Tuſcan order for piers in any caſe. If the Ionic or Corinthian orders are employed in the front of the houſe, the Doric or Ionic may be uſed with propriety in the piers. One piece of ornament is almoſt univerſal in piers, namely, a niche with its ſeat, made as if for the convenience of weary travellers. On this account, it will be proper to raiſe the columns on pedeſtals, becauſe the continued moulding from their cap will be a good ornament under the niche. The baſe of the columns ought always to be Attic.

Inſide-doors, however ſmall the building may be, ſhould never be narrower than two feet nine inches; nor ſhould they ever, in private houſes, exceed three feet ſix inches in breadth, which is more than ſufficient to admit the bulkieſt perſon. Their height ſhould at leaſt be ſix feet three or four inches; otherwiſe a tall perſon cannot paſs without ſtooping. In churches, palaces, &c. where there is a conſtant ingreſs and egreſs of people, the apertures muſt be larger. The ſmalleſt breadth that can be given to a gate is $8\frac{1}{2}$ or 9 feet, which is but juſt ſufficient for the paſſage of a coach.

Sect. XV. *Of Niches and Statues.*

It has been the cuſtom of every age to enrich different parts of buildings with repreſentations of the human body. Thus the ancients adorned their temples, baths, theatres, &c. with ſtatues of their deities, heroes, and legiſlators. The moderns ſtill preſerve the ſame cuſtom, placing in their churches, palaces, &c. ſtatues of illuſtrious perſons, and even groups compoſed of various figures, repreſenting occurrences collected from hiſtory, fables, &c. Sometimes theſe ſtatues or groups are detached, raiſed on pedeſtals, and placed contiguous to the walls of a building, or in the middle of a room, court, or public ſquare. But they are moſt frequently placed in cavities made in the walls, called *niches*. Of theſe there are two ſorts; the one formed like an arch in its elevation, and ſemicircular or ſemielliptical in its plan; the other is a parallelogram both in its plan and elevation.

The proportion of both theſe niches depends on the characters of the ſtatues, or the general form of the groups placed in them. The loweſt are at leaſt a double ſquare in height; and the higheſt never exceed $2\frac{1}{2}$ of their breadth.

With regard to the manner of decorating them, when they are alone in a compoſition, they are generally incloſed in a pannel, formed and proportioned like the aperture of a window, and adorned in the ſame manner. In this caſe the niche is carried quite down to the bottom; but on the ſides and at the top, a ſmall ſpace is left between the niche and the architrave of the pannel. And when niches are intermixed with windows, they may be adorned in the ſame manner with the windows, provided the ornaments be of the ſame figure and dimenſions with thoſe of the windows.

The ſize of the ſtatue depends on the dimenſions of the niches. They ſhould neither be ſo large as to have the appearance of being rammed into the niches, as in Santa Maria Maſora at Rome; nor ſo narrow as to ſeem loſt in them, as in the Pantheon. The diſtance between the outline of the ſtatue and ſide of the niche ſhould never be leſs than one-third of a head, nor more than one half, whether the niche be ſquare or arched; and when it is ſquare, the diſtance from the top of the head to the cieling of the niche ſhould not be greater than the diſtance on the ſides. Statues are generally raiſed on a plinth, the height of which may be from one-third to one-half of a head; and ſometimes where the niches are large, the ſtatues may be raiſed on ſmall pedeſtals.

The character of the ſtatue ſhould always correſpond with the character of the architecture with which it is ſurrounded. Thus, if the order be Doric, Hercules, Jupiter, Mars, Æſculapius, and all male ſtatues, repreſenting beings of a robuſt and grave nature, may be introduced; if Ionic, then Apollo, Bacchus, &c. and if Corinthian, Venus, Flora, and others of a delicate nature ſhould be employed.

Sect. XVI. *Of Chimney-Pieces.*

Among the ancients there are very few examples of chimney-pieces to be met with. Neither the Italians nor French have excelled in compoſitions of this kind; but Britain, poſſeſſed of many able ſculptors at different times, has occaſionally ſurpaſſed all other nations, both in taſte of deſign and workmanſhip.

The ſize of the chimney muſt be regulated by the dimenſions of the room where it is placed. In the ſmalleſt apartments, the breadth of the aperture ſhould never be leſs than three feet, or three feet ſix inches. In rooms from 20 to 24 feet ſquare, or of equal ſuperficial dimenſions, it may be from 4 to $4\frac{1}{2}$ feet broad; in thoſe of 24 to 27, from $4\frac{1}{2}$ to 5; and in ſuch as exceed theſe dimenſions, the aperture may even be extended to $5\frac{1}{2}$ or 6 feet.

The chimney ſhould always be ſituated ſo as to be immediately ſeen by thoſe who enter the room. The middle of the partition-wall is the moſt proper place in halls, ſaloons, and other rooms of paſſage; but in drawing-rooms, dreſſing-rooms, and the like, the middle of the back-wall is the beſt ſituation. In bed-rooms, the chimney is always in the middle of one of the partition-walls: and in cloſets and other very ſmall places, to ſave room, it is put in a corner. Wherever two chimneys are uſed in the ſame room, they ſhould be placed either directly facing each other, if in different walls, or at equal diſtances from the centre of the wall in which they both are.

The proportion of the apertures of chimney-pieces of a moderate ſize is generally a perfect ſquare; in ſmall ones it is a trifle higher; and in large ones, a trifle lower. Their ornaments conſiſt in architraves, frizes, cornices, columns, pilaſters, termini, caryatides, conſoles, and all kinds of ornaments of ſculpture, repreſenting animals and vegetables, &c. likewiſe vaſes, chalices, trophies of arms, &c. In deſigning them regard muſt be had to the nature of the place where they are to be employed. Such as are intended for halls, ſaloons, guard-rooms, galleries, and other large places, muſt be compoſed of large parts, few in number, of diſtinct and ſimple forms, and having a bold relief; but chimney-pieces for drawing rooms, dreſſing-rooms, &c. may be of a more delicate and complicated nature.

Sect. XVII. *Of Stair-Caſes, and the Methods of managing the Hand-rail.*

Staircases are the means of aſcending to the different ſtories of a building, and ought to be ſo conſtructed as to make the aſcent ſafe, agreeable, and eaſy.

To fix on a proper and advantageous ſituation for a ſtair-caſe is often attended with difficulty; but without which the internal convenience and beauty of a houſe will be much injured. Palladio is of opinion, that the entrance to a ſtaircaſe ought to be ſituated, ſo as the principal parts of a building may be ſeen before we aſcend the ſteps: and upon this principle it is obſervable, that a more eaſy acceſs is gained to the principal apartments on the ground-floor.

To render ſtairs eaſy of aſcent, the height of a ſtep ought not to exceed ſeven inches, nor in any caſe to be leſs than four; but ſix inches is a general height. The breadth of the ſteps ſhould not be leſs than 12 inches, if it can poſſibly be avoided; nor ſhould they ever be more than 18; and to render our aſcent free from the interruption of perſons deſcending, their length ſhould not exceed 12, nor be leſs than four feet, except in common and ſmall buildings, whoſe area will not admit of a ſtaircaſe of more than three feet.

That the aſcent may be both ſafe and agreeable, it is requiſite alſo to introduce ſome convenient aperture for light, which ought to be as nearly oppoſite to our firſt entrance to the ſtairs, as the nature of the building will admit of. An equal diſtribution of light to each flight of ſtairs ought to be particularly regarded; for which reaſon, theſe apertures or windows are commonly placed at the landings or half-ſpaces; though ſometimes the whole is lighted from a dome.

Stair-caſes are of various kinds, whoſe plans are circular. Some wind round a newel in the middle, and the riſers of the ſteps are ſtraight, and ſometimes curved. Others have their plan circular, but form a well in the centre. The ſame may be obſerved of thoſe whoſe plans are elliptical: the moſt common, however, are thoſe whoſe plans are a ſquare or parallelogram. The ancients paid a ſuperſtitious regard to an odd number in their flights of ſteps; as 3, 5, 7, &c. in order that in their aſcent, they might begin and finiſh with the right foot. Palladio, therefore, allows to the ſtair-caſe of a dwelling-houſe 11 or 13 ſteps to each flight.

When a ſtair-caſe winds round a newel or column, whether its plan be circular or elliptical, the diameter being divided into three equal parts, two are ſet apart for the ſteps, and one for the column. But in circular or elliptical ſtair-caſes that are open, or which form a well in the middle, the diameter is divided into four equal parts; two for the ſteps, and two for the void ſpace or well in the centre. Modern ſtair-caſes, however, have often a kind of well of a mixed form; ſtraight on each ſide, and circular at the returns of each flight. The openings of theſe wells are various in width, but ſeldom exceed 18 or 20 inches.

To moſt ſtair-caſes it is abſolutely neceſſary, both for convenience and ornament, to have hand-rails; and theſe generally begin from the ground by a twiſted ſcroll, which, when ſkilfully managed, produces a very good effect. To aſſiſt in the conſtruction of theſe, we ſhall offer the following obſervations, as illuſtrated by the various figures in Plate 25. In figure 1, we have the plan of the firſt ſtep, formed with a ſcroll

to receive the newel poſt and baluſters of the twiſted hand-rail: *a* is the projecting noſing of the ſtep; *b* the thickneſs of the bracket, and *c* the ſtring board. To draw the ſcroll proceed thus: Let the ſpace 1, 3, in fig. 1, be conſidered as equal to the ſpring of the ſcroll from its centre to the ſtraight part of the hand-rail, as from O to 1, fig. 3. Divide 1, 3, into three equal parts; and drawing the line 4, 3, at right angles to 1, 3, make it equal to one more of theſe parts. Draw then the diagonal 4, 1; and from the centre 4, deſcribe the arch 3, 5. Divide the arch into 12 equal parts; and through theſe diviſions, draw the radii till they interſect the line 3, 1, as at 2, 3, 4, &c. which completes the ſcale for drawing the ſcroll. Suppoſing that the ſeveral radial lines 1, 2, 3, 4, &c. in fig. 3 are already drawn, proceed thus: Take from fig. 2 the ſpace 3, 2, and place it at fig. 3, from the centre O to 2. On 2 with the ſame opening, fix one foot of the compaſſes, and with the other ſtrike a ſhort curve line, as at C, and from 1 with this opening, deſcribe another, interſecting it at C. From the centre C thus found, draw the arch 2, 1. Again, from fig. 2 take the ſpace 3, 3, and place it from O on the radial 3: with this opening, find the centre as before, and draw the arch 3, 2, proceeding in the ſame way with the reſt. By contracting the line 4, 3, in fig. 2, it is evident, that a ſcroll may be drawn more open, or with leſs convolution, as in fig. 4; conſequently, by increaſing the length 4, 3, the ſcroll will acquire more convolution; and therefore we may, by theſe means, vary the ſcroll as we pleaſe. In fig. 5, is ſhewn the pitch-board or raking of the ſteps, in order to determine the falling mould of the twiſt. The dotted lines drawn from the hand-rail to the pitch-board, ſhew its width, which is to be kept level, as it winds about. The lines *a*, 3, *b*, 2, continued round to D, ſhew how much half the width of the rail riſes on the pitch-board, from its firſt beginning to 3. D exhibits the ſame pitch-board; and the method of finding the outſide mould for the twiſt of the hand-rail, after its ſides are ſo ſquared as to be every way in a perpendicular direction to its ground plan. But this cannot be done without firſt finding the mould for the hand-rail, which may be done thus: Conſider B in fig. 6, as that part of the plan of the hand-rail, comprehended between 1, 3, fig. 3. D is the pitch-board, which gives the rake or bevel of the hand-rail; which, being divided into any number of equal parts, draw ordinates to the plan B, as *a*, *b*. From the raking line *e*, *d*, draw the correſponding ordinates at right angles with it; and by the compaſſes transfer the ſeveral ordinates from 3 to G, as *a*, *b*, to *c*, *d*, and 1, 2, 3, 4, reſpectively: then, by drawing a curve line through theſe points, G will become an accurate mould for the upper ſide of the hand-rail.

As however the twiſt of the hand-rail requires a greater ſubſtance of wood than the ſtraight part, this may eaſily be determined thus: Draw the ſquare of the hand-rail on the pitch-board, as *a* in fig. 7; and parallel lines from the oppoſite angles will ſhew the thickneſs required, as at 1, 2. Agreeably to this, *l*, *m*, *n*, in fig. 8, ſhew the manner of glewing the rail with the additional thickneſs of wood before deſcribed. It is made of ſo many pieces, and varied in glewing, to aſſiſt in more eaſily forming the twiſt. The beſt method, in fact, is to glew theſe in the ſtraight way of the grain, by which, if the wood be properly matched, the whole will appear one ſolid piece. To reduce theſe pieces properly, and to produce in the whole twiſt an agreeable turn, it will be requiſite to have a falling mould, that when each part of the twiſt is ſo ſquared, as in every part to anſwer to a perpendicular line over its plan when placed in its due poſition, it may be applied to the outſide of the rail round the twiſt.

In fig. 5, therefore, conſider D the pitch-board and O P the level of the ſcroll at 3, 4. Take the ſtretch of a line ſuppoſed to be girted from 1 to 3, which transfer to O P at D. Divide each ſide of the angle formed by the raking and level line into any number of equal parts, as 1, 2, 3, each way, and the points produced by the interſections of the lines drawn from each diviſion, will form a curve, perfectly eaſy and ſufficiently accurate for the purpoſe.

If a ſcroll is required to take its ſpring from any part of the ſecond ſtep, then draw the pitch-board as at fig. 6, and proceed in every particular as before.

Fig. 9, is a plan of a hand-rail, including 5 ſteps, as in cylindrical ſtair-caſes. M is the quarter plan, and D is the pitch of 5 ſteps; and R the face-mould for the hand-rail if it be cut out of the ſolid; if otherwiſe, thin veneers are glewed round a cylinder made for the purpoſe, and on which muſt be marked each ſtep and riſer as ſhewn at A, that the thin ſlips at *b* for the hand-rail, and thoſe at *a* for the ſtringing-board, may be correctly laid down.

Sect. XVIII. *Of Balluſtrades.*

Balluſtrades are ſometimes of real uſe in buildings; and at other times they are only ornamental. Such as are intended for uſe, as when they are employed in ſtair-caſes, before windows, or to incloſe terraces, &c. muſt always be nearly of the ſame height; never exceeding three feet and a half, nor ever leſs than three. But thoſe that are principally deſigned for ornament, as when they finiſh a building, ſhould be proportioned to the architecture they accompany; and their height ought never to exceed four-fifths of the height of the entablature on which they are placed: nor ſhould it ever be leſs than two-thirds thereof, without counting the zocholo, or plinth, the height of which muſt be ſufficient to leave the whole balluſtrade expoſed to view.

The beſt proportion for balluſtrades is to divide the whole given height into thirteen equal parts; eight of theſe for the height of the balluſter, three for the baſe, and two for the cornice or rail; or into fourteen (if it be required to make the balluſter leſs), giving eight parts to the balluſter, four to the baſe, and two to the rail. One of theſe parts may be called a *module*; and being divided into nine minutes, may ſerve to determine the dimenſions of the particular members.

In balluſtrades, the diſtance between two balluſters ſhould not exceed half the diameter of the balluſter meaſured in its thickeſt part, nor be leſs than one third of it.

The breadth of the pedeſtals, when they are placed on columns or pilaſters, is regulated by them; the dye never being made broader than the top of the ſhaft, nor much narrower; and when there are neither columns nor pilaſters on the front, the dye ſhould not be much lower than a ſquare, and ſeldom higher. On ſtairs, or any other inclined planes, the ſame proportions are to be obſerved as on horizontal ones.

Sect. XIX. *Of Orders upon Orders, and of Baſements.*

We have already, in ſpeaking of the Compoſite order, deſcribed the regular ſucceſſion that ſhould be obſerved, from the ground upwards; and therefore we have now only to obſerve, that in placing columns upon one another, the axis of every column ſhould be perpendicular to each other; at leaſt they muſt be ſo in the front view. With regard to the proportions of columns placed above each other, Scamozzi's rule, that the lower diameter of the ſuperior column ought conſtantly to be equal to the upper diameter of the inferior, is univerſally eſteemed the beſt, and gives all the columns the appearance of one long tapering tree cut into ſo many pieces.

In this country, however, we have few examples of more than two ſtories of columns in the ſame elevation; for when

there are three, it is impoſſible to avoid ſome ſtriking inconſiſtencies, or to preſerve the character of each order in its intercolumnial decorations; ſince the intervals of the upper columns muſt become too wide, and would neither appear graceful nor ſolid.

But, inſtead of employing ſeveral orders, one above another, the ground floor is, in ſome caſes, made in the form of a baſement, on which the order that decorates the principal ſtory is placed. The proportions of theſe baſements are not fixed, but depend on the nature of the rooms on the ground floor. In ſome ſtructures, the height of the baſement is equal to that of the firſt order. In ſome buildings, it does not exceed two thirds of the order, and in others is only half its height. Baſements ſhould never be higher than the columns they ſupport, nor leſs than one half of their height.

It is uſual for baſements to be decorated with ruſtics, whoſe height, including the joint, ſhould be half a diameter of the order placed upon them. Their figures are from a ſquare to a ſeſquialtera; and their joints may be either ſquare or chamfered. The ſquare joint is one eighth of the height of the ruſtic, and in depth they are equal to their width; thoſe that are chamfered muſt form a rectangle; and their joints are one fourth of the width of the flat part of the ruſtic.

Sect. XX. *Of Roofs and their Coverings.*

Before we can proceed in the buſineſs of roofing, a plan of the building to be covered ſhould be made, by which we may be able to aſcertain the lengths of the various timbers required for the whole. The particular kinds of covering practiſed in England are lead, pantiles, plain tiles, and ſlates. Coverings of lead are doubtleſs the beſt and moſt durable of any other; but on account of their expence they are ſeldom choſen, except for magnificent buildings. Lead is moſt generally uſed on roofs of a very flat pitch, where any other ſort of covering would not be ſafe. The pitch or perpendicular height of ſuch roofs is about 2-9ths of the width of the building, or rather under what is termed pediment pitch. Lead however is now moſtly uſed for perfectly flat coverings. Pantile coverings may alſo be uſed to low roofs; but their general pitch ought to be about 3-8ths of the width of the building. Coverings of plain tiles and ſlates are generally allowed the higheſt pitch; becauſe when they are laid on low roofs, the rain will more eaſily find its way between them. Theſe ought to have a pitch, the length of whoſe rafters is 3-4ths of their girder; or at leaſt, the ſides of the roof ought to be at right angles with each other. There are alſo various kinds of circular roofs; but thoſe moſt generally in uſe are formed in the manner now deſcribed, having ſquare or oblong plans, and timber frames, as in figures A and G in Plate 27, whoſe principal parts are thus named: A is the beam or girder; B, the principal rafter or ſuſpar; C, the king poſt; DD, the ſtruts. Fig. 1. is a truſſed roof, with 3 king poſts, capable of bearing 70 feet ſpan. Fig. 2. is an M roof, capable of ſupporting to the ſame extent. Such roofs are uſeful in caſes where the ſpan is extenſive, and when the pitch is required to be low. This however ſeldom happens in practice; for if there be a middle wall, the roof is made double, as in fig. 9. Fig. 4, 4, ſhews the method of piercing timber, and ſecuring it by bolts: Fig. 5, the method of truſſing a girder with pieces *a*, *b*; Fig. 6, of truſſing a partition.

When beams exceed 20 feet in extent, they ſhould be truſſed up in one or more places, as may be required. Beams ſhould never exceed 15 feet in bearing; nor rafters more than 10 feet; and eſpecially in roofs of very low pitch, whoſe coverings have a much greater preſſure on their rafters, than thoſe of higher pitches, and which may therefore exceed 10 feet.

If the length of a beam of fir be 30 feet, its ſcantlings may be——————7 inches deep and 6 inches thick:

If 45	9	——	7	——
60	10	——	$8\frac{1}{2}$	——
75	$10\frac{1}{2}$	——	10	——
90	12	——	$10\frac{1}{2}$	——

If the length of a principal rafter be 24 feet, its ſcantlings may be——————6 inches deep and 5 in thickneſs:

If 36	7	——	6	——
41	9	——	7	——
60	10	——	$7\frac{1}{2}$	——
72	10	——	9	——

Rafters of theſe dimenſions are generally made about one inch larger at the bottom both in depth and thickneſs; which ſtrengthens the roof by admitting larger tenons into the principal beams, and by becoming lighter at the top.

If the rafters be ſmall, as 8 feet in length, their ſcantlings may be——————$4\frac{1}{2}$ inches by 3 inches thick:

If 10	5	——	3	——
12	6	——	3	——

Sect. XXI. *Of Cielings.*

Cielings in churches and temples may be conſidered as the interior coverings of their roofs, as there is nothing between them but the neceſſary framing by which the whole is ſupported. For dwelling-houſes the ſimpleſt and moſt common ſort are thoſe which are flat. Theſe are generally adorned with principal compartments, ſurrounded with mouldings, either let into the cieling or projecting from it. Their ornaments and mouldings do not require a bold relief; but being near the eye, they muſt be finiſhed with neatneſs and taſte.

Coved cielings are certainly more beautiful than flat ones; but their execution is attended with more expence. They are uſed promiſcuouſly in large and ſmall rooms, and occupy from one-fifth to one-third of the height of the room. But where the architect is at liberty to proportion the height of the room to its ſuperficial dimenſions, the moſt eligible proportion for the cove is one-fourth of the whole height of the room. The figure of the cove is commonly either a quadrant of a circle or of an ellipſis, taking its riſe a little above the cornice, and finiſhing at the border round the great pannel in the center. The border projects ſomewhat beyond the coves on the outſide; and on the ſide towards the pannel, it is generally made of ſufficient depth to admit the ornaments of an architrave.

When the profiles of rooms are gilt, the cielings ought likewiſe to be gilt. The uſual method is to gild all the ornaments, and leave the ground white, pearl-colour, light-blue, or any other that may be proper to ſet off the gilding to advantage.

Hiſtorical and other paintings are often introduced with good effect in the centre and angular compartments of large cielings; and of late an invention of painted ſilk and ſattin in various ornaments from the antique, has been introduced, to adorn the profiles or walls of rooms. Theſe are incloſed in pannels, pilaſters, and tablets, according to their ſituation; and, when they have ſuitable gilt mouldings, produce a very pleaſing and ſplendid effect.

PART III.

OF THE CONSTRUCTION AND PRINCIPLES NECESSARY TO BE OBSERVED IN THE ERECTION OF BUILDINGS IN GENERAL, INCLUDING AQUATIC WORKS.

SECT. I. *Of the Principles neceſſary in erecting a Building.*

HAVING now finiſhed our obſervations on the ſeveral detached articles neceſſary to complete the compoſition of different ſtructures, we ſhall next take ſome notice of the principles eſſential to the rearing of buildings in general.

The rules of building require, that in a whole fabric judiciouſly and elegantly erected, there ſhould be ſolidity, convenience and beauty; to which, according to the taſte of ſome of the moſt refined maſters, are added, order, diſpoſition, proportion, decorum, and economy. Theſe eight particulars are conſidered by the moſt ſkilful architects as abſolutely requiſite in the planning, erecting, and finiſhing an entire fabric.

Solidity implies the choice of a good foundation, proper materials to work with, as well as their judicious application. Convenience demands ſuch a diſpoſition of the various parts of a ſtructure, that they may not crowd and embarraſs each other, or appear diſagreeable to a ſpectator. Beauty, of which we have treated in another place, is that engaging form, and pleaſing appearance, which captivate at one glance the eye of the obſerver. Order gives each part of the building a proportionate extent; ſuch as is adapted to the magnitude of the whole. Diſpoſition is the due ranging and agreeable union of all the parts, including a proper and convenient arrangement of the various apartments of the whole fabric. Proportion is the relation that the whole work has to its conſtituent parts, and which each part has to the complete idea of the whole; for in buildings that are perfect in their kind, from any particular part we may form a tolerable judgment of the whole. Decorum conſiſts in making the whole aſpect of the fabric ſo correct, that nothing ſhall appear, but what is founded on the principles of reaſon, geometry, and delicacy of judgment. Deſign, in the limited ſenſe here uſed, is the choice of one ſituation in preference to another, which we may conceive improper for the kind of building which we are about to erect. The regard we have to the nature of places, from an inherent taſte natural to mankind, makes us pitch upon different proſpects or views for different parts of an edifice. Oeconomy inſtructs the architect to have regard to the expence of his whole deſign, which will be greatly effected by a choice of ſuch materials as are not only proper for his purpoſe, but of the cheapeſt of the kind which are proper.

SECT. II. *Of Proper and Sure Foundations.*

THE beſt foundation is that which conſiſts of gravel or ſtone; but, in order to know whether the inferior ſtrata are ſufficient for the ſupport of the building, it will be adviſable to ſink wells at ſome little diſtance. By attending to what is thrown up in digging theſe, the architect will be acquainted with what lies under the ſtony or gravelly bed which on the ſurface promiſes ſo much ſecurity, and will know what meaſures to take.

But though a ſtony or gravelly bottom is undoubtedly the moſt ſure and firm, where all is ſound beneath, there is no kind of ground which may prove more fallacious, or occaſion ſuch terrible accidents. The reaſon of this is, that ſuch kind of ground often contains abſolute vacuities; nor is rock itſelf, though a foundation upon a rock is ſtrong even to a proverb, free from danger of the ſame kind. Caverns are very frequent in rocky places; and ſhould an heavy building be erected over one of theſe, it might ſuddenly fall down altogether. To guard againſt accidents of this kind, Palladio adviſes the throwing down great weights forcibly on the ground, and obſerving whether it ſounds hollow, or ſhakes. He ſays, if a drum be placed on the ſuſpected ground near to a veſſel filled with water, a gentle ſtroke will not reſound nor ruffle the ſurface of the water, if the earth be ſolid; but, if it be hollow, the effects produced will very clearly ſhew it.

Where the foundation is gravel, it will be proper to examine the thickneſs of the ſtratum, and the qualities of thoſe that lie under it, as they have appeared in digging. If the bed of gravel is thick, and the under ſtrata of a ſound and firm kind, there needs no aſſiſtance; if otherwiſe, we muſt have recourſe to various methods in order to ſupply the defect.

In caſe of boggy earths, or unfirm ſand, piling is one of the moſt common methods of ſecuring a foundation; and, notwithſtanding the natural diſadvantages in ſuch a caſe, piles when properly executed, make one of the firmeſt and moſt ſecure foundations.

In foundations near the edge of waters, we ſhould always be careful to ſound to the very bottom, as many fatal accidents have happened from the ground being undermined by rivers. The ſame method is to be followed when the ground on which we build has been dug or wrought before. It ought never to be truſted in the condition in which it is left; but we muſt dig through it into the ſolid and unmoved ground, and ſome way even into that, according to the weight and ſize of the intended edifice.

Before the architect, however, begins to lay the foundation of the building, it will be proper to conſtruct ſuch drains as may be neceſſary for carrying off the rain, or other refuſe water that would otherwiſe be collected and lodge about the houſe. In forming drains for carrying off this water, it will be neceſſary to make large allowances for the different quantities that may be collected at different times. It muſt alſo be conſidered, that water of this kind is always loaded with a vaſt quantity of ſediment, which by continually falling to the bottom will be very apt to choak up the drain, eſpecially at thoſe places where there happen to be angles or corners in its courſe. The only method of preventing this is by means of certain cavities diſpoſed at proper diſtances from one another. Into theſe the ſediment will be collected, and they are for that reaſon called *ſeſpools*.

All drains ought to be arched over at top, and may be moſt conveniently built of brick. According to their different ſizes, the following proportions of height and thickneſs may be obſerved. If the drain is 18 inches wide, the height of the walls may be one foot, and their thickneſs 9 inches; the bottom may be paved with brick laid flatwiſe, and the arch turned 4 inches. If the drain be 22 inches wide, the ſide-walls are then to be one foot three inches in height, and the reſt conſtructed as before. If it is 14 inches wide, the height of the walls may be 9 inches, and the ſweep of the arch 4. A drain of a yard wide ſhould have the ſame height, and the arch turned over it ought to be 9 inches thick. Upon the ſame principles and proportions may other drains of any ſize be conſtructed.

The ſewers and drains being conſtructed in a manner proportioned to the ſize of the intended building, the architect may next proceed to lay the foundation of the walls. Here his firſt care muſt be, that the floor of the foundation be perfectly ſmooth and level. The Italians begin with laying over it an even covering of ſtrong oak plank; and upon that they lay, with the moſt exact care, the firſt courſe of the materials. Whether we take this method, or begin upon the naked floor, all muſt be laid with the moſt exact truth by rule and line. When the board-plat is laid, a courſe of ſtone is the beſt firſt bed, and this is to be laid without mortar; for lime would make the wood decay, which otherwiſe, in a tolerably good ſoil, will laſt for ages.

The thickneſs of foundation-walls in general ought to be double that of the walls which they are to ſupport. The looſer the ground, the thicker the foundation-wall ought to be; and it will require the ſame addition alſo in proportion to what is to be raiſed upon it. The plane of the ground muſt be perfectly level, that the weight may preſs equally every where: for when it inclines more to one ſide than the other, the wall will ſplit. The foundations muſt diminiſh as they riſe, but the perpendicular is to be exactly kept in the upper and lower parts of the wall; and this caution ought to be obſerved all the way up with the ſame ſtrictneſs. In ſome ground, the foundation may be arched; which will ſave materials and labour, at the ſame time that the ſuperſtructure has an equal ſecurity. This practice is peculiarly ſerviceable where the foundation is piled.

As the foundation-walls are to diminiſh in thickneſs, ſo are thoſe alſo which are built upon them. This is neceſſary in order to ſave expence, but is not abſolutely ſo to ſtrengthen the wall; for this would be no leſs ſtrong though it was continued all the way to the top of an equal thickneſs, provided the perpendicular was exactly kept. In common houſes built of brick, the general diminution from the bottom to the top is one half the thickneſs at the bottom; the beginning is two bricks, then a brick and a half, and laſtly one brick in thickneſs. In larger edifices, the walls muſt be made proportionally thicker; but the diminution is preſerved much in the ſame manner. When ſtones are uſed, regard muſt be had to their nature, and the propriety of their figures for holding one another; and where the wall is to be compoſed of different materials, as ſtone and brick, the heavieſt ought always to be placed undermoſt.

One farther particular reſpecting the ſtrength of a plain wall muſt be obſerved, and that is, the fortifying its angles. This is beſt done with good ſtone on each ſide, which gives not only a great deal of ſtrength, but a great deal of beauty. Pilaſters properly applied afford great ſtrength to walls. Their beſt diſtance is about every 20 feet, and they ſhould riſe five or ſix inches from the naked of the wall. The openings in a wall are all weakeners, and as the corners require to be the ſtrongeſt parts, there ſhould never be a window very near a corner. Properly, there ſhould always be the breadth of the opening firm to the corner.

Along with the conſtruction of walls, that of the chimneys muſt alſo be conſidered; for errors in the conſtruction of theſe will render the moſt elegant building extremely diſagreeable.

After the walls are finiſhed, the roof is the next conſideration: but concerning it very little can be ſaid; only that its weight muſt be proportioned to the ſtrength of the walls.

With regard to the floors, they are moſt commonly made of wood; in which caſe, it will be neceſſary that it ſhould be well ſeaſoned by being kept a conſiderable time before it is uſed. The floors of the ſame ſtory ſhould all be perfectly on a level; not even a threſhold riſing above the reſt: and if in any part there is a room or cloſet whoſe floor is not perfectly level, it ought not to be left ſo, but raiſed to an equality with the reſt; what is wanting of the true floor being ſupplied by a falſe one.

In mean houſes, the floors may be made of clay, ox blood, and a moderate portion of ſharp ſand. Theſe three ingredients, beaten thoroughly together and well ſpread, make a firm good floor, and of a beautiful colour. In elegant houſes, the floors of this kind are made of plaſter of Paris, beaten and ſifted, and mixed with other ingredients. This may be coloured to any hue by the addition of proper ſubſtances; and, when well worked and laid, makes a very beautiful floor. Beſides theſe, halls, and ſome other ground-rooms, are paved or floored with marble or ſtone; and this either plain or dotted, or of a variety of colours: but the univerſal practice of carpeting has, in a great meaſure, ſet aſide the beſtowing any ornamental work upon floors.

PART IV.

OF AQUATIC ARCHITECTURE.

SECT. I. *Preliminary Obſervations relative to Aquatic Works.*

BRIDGES generally form the continuation of a ſtreet or highway, over a river, canal, brook or marſhy ground; without which we could not conveniently paſs or repaſs. Conſidered merely as part of a high road, they are built in a rude and cheap manner; but when they take their lead or direction from a principal ſtreet in a capital city, their conſtruction is attended with great expence, and a degree of elegance and durability is required in their formation, that calls for the utmoſt ſkill and ingenuity of the architect. Palladio in his 3d Book tells us, that bridges ought to have the ſame qualifications that are judged neceſſary in all other buildings, namely, that they ſhould be convenient, beautiful, and laſting. The perfection of a bridge conſiſts in its having a good foundation, which makes it laſting; an eaſy aſcent to its centre arch, which makes it convenient; and juſt proportion in its ſeveral parts, which renders it beautiful.

When the architect is not abſolutely confined to any particular ſituation, he ought to chooſe that part of a river which has its courſe narrow and ſhallow, and which is the moſt promiſing for a good foundation. A ſtraight current, where the ſhore does not wind, and poſſeſſing the farther advantage of a level and ſtoney bed, is the moſt eligible.

In erecting bridges of ſtone, there are three or four particulars, which principally claim our attention. In the firſt place, the butments not only receive the preſſure of the arches, with which they are connected, but they muſt be capable of reſiſting the force of the whole combined together. Hence the neceſſity of a ſolid foundation at the oppoſite ſides of the river, without which the ſeveral arches will be liable at leaſt to partial rents, if the whole does not entirely give way. Secondly, the direction which the whole ſtructure is to take acroſs the river is to be attended to; and this ought always to be at right angles with the current, in order that the ſtream may more eaſily paſs through each arch without injuring the piers. Thirdly, we are to conſider the ſize of the piers which ought not to be larger than what is eſſentially requiſite to the ſupport of the arches; for the unneceſſary thickneſs of piers has the effect of contracting the current of the water, which conſequently increaſes its velocity, and renders the foundation of each pier more liable to be undermined. Fourthly, we are to decide on the dimenſions, number, and figure of the arches, which are points of great conſequence to the whole, in relation to ſtrength, uſefulneſs, beauty and œconomy.

In a ſituation where there is a ſtrong current and much na-

vigation, with elevated ground on each ſide, wide arches are preferable on many accounts: for they afford a more ſafe and eaſy paſſage to veſſels, and, being formed with a ſmaller number of piers, they become leſs expenſive, prove a leſs hindrance to the current of water, and in ſome reſpects are more ſafe than thoſe bridges which are built with narrow arches. Theſe, perhaps, were ſome of the reaſons that determined many foreign bridge-builders to chooſe only one arch, and that even in caſes where there were ſufficient room and great occaſion for more; for we read of a bridge in China, whoſe butments are two oppoſite mountains, having but one arch, whoſe length is 400, and its height (we ſuppoſe from the ſurface of the water) 500 cubits. Diſmiſſing ſuch extravagancies however, we muſt obſerve on the other hand, that in thoſe inſtances where the ground is low on each ſide, a very wide arch would be improper; for as a perfect ſemicircle is not only the moſt beautiful figure, but moſt conducive to the ſtrength of an arch, to chooſe an extenſive radius would occaſion the centre of the bridge to be ſo high as to render the paſſage of carriages exceedingly troubleſome. To obviate this, by changing the figure of the arch into an ellipſis, is, we preſume, an impropriety, as that is neither ſo ſtrong nor ſo beautiful as the former; yet it may be admitted when a river is narrow and its banks are extremely low. In ſuch caſes the danger will often lie in the butments; for arches which are either elliptical or ſmall ſegments of circles, preſs their butments in proportion as their height is to their length. When therefore we cannot depend on our butments, though the river be narrow, the number of arches muſt be increaſed, and their figure ought to be a ſemicircle; as it is ſelf-evident that ſuch arches preſs more perpendicularly on their piers, and in proportion to their number will relieve the butments.

The ancients, as well as the moderns, aſſign to a bridge an even number of piers, in order that an arch, and not a pier, may fall in the centre of the river. This is indeed founded, not merely on the principles of beauty, but of philoſophy and utility; ſince, in general, it is found that the ſtrongeſt current runs in the centre of a river, which therefore clears itſelf in the aperture of a bold arch, and makes it leſs dangerous to the piers near the centre.

The ſize of the pier is to be determined by that of the arch, and, according to Palladio, ſhould never be leſs than one-ſixth part of its width, nor more than one-fourth. In the plans of piers for bridges they are generally drawn of an hexagonal figure, having two long ſides parallel to each other, and at the ends of them are placed two ſhort ones facing the courſe of the river at right angles to each other. Palladio ſays, they are ſometimes made ſemicircular facing the ſtream in order to divide the water, and that thoſe things which are impetuouſly brought down the river, when they ſtrike againſt them, may be thrown from the piers, and paſs through the middle of the arch.

With reſpect to the proper dimenſions of the key-ſtones or archivolts, he gives to their height a 17th part of the width of the arch. This proportion is ſomewhat ſmaller than that propoſed by Mr. Gautier, an experienced engineer, who makes the length of the arch-ſtones, of an arch 24 feet wide, two feet; and to arches 45, 60, 75, or 90 feet wide, he gives 3, 4, 5, and 6 feet reſpectively, and more than this when the ſtone is of a ſoft nature. But Mr. Belidore ſays, the length of the key-ſtones ought always to be one 24th part of the width of the arch, whether the ſtone be hard or ſoft, becauſe, if they are ſoft, their weight is proportionably leſs. It appears ſomewhat ſtrange, that ſcientific men ſhould differ ſo widely about the ſize of a key-ſtone. The moſt illiterate pretenders to the ſcience could ſcarcely vary more in their opinions reſpecting the ſuitable proportion of a key-ſtone, than the difference between one and two feet in an arch of 24 feet wide. To what can ſuch a ridiculous difference be attributed, but to mere modern caprice? or what other tendency can it have but to excite laughter? However, as a juſt and proper medium between the two extremes, we may very ſafely venture to recommend the ſolid, judicious, and well founded proportion adopted by that ſenſible and learned architect, to the ſanction of whoſe name we have ſo often reſorted in this treatiſe. Of a bridge which Palladio deſigned at the requeſt of ſome gentlemen, he mentions the following proportions. The river was 180 feet wide, which he divided into three arches, giving 60 feet to the centre arch, and to the other two, 48 feet each. The piers, which he terms *pilaſters*, were 12 feet thick, or one-fifth of the width of the middle arch, and a fourth of the ſmaller ones. The arches were a ſmall portion leſs than a ſemicircle; and their archivolt one-ſeventeenth part of the aperture of the centre arch, as mentioned before; and a fourteenth part of the other two. According to this proportion, the key-ſtone of the centre arch was 3 feet 6 inches long, but, according to Mr. Gautier, it ſhould have been 4 feet, and agreeably to Mr. Belidore only 2 feet 10 inches. In an arch of 24 feet, Palladio's rule makes the length of the key-ſtone a ſmall part more than 16 inches, which is a much more eligible ſize than either the one or the two feet key-ſtone of the former gentlemen.

As to the thickneſs of the key-ſtones, ancient authors ſay nothing on the ſubject; nor have the moderns propoſed any determined rule. This ſilence is probably owing to their being conſidered in common with other ruſtic works whoſe thickneſs is as 4 to 6.

The width commonly allowed to ſmall bridges is 30 feet: but in large ones near great towns, theſe 30 feet are allowed clear for horſes and carriages, beſides a banquette on each ſide for foot paſſengers of 6 to 9 feet each, raiſed about a foot above the common road; the parapet-walls on each ſide are about 18 inches thick, and 4 feet high; they generally project the bridge with a cornice underneath: ſometimes balluſtrades of ſtone or iron are placed upon the parapet, as at Weſtminſter; but this is only practiſed where a bridge is of great length, and built on a magnificent plan.

The ends of bridges open from the middle of the two large arches with two wings, making an angle of 45 degrees with the reſt, in order to make their entrance more free: theſe wings are ſupported by a continuation of the arches; that immediately under each wing being ſmaller than the reſt. But the wings of bridges are generally ſupported by the ſolid butment alone.

Sect. II. *Of the various Methods of laying the Foundation of Piers, and conducting the Work.*

The moſt proper ſeaſon for laying the foundations of a bridge is in autumn, when the waters are loweſt, and when the weather is ſuitable for aquatic undertakings. The ancients uſed ſeveral methods to obtain a laſting foundation for their ſtone bridges. Some of theſe we conceive it proper to deſcribe, in order that the reader may form his own judgment, by drawing a compariſon between what they have done ſo long before our time, and what architects are now doing.

Alberti, who is reckoned among the firſt who wrote on bridges, gives us the following directions for laying the foundation of a pier. "Firſt raiſe an inclоſure to keep off the water, by driving a double row of ſtakes very cloſe and thick ſet, with their heads above the top of the water like a trench. Then put hurdles within this double row of ſtakes. Cloſe that ſide of the row which is next to the intended pier, and fill up the hollow between the two rows with ruſhes and mud, ramming them together ſo hard, that no water can poſſibly get through. Then whatever you find within this inclоſure, water, mud, ſand, or whatever elſe is a hindrance to you, throw out, and dig till you come at a ſolid foundation; or if

you find it neceſſary, make a foundation of wooden piles burnt at the ends, and driven in as cloſe together as poſſible. And here I have obſerved, that the beſt architects uſed to make a continued foundation of the whole length of the bridge, and not merely under each pier; and this they did, not by ſhutting out the whole river at once by one ſingle incloſure, but by firſt excluding one part, then another, and ſo joining the whole together by degrees: for it would be impoſſible to withſtand and repel the whole force of the water at once. We muſt therefore, while we are at work on one part, leave another part open for a paſſage for the ſtream. You may leave theſe paſſages either in the channel itſelf, or if you think it more convenient, you may frame wooden dams or hanging channels, by which the ſuperfluous water may run off: but if you find the expence of a continued foundation for the whole bridge too great, you may only make a ſeparate foundation for every particular pier, in the form of a ſhip, with one angle in the ſtern and another in the head, lying directly even with the current of the water, that the force of the water may be broken by the angles. We are to remember that the water is much more dangerous to the ſtern than to the head of the pier." Palladio, who is the next writer, ſays, "To lay the foundations of pilaſters, if the bed of the river be ſtone or gravel-ſtone, you have the foundation without any trouble; but in caſe the bottom be quickſand or gravel, you muſt dig therein till you come to ſolid or firm ground; or if that ſhould be found too laborious or impracticable, you muſt dig moderately deep in the ſand or gravel, and then you muſt thruſt in oaken piles, which will reach the ſolid or firm ground, with the iron by which their points are to be armed. A part only of the bed of the river muſt be incloſed from the water, and then we are to build there; that the other part being left open, the water may have its free current; and ſo go on from part to part."

Scamozzi propoſes three different methods, which, for the ſake of brevity, we will not give verbatim, but communicate in general terms. The firſt is, by driving a double row of piles, and filling in between them chalk, or ſome cloſe materials, and afterwards pumping out the water, and then drive other piles within theſe to form the foundation of the piers. This being done, a platform of oak plank is to be framed and laid upon theſe piles, on which the ſtone-work of the pier is to reſt.

His ſecond method is: After having ſounded the river and levelled its bed, he propoſes to make a ſtrong oaken frame, or grillage as he terms it, which is to be buoyed up with boats, and laying on it a thick ſtratum or layer of ſtones, well cramped together with iron, and jointed with ſtrong tarraſs, he directs it to be let down gently to the bed of the river. The third method by which he effected this was the following: After having turned off the courſe of the river to one ſide, by means of fences or channels ſunk on one ſide of the bed of the river, he made a dam with piles entirely acroſs the river, ſufficiently wide to form the piers in; and when he had by digging obtained a proper foundation, he proceeded to build all his piers together, and having raiſed them above low water-mark, he again turned the channel of the river into its former place.

It evidently appears on the face of this author's account, that the various circumſtances attendant on rivers gave occaſion to theſe three methods in the courſe of his practice, and not that he conſidered any of the methods recommended as like practicable in all caſes. His firſt method, we preſume, was applied in thoſe caſes where a river was deep, and deſtitute of a natural good bed. His ſecond was probably adopted when a river was moderately deep, but of a natural good foundation in its bed capable of ſupporting a heavy pier, founded on a ſtrong frame of oak immediately let down upon it, without the infinite trouble of piling, damming, and pumping off the water. His third ſcheme we ſuppoſe to have been applied in fordable ſhallow and narrow rivers, canals, or brooks, &c. where there was a ſuitable place for turning the courſe of the water, either by a wooden fence placed in a diagonal or ſloping direction acroſs the river, or, when the ground on one ſide of the river formed a peninſula, or ſomething approaching to it, as was the ſituation of the wonderful bridge built over the Danube by the emperor Trajan*; in which caſe, by digging through the neck of land, it was eaſy to turn off the ſtream to one ſide, and equally eaſy to bring it back again. Moſt of the French bridges have been built on the principles of Scamozzi's firſt method, viz. by driving oak piles and keeping off the water: this they call a batardeau, and we name it a coffer-dam.

The piers of Weſtminſter-bridge were founded by an improved kind of coffer-dam, made capable of floating and riſing again after being ſunk with two or three of the firſt courſes of ſtone for the pier. The bed of the river being of the beſt kind, they had little more to do than to level it; for previous to this operation, they had driven in large piles all round, about five feet clear of the dimenſions of the coffer-dam. Theſe piles ſerved both as a defence to the coffer-dams and to ſecure them in their place when ſunk. Having laid the firſt courſe of ſtones on the bottom of the coffer-dam, they drew it exactly over the place where it was to be ſunk, and by opening a ſluice made for the purpoſe in the ſide of this veſſel, the water came in and ſunk it. During about two hours before low-water mark, they employed their pumps to draw off the water again, by which means the coffer-dam was once more raiſed to the ſurface, ſo as to afford them an opportunity of correcting ſuch uneven parts of the foundation as they might have obſerved in their experiment. To the firſt courſe they now added two more, cramping each ſtone together, and filling every joint with tarraſs mortar; and after having ſo done, they again opened their ſluice and ſunk the machine, and depoſited the ſtone work in the manner juſt related. By this means they ſoon brought the work to within two feet of low-water mark, and by the next tide they were enabled to get above it. The ſides of the coffer-dam were ſo contrived, that by relieving a number of iron wedges, they detached themſelves from the bottom, and were at liberty to be uſed for another pier, by being again fixed to a new bottom. It ſhould alſo be obſerved, that when the tide was at its height, the coffer-dam was about ſix feet under the ſurface of the water; but being loaded with three courſes of ſtones, and well ſecured by ropes faſtened to the piles, it remained unmoved by the tide. Here it will be very natural to enquire why the coffers were not made ſufficiently deep to exclude the water at its greateſt height? The anſwer is eaſy, when the circumſtances are known; for, if it be conſidered, that the water at its full height roſe ſixteen feet, and that the bed of the river where the pier ſtood was ſunk about ſix feet, a coffer twenty-two feet high would have been required, a ſize completely unmanageable; and as they alſo had a ſluice in the ſide of the coffer juſt on a level with low-water mark, and by which all the ſuperincumbent water was eaſily got rid of, it was evidently unneceſſary to have the coffer higher than ſixteen feet. The circumſtance of the coffer's being ſo much under water, far from impeding, rather facilitated the execution of the work; for all the water above the edges of the coffer cleared itſelf with greater facility than that within, which paſſed through the ſluice. As for the remaining water below the ſluice, it was carried off by a number of chain pumps, ſo that the workmen were ſhortly enabled to bring the pier above water. Thus was every pier raiſed above low-water mark; and in the courſe of ſeven years, the whole bridge was com-

* This bridge was compoſed of twenty arches, and their openings from one pier to another were 170 feet high above the foundation.

pleted. Since that period, however, ſome of the arches have exhibited marks of injury and decay; and a method of repairing them, and reducing the enormous weight of the ſtone-work, by means of ſpandral walls on the back of the damaged arches, has been projected by a certain architect, who ſuppoſes that there are not leſs than 500 tons of not merely ſuperfluous, but injurious weight upon them.

In the year 1753, the foundation of Eſſex-bridge in Dublin was laid in a very deep and rapid ſtream by Mr. Semple, who adopted the following method. Round the place where the intended pier was to reſt, the workmen drove, at about 30 inches diſtance from each other both ways, two rows of ſtrong piles, which were left at the height of low-water mark. Theſe piles were lined with planks, within which they rammed a quantity of clay, and thus formed the external wall of the coffer-dam. Within this wall, and at about the ſame diſtances, they drove in a row of piles dovetailed at their edges ſo as to receive each other, and which formed the extremities of the plan of the piers at the level of the bed of the river. After having dug to a fine ſtratum of ſand about 4 feet lower, within theſe there were a great number of other piles of oak driven as deep as they poſſibly could be made to penetrate. They next filled up the voids or intervals of theſe piles; and in order to produce a ſolid and petrified foundation, they employed mortar of a peculiar quality, made up of roach lime and ſharp gravel; and with this they began to lay the firſt courſe, ramming in large flat ſtones upon it to about a foot thick. On this firſt courſe they laid a plentiful coat of dry lime and gravel of the ſame quality, on which they again laid ſtones, and then proceeded to lay mortar as at firſt, and continued to do ſo alternately till they came to a perfect level with the piles. Faſtened down to the end of theſe piles were laid three beams, ſtretching the whole length of the pier from ſterling to ſterling, the intervals being filled up with maſonry. On this platform, which was four feet ſix inches under low-water mark, they began to lay the firſt courſe of ſtones for the pier cramped together, and jointed with tarraſs as uſual, and went forward till they came to a level with the water at ebb tide.

About the year 1765, the foundation of a ſtone bridge acroſs the river Tees, near Stockton, was laid by Mr. Shout, and we ſhall here mention thoſe few particulars in which his method differed from the preceding. The workmen began with firſt making very ſtrong coffers of ſolid fir timber about ten feet ſquare, which they piled, jointed, and ſecured one upon another till they had gained a ſufficient height to exclude the water at its higheſt tide. The joints of theſe timbers they caulked in the ſame manner as ſhips are; and launching them without any bottoms, they fixed them down to their reſpective ſtations in the river. On the outſide and inſide they drove a number of piles, which they boarded and rammed with clay, to prevent the water from oozing in at the bottom of the coffers. This indeed was their greateſt difficulty, for, owing to quick-ſands and other looſe ſtrata through which the water ſprang in, the labour of digging to the proper kind of foundation was immenſe. The chain pumps played inceſſantly, and by a reſolute perſeverance, the work, which at ſome periods ſeemed to bid defiance to human induſtry and ſkill, was at length brought above low-water mark, and the completion of the whole occupied a ſpace of time nearly equal to Weſtminſter bridge. The bridge is neat and plain, and continues to the preſent time a proof of the ſolidity of its foundation.

Sect. III. *Of Wooden Bridges.*

There are various methods of conſtructing wooden bridges, ſo as to anſwer valuable purpoſes, and even to laſt a conſiderable time (ſee Pl. 26). The invention of wooden bridges was certainly prior to thoſe erected of ſtone: two or three different kinds of them are deſcribed by Palladio, after the manner of the ancients. Some of theſe are one continued frame of wood compoſed of a number of parts, and connected together by lap joints and iron bolts extending quite acroſs the river, without any piles to ſupport them; depending entirely on the truſſed parapets, and on the manner of fixing theſe frames on the ſtone butments. Palladio built one at Baſſano about 200 feet long by 26 broad, which he divided into five apertures, ſupported and framed as that repreſented in the plate, which was partly taken from his.

The principal and moſt eſſential points of wooden-bridge building are two; firſt, to ſeaſon and prepare the wood ſo as to make it laſting; and ſecondly, to lay a proper and durable pavement on the top.

In ſeaſoning the wood for this purpoſe, the following particulars ſhould be attended to: The ſudden decay of fir timber generally is owing to the ſappy nature of its exterior ſurface, which is by no means capable of being remedied by any immediate application of paint previous to its being ſeaſoned: on the contrary, it has been proved, that ſuch an application is actually injurious, ſince it hinders the free admiſſion of air and heat, which would have the property of extracting that ſappy quality which ſo much contributes to decay and rottenneſs. In conſequence of this practice, the ſap ſtrikes inwardly and makes its way to the heart of the wood, the ſubſtance of which is preſently contaminated and deſtroyed. As a means of preventing this evil, ſome burn and ſcorch the timber over a flaming fire, turning it about till every ſide acquires a ſort of cruſty ſurface; and in doing this, it neceſſarily follows that the external moiſture is diſſipated. After this proceſs, a mixture of pitch and tar, ſprinkled with ſand and powdered ſhells, may be advantageouſly applied to the parts under water. Thoſe more in ſight, after being well ſcorched, and while the wood is hot, ſhould be rubbed over with linſeed oil mixed with a little tar. This will ſtrike deeply into the grain of the wood, and will ſoon harden ſo as to receive as many coats of paint as may appear neceſſary. It has been found that fir timber thus prepared is nearly equal to oak for durability.

With reſpect to the top of the bridge, and the formation of the pavement, we muſt obſerve, that the joiſts that lie on the beams at *a*, ſhould be 9 inches ſcantling, and ſpaced about 18 inches apart, projecting out before the beam, and forming a kind of modillion. Upon theſe joiſts, 6 inch planks are to be laid, and brought forward ſo as to project before the ends of the joiſts, ſerving as a corona to the modillion, which, with the beam on which they reſt, will form ſomething like an entablature to the whole bridge.

This floor may be firſt covered with pitch and tar, and then with common ſlates, afterwards with one or two courſes of brick ſet in with the beſt of mortar, and laſtly, with the common paving work.

A proper acquaintance with the preceding principles, as they appear connected with practice, will, we apprehend, enable the young architect to apply proper methods in the conſtruction of aquatic buildings. Before we conclude, however, we ſhall take ſome notice of a ſubject, the introduction of which is perhaps indiſpenſable to the completion of our remarks on this branch of architecture.

Sect. IV. *Of Harbours.*

The firſt thing to be conſidered under this head is the chooſing a ſituation favourable by nature to the end propoſed; ſuch as a large creek or baſon of water where ſhips can lie ſafe in ſtormy weather, and where there is likewiſe a ſufficient depth

of water for large ships to enter and remain without touching the ground. The depths of water where the piers are to be built must be taken at every 10, 15, or 20 feet distance, and marked upon piles driven here and there, in order that the workmen may be directed in laying the foundation. It must be next considered what kind of materials are to be used, whether stone, brick, or wood. If stones are to be had at a moderate price, they should be preferred, because the work will be much stronger, and need fewer repairs: but when stones are too expensive, the foundation may be made of stone as high as low-water mark, and the rest finished with brick. If this should still be too expensive, wood must be used; and piles driven close, and fastened together by cross-bars, covered with strong oaken planks, so as to form a kind of coffer, which may be filled with stones, chalk, shingles, &c.

The manner of laying the foundation in different depths of water, and in various soils, requires particular methods to be followed. When the water is very deep, a coffer must be made with dove-tailed piles of about 30 yards long, and as wide as the thickness of the foundation is to be: then the ground is dug and levelled, and the wall is built with the best mortar. As soon as the mortar is tolerably dry, the piles at the end of the wall are drawn out, the side-rows are continued to about 30 yards farther, and the end inclosed; then the foundation is cleared, and the stones laid as usual. But it must be observed, that the end of the foundation finished is left rough, in order that the part next to it may incorporate with it in a proper manner; but if it is not very dry, it will incline that way of itself, and bind with the mortar that is thrown in next to it: this method is continued till the whole pier is entirely finished.

Another method which may be practised, is to build in coffers much after the same manner as was done in building the piers of Westminster bridge; but as in this case the ends of the coffers are left in the wall, and prevent their joining so well as to be water-tight, the water may penetrate through and render the work insecure. The proper thickness of piers can only be determined by experience. Some architects suppose, that if the thickness of a pier be equal to the depth of the water, it is sufficient; but for a greater security they allow 2, 3, or 4 feet more. This might probably do, if the pier were built with solid stones cramped together; but as its inside is filled up with shingles, chalk, or other loose materials, their rule is not to be depended on; besides, it makes the space above too narrow for lading and unlading the ships, unless in a great depth of water: so that it does not appear that their method can be followed, except in a very few cases where the water has no considerable motion.

The wall must be built with tarras mortar from the bottom to the height of low-water mark, and the rest finished with cinder or tile-dust mortar, which has been found sufficiently good in those places where the wall is wet and dry alternately. The upper part of the pier should be paved with flat hewn stones laid in strong mortar, in order to prevent any water from penetrating into it. Iron rings ought also to be fixed here and there at proper distances, to fasten the ships, and prevent them from striking against the pier.

Wooden fenders or piles should be driven at the inside close to the wall, and cramped to it with iron, to prevent the ships from touching them, and doing mischief by their continual motion. Where the sea breaks against the piers with great violence, breakers should be made at proper distances; namely, two rows of piles driven nearly at right angles to the piers for the length of about 12 or 15 feet, and at about 8 or 10 feet distance from each other; and then another to join the two former: these piles being covered with planks, and the inside being filled with shingle and ruble-stones, the top is then paved with stones of about a foot in length, set long-wise to prevent the waves from tearing them up. This precaution is absolutely necessary where the water rushes in very rapidly.

ARC

Military ARCHITECTURE, the same with what is otherwise called *fortification*. See FORTIFICATION.

Naval ARCHITECTURE, the art of building ships. See SHIP-*Building*.

ARCHITRAVE, in architecture, that part of a column which lies immediately upon the capital, being the lowest member of the entablature. Over a fire-place, this member is called the *mantle-piece*; and over doors or windows, the *hyperthyron*.

ARCHITRICLINUS, in antiquity, the master or director of a feast, charged with the order and œconomy of it, the covering and uncovering of the tables, the command of the servants, and the like. The architriclinus was sometimes called *servus tricliniarcha*, and by the Greeks προγευστης, i. e. *prægustator*, or *fore-taster*. Potter also takes the architriclinus for the same with the sympositarcha.

ARCHIVAULT, in architecture, implies the inner contour of an arch, or a band adorned with mouldings, running over the faces of the arch-stones, and bearing upon the imposts. It has only a single face in the Tuscan order, two faces crowned in the Doric and Ionic, and the same mouldings as the architrave in the Corinthian and Composite.

ARCHIVE, or ARCHIVES, a chamber or apartment wherein the records, charters, and other papers and evidences, of a state, house, or community, are preserved, to be consulted occasionally. We say, the *archives* of a college, of a monastery, &c. The archives of ancient Rome were in the Temple of Saturn; the archives of the court of chancery are in the Rolls Office.

ARCHIVIST, ARCHIVISTA, a keeper of an archive. Under the emperors, the archivist was an officer of great dignity, held equal to the proconsuls, vested with the quality of a count, styled *clarissimus*, and exempted from all public offices and taxes. Among the ancient Greeks and Persians, the trust was committed to none but men of the first rank; among the Franks, the clergy being the only men of letters, kept the office among themselves. Since the erection of the electoral college, the archbishop of Mentz has had the direction of the archives of the empire.

ARCHMARSHAL, the grand marshal of the empire, a dignity belonging to the elector of Saxony.

ARCHONS, in Grecian antiquity, were magistrates appointed after the death of Codrus. When any obscurity occurred in the laws relative to religion and the worship of the gods, the interpretation was submitted to the tribunal of the archons. Aristotle observes, that Solon, whose aim was to make his people happy, and who found their government in his time aristocratical by the election of the nine archons, who were annual magistrates, tempered their power, by establishing the privilege of appealing from them to the people,

called by lot to give their ſuffrage, after having taken the oath of the Heliaſtæ, in a place near the Panathenæum, where Hiſſus had formerly calmed a ſedition of the people, and bound them to peace by an oath. The archons were the principal officers, not only in civil, but likewiſe in ſacred matters, and eſpecially in the myſteries of Bacchus. The archons, however, who were ſurnamed *eponymi*, were chiefly employed in civil affairs; yet they preſided at the great feaſts, and held the firſt rank there. Hence they are ſometimes ſtyled *prieſts*.

ARCHON is alſo applied by ſome authors to divers officers, both civil and religious, under the eaſtern or Greek empire. Thus biſhops are ſometimes called *archontes*; and the ſame may be ſaid of the lords of the emperor's court. We alſo read of the *archon of the antimenſia*, *archon of archons*, *grand archon*, *&c.*

ARCHONTICI, in church-hiſtory, a branch of Valentinians, who maintained that the world was not created by God, but by angels called *Archontes*.

ARCHPRIEST, ARCHPRESBYTER, a prieſt or preſbyter eſtabliſhed in ſome dioceſes, with a pre-eminence over the reſt. Anciently the archprieſt was the firſt perſon after the biſhop: he was ſeated in the church next after the biſhop; and even acted as his vicar, in his abſence, as to all ſpiritual concerns. In the ſixth century, there were found ſeveral archprieſts in the ſame dioceſe; from which time ſome will have them to have been called *deans*. There are archpreſbyters ſtill ſubſiſting in the Greek church, veſted with moſt of the functions and privileges of chorepiſcopi or rural deans.

ARCHTREASURER, the great treaſurer of the German empire. This office was created with the eighth electorate, in favour of the elector palatine, who had loſt his former electorate. The dignity of archtreaſurer was conteſted between the elector of Brunſwick, who claimed it in virtue of his deſcent from the elector Frederic, and the elector palatine.

ARCHILUTE, ARCHILEUTO, a long and large lute, having its baſs ſtrings lengthened after the manner of the theorbo, and each row doubled, either with a little octave or an uniſon. It is uſed by the Italians for playing a thorough baſs.

ARCIS-SUR-AUBE, a ſmall handſome town of France, in the department of Aube, and late province of Champagne, ſeated on the river Aube. E. long. 4. 15. N. lat. 48. 40.

ARCO, a ſtrong town and caſtle in the Trentin, belonging to the houſe of Auſtria. E. long. 9. 55. N. lat. 45. 52.

ARCONA, a ſtrong town ſituated on the iſland of Rugen in the Baltic.

ARCOS, a ſtrong city of Andaluſia, in Spain. W. long. 2. 10. N. lat. 36. 40.

ARCTIC, in aſtronomy, an epithet given to the north pole, or the pole raiſed above our horizon. It is called the *arctic pole*, on account of the conſtellation of the little bear, in Greek called ἄρκτος; the laſt ſtar in the tail of which nearly points out the north pole.

Arctic Circle is a leſſer circle of the ſphere, parallel to the equator, and 23° 30′ diſtant from the north pole; from whence its name. This and its oppoſite, the *antarctic*, are called the two *polar circles*; and may be conceived to be deſcribed by the motion of the poles of the ecliptic, round the poles of the equator, or of the world.

ARCTIUM, BURDOCK; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ capitatæ*. The calyx is globular; with ſcales having hooks reflected at the tops. The ſpecies are three, viz. the lappa or common burdock, the tomentoſum, and the perſonata. All theſe are troubleſome weeds, and require no direction for their culture. The tender ſtems of the common kind, deprived of the bark, may be boiled and eat like aſparagus: when raw, they are good with oil and vinegar. Boys catch bats by throwing the prickly heads of this ſpecies up into the air. The ſeeds, which have a bitteriſh ſubacrid taſte, are recommended as very efficacious diuretics, given either in the form of emulſion, or in powder to the quantity of a dram. The roots, which taſte ſweetiſh, with a ſlight auſterity and bitteriſhneſs, are eſteemed aperient, diuretic, and ſudorific; and are ſaid to act without irritation, ſo as to be ſafely ventured upon in acute diſeaſes.

ARCTOPHYLAX, from ἄρκτος *bear*, and φυλάττω *I guard*, in aſtronomy, a conſtellation, otherwiſe called *Bootes*.

ARCTOPUS, in botany; a genus of the polygamia dioecia claſs; and in the natural method ranking under the 45th order, *Umbellatæ*. The umbella of the male is compound; the involucrum conſiſts of five leaves; the corolla has five petals; the ſtamina are five; and two piſtilli. The umbella of the hermaphrodite is ſimple; the involucrum is divided into four parts, is ſpinous, large, and contains many male flowers in the diſk. There is but one ſpecies of arctopus, viz. the echinatus, a native of Ethiopia.

ARCTOTIS, in botany; a genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The receptacle is briſtly; the corona of the pappus is pentaphyllous; and the calyx is imbricated with ſcales looſe at the top. It is commonly called *anemoſpermos*, from the reſemblance of its ſeeds to thoſe of the anemone. The ſpecies are 11; all of them natives of Ethiopia, or the Cape of Good Hope. Of theſe the anguſtifolia, with ſpear-ſhaped leaves, and the aſpera with wing-ſhaped woolly leaves, are moſt remarkable for their beauty, having rays of a deep gold colour. All the ſpecies of arctotis may be propagated by cuttings; which ſhould be frequently renewed, as the old plants are ſubject to decay in winter. They may be planted in any of the ſummer months, in a bed of light freſh earth; obſerving to ſhade them from the ſun until they have taken root. They ſhould be expoſed to the open air until the latter end of October, or longer, if the weather is favourable, when they muſt be removed into the green-houſe.

ARCTURUS, in aſtronomy, a fixed ſtar, of the firſt magnitude, in the conſtellation of Arctophylax, or Bootes. The word is formed of ἄρκτος *bear*, and οὐρὰ *tail*, q. d. *bear's tail*, as being very near it. This ſtar was known to the ancients, as in the following verſe of Virgil: *Arcturum*, *pluviaſque Hyades*, *geminoſque Triones*. See alſo Job ix. 9. xxxviii. 32.

ARCUATION, in gardening, the method of raiſing trees by layers, which is done in the following manner: Strong mother-plants or ſtools muſt be planted in a clear border, and in a ſtraight line, about ſix feet aſunder. When theſe have ſhot five or ſix main branches from the root, and as many collateral branches, the former muſt be bent to the ground, and there faſtened. The ſmall branches muſt be covered three inches deep upon the joints, and have a large baſon of earth made round them to hold the water. About the middle of September they may be opened, and if they have taken root, may be immediately removed into the nurſery; but if they have not ſufficiently extended their roots, they muſt be ſuffered to remain till the ſpring, and then tranſplanted.

ARCUCCIO, ARCUTIO, a machine conſiſting of a frame of wood, covered with pieces of hoops, like the tilt of a waggon; uſed in Italy to prevent children from being overlaid by their nurſes. Every nurſe in Florence is obliged to lay her child in an *arcuccio*, under pain of excommunication.

ARDAMON, or ARDAMA, in antiquity, a veſſel of water placed at the door of a perſon deceaſed, till the time of burial, as a token that the family was in mourning, and to ſerve to ſprinkle and purify perſons as they came out of the houſe.

ARDASSES, in commerce, the coarſeſt of all the ſilks of Perſia; and as it were the refuſe of each kind. In this ſenſe, they ſay, the *legis*, the *houſets*, the *chouſs*, and the *payas ardaſſes*, to ſignify the worſt of thoſe four ſorts of Perſian ſilks.

ARDASSINES, in commerce, called in France *ablaques*; a very fine ſort of Perſian ſilk, little inferior in fineneſs to the fourbaſtis, or rather cherbaſſis, and yet it is little uſed in the ſilk manufactures of Lyons and Tours, becauſe that kind of ſilk will not bear hot water in the winding.

ARDEA, in ornithology, a genus of the order of grallæ. The general characters of this order are theſe: The bill is ſtraight, ſharp, long, and ſomewhat compreſſed, with a furrow that runs from the noſtrils towards the point; the noſtrils are linear; and the feet have four toes. Under this genus Linnæus comprehends the grus or crane, the ciconia or ſtork, and the ardea or heron, of other authors. (See Plate 29.) The ſpecies are, 1. The *pavonia*, or crowned-crane, which has an erect briſtly creſt, with the temples and two wattles naked. The head is black; the creſt is yellowiſh, and tipped with black at the top; the wings are white; and the feathers of the tail black, and of an equal length. It is a native of Africa, is often kept in our menageries; and, when ſheltered of nights, will live a good while. 2. The *virgo*, with a ſtraight greeniſh bill and crimſon irides. The crown of the head is aſh colour; the reſt of the head, the upper part of the neck behind, and all the under parts, to the breaſt, black; the back, rump, and tail, and all the under part from the breaſt, are of a blueiſh aſh-colour. Behind each eye ſprings a tuft of long white feathers, which decline downwards, and hang in an elegant manner. The quills and tail are black at the ends; the legs black. This ſpecies is found in many parts of Africa and Aſia. It puts itſelf into very uncouth attitudes, eſpecially thoſe which imitate dancing; and Keyſler mentions one in the great duke's gallery, at Florence, which had been taught to dance to a certain tune. 3. The *leucogeranos* of Pallas, or *Siberian crane* of Pennant, is four and a half feet when ſtanding erect. The bill is of a red colour; the irides are white; the plumage is white as ſnow, except the 10 firſt greater quills, with the coverts of them, which are black: the legs are long and red. This ſpecies inhabits the vaſt marſhes and lakes in Siberia; and makes its neſt among the reeds. They are ſhy birds, and always upon their guard againſt an enemy; having a ſentinel to warn them of an approach: on the leaſt alarm they utter a cry, not unlike the ſwan, and fly off directly. 4. The *grus*, or common crane of Engliſh authors, has a naked papillous crown; the prime feathers of the wings are black; the body is aſh-coloured; the prime feathers of the tail are ragged. This ſpecies is met with in great flocks throughout northern Europe and Aſia. They feed on reptiles of all kinds, and in turn on green corn; of which laſt they are ſaid to make ſo great havock, as to ruin the farmers wherever the flocks of theſe depredators alight. 5. The *Americana*, or hooping crane of Edwards, is a native of America. The crown of the head and temples are naked and papillous; the forehead, nape of the neck, and prime wing feathers, are black; but the body is white. The under-part of the head, as far as the lower chap, is red; the beak is yellowiſh, and jagged at the point; the feet are red, and the prime tail feathers white. This is an American ſpecies, often ſeen at the mouths of the Savanna, Aratamaha, and other rivers near St. Auguſtine; in ſpring going to the north to breed, like the common crane, and returning, like that bird, to the ſouth in autumn. Theſe birds have a loud long note, which may be heard at a great diſtance. The natives of Hudſon's Bay call this ſpecies *Wapaw-uchechauk*. 6. The *argil*, or *hurgil*, of Ives, is a very large ſpecies; from tip to tip of the wings meaſuring 14 feet 10 inches; and from the tip of the bill to the claws ſeven feet and a half. The bill is 16 inches round at the baſe, of different colours, and nearly of a triangular ſhape; the feathers of the back and wings are very ſtrong, and of an iron colour; thoſe of the breaſt long. Over the belly, it has a great deal of down, of a dirty white; the legs and half the thighs are naked; the naked parts full three feet in length. This monſter, as Ives terms it, inhabits Bengal, is alſo found at Calcutta; and at the laſt place is called *Hurgill*, or *Argill*. It majeſtically ſtalks along before one, and appears at firſt like a naked Indian. The common opinion is, that the ſouls of the Bramins poſſeſs theſe birds. On opening one of them, a terapin, or land tortoiſe, 10 inches long, was found in its craw, and a large male black cat was found entire in its ſtomach. In Sumatra there is ſaid to be a great variety of the ſtork kind, ſome of a prodigious ſize, and otherwiſe curious; as the Boorong Cambing, and Booringoolar. The ſame ſpecies ſeems to have been remarked by Mr. Smeathman in Africa, while reſident there; an adult of one of which will often meaſure ſeven feet when ſtanding erect. He deſcribes the plumage much the ſame as Mr. Ives's bird; adding, that the gape is monſtrouſly wide: the head covered with white down, thinly diſperſed, appeared not unlike a greyheaded man: on the middle of the neck before, is a long, conic membrane, like a bladder, ſprinkled very thinly with ſhort down, riſing or falling as the animal moves the beak, and always appearing inflated. Theſe birds are met with in companies. When ſeen at a diſtance, near the mouths of rivers, coming towards an obſerver, which they do with the wings extended, they may well be taken for canoes, upon the ſurface of a ſmooth ſea; and when on the ſand-banks, for men and women picking up ſhell-fiſh or other things on the beach. 7. The *ciconia*, or white ſtork of Ray, has naked eye-balls, and black prime wing-feathers. The ſkin below the feathers, as alſo the beak, feet, and claws, are of a blood colour. It is a native of Europe, Aſia, and Africa; but is ſeldom or never to be met with in Italy. The ciconia feeds upon amphibious animals. It is ſuch an enemy to ſerpents, that it is reckoned almoſt a crime to kill a ſtork. From this favourable treatment, they are ſeen in Holland and the Low Countries walking unconcerned in the middle of the ſtreets. Storks are birds of paſſage: they ſpend the ſummer in Europe, and diſappear all at once, and go off to Egypt, Ethiopia, &c. before winter, and do not return till about the middle of March. 8. The *major*, or common heron, has a black creſt depending from the back part of the head, an aſh-coloured body, and a black line and belt on the neck and breaſt. It is a native of Europe. This bird is remarkably light in proportion to its bulk, ſcarcely weighing 3½lb. the length is three feet two inches; the breadth five feet four inches. The body is very ſmall, and always lean; and the ſkin ſcarce thicker than what is called gold-beater's ſkin. It muſt be capable of bearing a long abſtinence, as its food, which is fiſh and frogs, cannot be readily got at all times. It commits great deva ſtation in our ponds; for though unprovided with webs to ſwim, nature has furniſhed it with very long legs to wade after its prey. It perches and builds in trees, and ſometimes in high cliffs over the ſea. It was formerly, in this iſland, a bird of game; heron hawking being ſo favourite a diverſion of our anceſtors, that laws were enacted for the preſervation of the ſpecies, and the perſon who deſtroyed their eggs was liable to a penalty of twenty ſhillings for each offence. Not to know the hawk from the heron-ſhaw was an old proverb, taken originally from this diverſion; but in courſe of time ſerved to expreſs great ignorance in any ſcience. This bird was formerly much eſteemed as food; and was valued at the ſame rate as a pheaſant. It is ſaid to be very long lived. By Mr. Keyſler's account it may exceed 60 years. The cinerea of Linnæus is the female of this ſpecies. 9. The *gar-*

zetta, or *egret*, is creſted behind; the body white, the beak black, and the feet greeniſh. It is a moſt elegant bird, weighs about 1lb. is in length 24 inches, and to the end of the legs, 32. It is a native of the eaſt; but that formerly it was very frequent in Britain, appears by ſome of the old bills of fare. Abroad they are ſtill common, eſpecially in the ſouthern parts of Europe, where they appear in flocks. The ſcapulars and creſt were formerly much eſteemed as ornaments for caps and head-pieces; ſo that aigrette and egret came to ſignify any ornament to a cap, though originally the word was derived from *aigre*. 10. The *herodias*, or *criſtata maxima* of Cateſby, is creſted behind, has a duſky-coloured back, reddiſh thighs, and the breaſt ſpeckled with oblong black ſpots. It is four feet and a half when erect; the bill is about eight inches from the angle of the mouth to the end of it; and the creſt is made up of long, narrow, brown feathers, the longeſt being five inches in length, which it can erect and let fall at pleaſure. It is a native of Virginia; and feeds not only upon fiſh and frogs, but on lizards, efts, &c. 11. The *ſtellaris*, or bittern, has a ſmooth head; and is variegated through the whole body with dark-coloured ſpots. It is a native of Europe, and inhabits chiefly the fen-countries, where it is met with ſkulking among the reeds and ſedges; and its uſual poſture is with the head and neck erect, and the beak pointed directly upwards. It will ſuffer perſons to come very near it without riſing; and has been known to ſtrike at boys and ſportſmen when wounded and unable to make its eſcape. It flies principally about the duſk of the evening, and then riſes in a very ſingular manner, by a ſpiral aſcent, till it is quite out of ſight. This bird and the heron are very apt to ſtrike at the fowler's eyes when only maimed. It was once held in much eſteem at our tables, its fleſh having much the flavour of a hare, and nothing of the fiſhineſs of that of the heron. 12. The *violacea*, or *creſted bittern* of Cateſby, has a white creſt; the body is variegated with black and white, and blueiſh below. Theſe birds are ſeen in Carolina in the rainy ſeaſons: but in the Bahama Iſlands, they breed in buſhes growing among the rocks in prodigious numbers, and are very eaſily taken, as they make no attempt to eſcape, even though almoſt full grown. They are called by the Bahamians *crab-catchers*, crabs being what they moſtly ſubſiſt on; yet they are well-taſted, and free from any rank or fiſhy flavour. There are 67 other ſpecies enumerated by ornithologiſts.

ARDEBIL, or ARDEVIL, a town of Perſia in the province of Aderbijan. E. long. 47. 30. N. lat. 37. 55.

ARDEN, the common name of foreſts among the Celtæ, from the wildly extenſive one which ranged for 500 miles in length acroſs the country of Gaul, or covered more than half the county of Warwick in Britain, and the ſites of which ſtill retain the appellation of *Arden*, to the much ſmaller one of the ancient Mancenion, that covered and ſurrounded the ſite of the preſent Mancheſter. *Ard* ſignifies either *high* or *great*, and *ven* or *den* either an *hill* or *wood*. *Arduen*, *Ardven*, or *Arden*, then, means a conſiderable wood.

ARDENBURG, a town of the Netherlands, in Dutch Flanders. E. long. 3. 30. N. lat. 51. 16.

ARDENNES, a department of France, part of the late province of Champagne, ſo named from a famous foreſt, lying on the river Meuſe, extending, in Cæſar's time, far into Germany. What remains of it at preſent lies between Thionville and Liege.

ARDENTES, in middle-age writers, an appellation given to thoſe afflicted with the *ignis ſacer*, or eryſipelas. They were thus called, as ſeeming to be ſcorched or *burned* with the diſeaſe.

ARDES, a town of France, in the late province of Lower Auvergne. E. long. 3. 10. N. lat. 45. 22.

ARDFERT, a town of Ireland, and the ancient capital of Kerry, with an univerſity, which was once held in great eſteem.

ARDRAH, a ſmall territory or kingdom of Africa, in Guinea properly ſo called. It lies at the bottom of the gulph of St. Thomas, and has a town called *Ardres*, ſuppoſed to be the capital.

ARDRES, a ſmall but ſtrong town of France, in the department of the ſtraits of Calais, and late province of Picardy. E. long. 2. 0. N. lat. 50. 35.

AREA, in architecture, denotes the ſpace or ſite of ground on which an edifice ſtands. It is alſo uſed for inner courts and ſuch-like portions of ground.

AREA, in geometry, denotes the ſuperficial contents of any figure. Thus, if a figure, *e. g.* a field, be in the form of a ſquare, and its ſide be 40 feet long, its area is ſaid to be 1600 ſquare feet; or it contains 1600 little ſquares, each a foot every way.

AREB, a kind of imaginary money uſed in the dominions of the Great Mogul. Four arebs are equal to one crou, or 100 lacs; one lac to 100,000 roupees.

AREBO, or AREBON, a town on the ſlave coaſt of Guinea, in Africa. E. long. 5. 5. N. lat. 5. 0.

ARECA, the FAUSEL-NUT, in botany, a genus of the order of *palmæ pennatifoliæ*. The male has no calyx, but three petals, and nine ſtamina; the female has no calyx; the corolla has three petals, and the calyx is imbricated. There are two ſpecies, *viz.* 1. The catheeu, a native of India. This has no branches, but its leaves are very beautiful; forming a round tuft at the top of the trunk, which is as ſtraight as an arrow. It grows to the height of 25 or 35 feet, and is a great ornament in gardens. The ſhell which contains the fruit is ſmooth without, but rough and hairy within; in which it pretty much reſembles the ſhell of the cocoa nut. Its ſize is equal to that of a pretty large walnut. The extract procured from this nut has been ſuppoſed the terra japonica of the ſhops; but according to later obſervations, the genuine drug ſeems to be obtained from the *Mimoſa Catechu*. The fruit when ripe is aſtringent, but not unpalatable, and the ſhell is yelloviſh. Of this fruit there is a prodigious conſumption in the Eaſt Indies, there being ſcarcely any perſon, from the richeſt to the pooreſt, who does not make uſe of it; and the trade they carry on in it is incredible. The chief uſe that is made of areca is to chew it with the leaves of betel, mixing with it lime made of ſea-ſhells. In order to chew it, they cut the areca into four quarters, and take one quarter of it, which they wrap up in a leaf of betel, over which they lay a little of the lime; afterwards they tie it, by twiſting it round. This bit prepared for maſtication is called *pinang*; which provokes ſpitting very much; cools the mouth, and faſtens the teeth and gums. The Europeans who live at Batavia, or Malaca, and in the Sunda and Molucca iſlands, uſe pinang as much as the Indians do; and by waſhing their teeth, preſerve them white. There grows in Malabar a ſort of red areca, which is very proper for dyeing in that colour. 2. The oleracea, or true cabbage-palm, is the moſt beautiful, and perhaps the talleſt, of all trees. The trunk is perfectly ſtraight, and marked with rings at the veſtigiæ of the footſtalks of the leaves. Near the ground it is about ſeven feet in circumference; but tapers as it aſcends, and attains the height of 170 or 200 feet. The bark is of an aſh colour till within 25 or 30 feet of the extremity of the tree; when it alters at once to a deep ſea green, which continues to the top. About five feet from the beginning of the green part upwards, the trunk is furrounded with its numerous branches in a circular manner; all the lowermoſt ſpreading horizontally with great regularity; and the extremities of many of the higher branches bend wavingly downwards, like ſo many plumes of feathers. Theſe branches, when full grown,

are 20 feet long, more or less; and are thickly set on the trunk alternately, rising gradually superior one to another: their broad curved sockets so surround the trunk, that the sight of it, whilst among these, is lost, though it again appears among the very uppermost branches, and is there inveloped in an upright green conic spire, which beautifully terminates its great height. Upon removing the large leaves, or branches, which surround the top of the trunk a little way above the beginning of the green bark just mentioned, what is called the *cabbage* is discovered lying in many thin, snow-white, brittle flakes, in taste resembling an almond, but sweeter. This substance, which cannot be procured without destroying the tree, is boiled, and eaten with mutton by the inhabitants of the West Indies, in the same manner as turnips and cabbage are with us; though it must appear the grossest luxury to fell so stately a tree, which would be an ornament to the most magnificent palace in Europe, to gratify the taste of an epicure, especially as there is but a very small part of it eatable. What is called the *cabbage-flower*, grows from that part of the tree where the ash-coloured trunk joins the green part already described. The sockets or grooves, formed by the broad part of the footstalks of the branches, are used by the negroes as cradles for their children. On the inner-side of the very young footstalks are tender pellicles, which when dried, it is said, make a writing-paper. The trunks serve as gutterings; the pith makes a sort of sago; and the nuts yield oil by decoction. In the pith also, after the trees are felled, there breeds a kind of worms, or grubs, which are eaten and esteemed a great delicacy by the French of Martinico, and the adjacent islands. These worms, when exposed to the sun, are said to yield an oil which is of great efficacy in the piles.

AREMBERG, a small town of Germany, in the circle of Westphalia, seated on the river Ayr. E. long. 7. 3. N. lat. 50. 27.

ARENA, in Roman antiquity, a place where the gladiators fought; so called from its being always strewed with sand, to conceal from the view of the people the blood spilt in the combat. Nero is said to have strewed the arena with gold dust.

ARENARIA, or SANDWORT, in botany; a genus of the decandria trigynia class; and in the natural method ranking under the 22d order, *Caryophyllæ*. The calyx has five open leaves; the petals are five, and entire; the capsule is unilocular, and contains many seeds. There are 17 species of arenaria, only seven of which are natives of Britain, viz. the peploides, or sea sandwort; the trinervis, or plantain-leaved sandwort; the serpylli-folia, or least sandwort; the saxatilis, or mountain-sandwort; the larisci-folia, or larch-leaved sandwort; the tenuifolia, or fine leaved sandwort; and the rubra, or purple-flowered sandwort.

ARENARII, in antiquity, gladiators who combated with beasts in the arena, or amphitheatre. The arenarii were slaves of the lowest rank: so that, though manumitted, they were not capable of being Roman citizens. They were the same with what were otherwise called *Bestiarii*.

ARENARIUM, in ecclesiastical writers, denotes a cemetery or burying-ground. The arenaria were properly a kind of pits, or holes under-ground, wherein the ancient Christians not only buried their dead, but held their religious assemblies in times of persecution.

ARENSBERG, a small town of Germany, in the circle of Westphalia. E. long. 8. 20. N. lat. 51. 25.

ARENSBOURG, an episcopal and maritime town of Livonia in Sweden, seated in the isle of Osel in the Baltic sea. E. long. 22. 40. N. lat. 58. 15.

AREOLA, among anatomists, the coloured circle surrounding the nipple.

AREOPAGUS, or *Areopagus*, a sovereign tribunal at Athens, famous for the justice and impartiality of its decrees, to which the gods themselves are said to have submitted their differences. It was in the town, on a rock or hill opposite to the citadel. The word signifies strictly, *rock of Mars*; from παγος *hill*, and αρης belonging to Mars. In effect, the denomination might either arise hence, that the *areopagus* was built in a place where had been a temple of Mars; or, because the first cause pleaded there was that of this god, who was accused of killing Halirrhotius the son of Neptune, and tried here before twelve gods, and acquitted by a majority of voices; or, finally, because the Amazons, whom the poets feign to have been the daughters of Mars, when they besieged Athens, pitched their tents and offered sacrifices to the god of war in this place.

This tribunal was in great reputation among the Greeks; and the Romans themselves had so high an opinion of it, that they trusted many of their difficult causes to its decision. Authors are not agreed about the number of the judges who composed this august court. Some reckon thirty-one, others fifty-one, and others five hundred; in effect, their number seems not to have been fixed, but to have been more or less in different years.—By an inscription quoted by Volaterranus it appears, they were then three hundred. However, at first this tribunal only consisted of nine persons, who had all discharged the office of archons, had acquitted themselves with honour in that trust, and had likewise given an account of their administration before the *logistæ*, and undergone a very rigorous examination. Their salaries were equal, and paid out of the treasury of the republic: they had three *oboli* for each cause.

The *areopagites* were judges for life.—They never sat in judgment but in the open air, and that in the night-time; to the intent that their minds might be more present and attentive; and that no object, either of pity or aversion, might make any impression upon them. However, some maintain, that the building in which the *areopagites* assembled was not wholly uncovered; and they observe, that among the ruins large stones have been found, whose joints are in the same angle with the pediment that must have been used for a covering.—All pleadings before them were to be in the simplest and most naked terms; without exordium, epilogue, or appeal to the passions. At first they only took cognizance of criminal causes; but in course of time their jurisdiction became of greater extent.—Mr. Spon, who examined the antiquities of that illustrious city, found some remains of the *areopagus* still existing in the middle of the temple of Theseus, which was heretofore in the middle of the city, but is now without the walls.—The foundation of the *areopagus* is a semicircle, with an esplanade of 140 paces round it, which properly made the hall of the *areopagus*. There is a tribunal cut in the middle of a rock, with seats on each side of it, where the *areopagites* sat, exposed to the open air.

This court by some is said to have been instituted by Solon; but others carry it much higher, and assert it to have been established by Cecrops, about the time that Aaron died; viz. in the year of the world 2553, maintaining withal, that Solon only made some new regulations in it, increased its power and privileges, and made it superior to the *ephetæ*, another celebrated court instituted by Draco.—In effect, Demosthenes himself, in his oration against Ctesiphon, owns himself at a loss on that point: *The institutors of this tribunal*, says he, *whatever they were, whether gods or heroes*, &c.

AREQUIBA, a city of Peru in South America, situated in W. long. 73°. S. lat. 17°. It is delightfully situated in the valley of Quilca, 100 leagues from Lima, and 20 from the sea, with which it communicates by a fine river. These natu-

ral advantages, however, are conſiderably allayed by its being very ſubject to earthquakes, which have already laid it five times in ruins.

ARES, a word adopted by Paracelſus, and by which he would expreſs that power of nature in the whole material world, by which ſpecies are divided into individuals.

ARETÆUS of Cappadocia, a Greek phyſician of the ſect of the Pneumatiſts, who lived in the reign of Auguſtus, according to ſome; according to others, under Trajan or Adrian.

ARETHUSA, in fabulous hiſtory, the daughter of Nereus and Coris, and the companion of Diana, who changed her into a fountain to deliver her from the purſuit of her lover Alphæus.

ARETHUSA, a celebrated fountain near the city of Syracuſe in Sicily, famous for the quantity of its waters, and the number of fiſhes it contained. Many fables were invented by the ancients concerning this fountain. They had alſo a notion that the river ALPHEUS run under or through the waters of the ſea, without mixing with them, from Peloponneſus to Sicily. Mr. Brydone informs us, that it ſtill continues to ſend forth an immenſe quantity of water, riſing at once to the ſize of a river, but is entirely abandoned by the fiſhes it formerly contained in ſuch plenty. At ſome diſtance from Arethuſa is a fountain of freſh water which boils up very ſtrongly in the ſea, inſomuch that, after piercing the ſalt water, it may be ſometimes taken up very little affected by it. This fountain Mr. Brydone thinks the ancients were ignorant of, or they would not have failed to uſe it as an argument for the ſubmarine journey of Alpheus.

ARETHUSA, in botany, a genus of the gynandria diandria claſs; and in the natural method ranking under the 7th order, *Orchideæ*. The generic character is taken from the nectarium, which is tubular, ſituated at the bottom of the corolla, and the inferior labium fixed to the ſtylus. There are four ſpecies, all natives of America, except the capenſis, which is only found at the Cape of Good Hope.

ARETIA, in botany; a genus of the pentandria monogynia claſs; and in the natural method ranking under the 21ſt order, *Pretiæ*. The corolla is divided into five parts; the tube of the corolla is ovated; and the capſule is globular, and conſiſts of but one cell. There is only one ſpecies, viz. the alpina.

ARETOLOGI, in antiquity, a deſcription of philoſophers, chiefly of the Cynic or Stoic tribe, who having no ſchool or diſciples of their own, haunted the tables of great men, and entertained them in their banquets with diſputations on virtue, vice, and other popular topics. Theſe are ſometimes alſo denominated *Circulatores Philoſophi*. In this ſenſe the word is derived from the Greek ἀρετὴ *virtue*, and λογος *diſcourſe*. Some authors chooſe to derive the word from ἀρεστὸς *gratus, agreeable*; and define Aretologi, perſons who ſtrive to divert and entertain their audience with jokes and pleaſant tales; which latter ſeems the more natural explication.

AREZZO, a city of Italy, in Tuſcany, ſeated between the Citta di Caſtelli and Florence. It is famed for being the birth-place of Mecænas. E. long. 12. 2. N. lat. 43. 27.

ARGEA, or ARGELI, in Roman antiquity, thirty human figures, made of ruſhes, thrown annually by the prieſts or veſtals into the Tiber, on the day of the ides of May.—Plutarch, in his Roman Queſtions, enquires why they were called *Argea*. There are two reaſons aſſigned. The firſt, that the barbarous nations who firſt inhabited theſe parts caſt all the Greeks they could meet with into the Tiber, for Argians was a common name for all Grecians; but that Hercules perſuaded them to quit ſo inhuman a practice, and to purge themſelves of the crime by inſtituting this ſolemnity. The ſecond, that Evander, an Arcadian, and a ſworn enemy of the Argians, to perpetuate that enmity to his poſterity, ordered the figures of Argians to be thus caſt into the river.

ARGEMONE, PRICKLY POPPY; a genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 27th order, *Rhœadeæ*. The corolla conſiſts of ſix petals; the calyx is triphyllous; and the capſule is ſemivalved. Of this genus there are three ſpecies, which are common in many parts of the Weſt Indies, and called by the Spaniards the *devil's fig*; but they are of no uſe and have very little beauty.

ARGENCES, a town of France, in the late province of Normandy. W. long. 0. 10. N. lat. 49. 15.

ARGENT, the common French word for *ſilver*, of which metal all white fields or charges are ſuppoſed to conſiſt. Argent of itſelf is uſed in heraldry to ſignify purity, innocence, beauty, and gentleneſs.

ARGENTAC, a town of France, in the Limoſin, on the river Dordogne. E. long. 2. 3. N. lat. 45. 5.

ARGENTAN, a town of France, in the department of Orne and late province of Normandy. It is ſeated on the banks of the river Orne. E. long. 0. 5. N. lat. 48. 54.

ARGENTARIA *Creta*, pure white earth, found in Pruſſia, and much eſteemed for cleaning plate.

ARGENTARIUS is frequently uſed in Roman writers for a money-changer or banker. The argentarii were monied people, who made a profit either by changing or lending money at intereſt. Theſe had their *tabernæ*, or offices, in the *forum Romanum*, built there as early as the reign of L. Tarquinius Priſcus. The argentarii and fœneratores were much hated on account of their covetouſneſs and extortion.

ARGENTATI MILITES, in antiquity. Livy, lib. vi. ſpeaks of *argentati milites*, as diſtinguiſhed from *aurati*. Aquinas ſuppoſes theſe to have been ſimilar to the argyraſpides and chryſaſpides; but the deſcriptions do not quadrate. Livy only repreſents the argentati as clothed in white linen coats.

ARGENTEUIL, a town in the Iſle of France, on the river Seine, 5 miles N. W. of Paris. E. long. 2. 28. N. lat. 48. 52.

ARGENTIERE, a ſmall iſland in the Archipelago, near Milo. E. long. 23. 10. N. lat. 36. 50.

ARGENTINA, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The generic characters are theſe: The teeth are in the tongue as well as the jaws; the branchioſtege membrane has eight radii or rays; the anus is near the tail; and the belly-fins conſiſt of many rays. There are two ſpecies of argentina, viz. 1. The ſpyræna has 15 rays in the fin at the anus; the air-bladder of this ſpecies is conical on both ſides, and ſhines like ſilver: according to Mr. Ray, falſe pearls are ſometimes made of it. 2. The carolina has likewiſe 15 rays in the fin near the anus; the tail is forked, and the lateral lines are ſtraight. It inhabits the freſh waters of Carolina.

ARGENTINUS, a deity worſhipped by the ancients, as the god of ſilver coin; as Æſculanus, whom they made his father, was the god of braſs money, which was in uſe before ſilver.

ARGENTON, a town of France, in the department of Indre. E. long. 1. 38. N. lat. 40. 30.

ARGENTUM. See SILVER.

ARGENTUM *Album*, in our old cuſtoms, ſilver coin, or pieces of bullion that anciently paſſed for money. By Doomſday tenure, ſome rents to the king were paid *in argento albo*, common ſilver pieces of money: other rents *in libris urſis et penſatis*, in metal of full weight and purity: in the next age, that rent which was paid in money, was called *blanch-fermé*, and after-

wards *white rent*; and what was paid in proviſions, was termed *black mail*.

ARGENTUM *Dei*, *God's penny*, anciently ſignified earneſt money, or money given to bind a bargain: in ſome places called *erles*, or *arles*, and by the civilians and canoniſts, *arrhæ*. *Et cepit de prædicto Henrico tres denarios de argento Dei præ manibus*.

ARGENTUM *Muſivum* is a maſs conſiſting of ſilver like flakes, uſed for the colouring of plaſter figures, and for other purpoſes, as a pigment. It conſiſts of an amalgam of equal parts of tin, biſmuth, and mercury. It is to be mixed with white of egg, or ſpirit varniſh, and then applied to the intended work, which is afterwards to be burniſhed.

ARGENTUM *Vivum*, now called *hydrargyrus*; *Mercury* or *Quickſilver*. See CHEMISTRY and QUICKSILVER.

ARGESTES, is uſed by Vitruvius for the wind which blows from that quarter of the horizon, which is 75° from the ſouth and weſtward. Ricciolus uſes the term to denote the wind which blows at 22° 30′ from the weſt towards the north, coinciding with that which is otherwiſe called *weſt-north-weſt*.

ARGIL, in ornithology, a ſpecies of ardea. See ARDEA.

ARGILLA, clay, in natural hiſtory. See CLAY.

ARGIVI, or ARGEII, the people of Argeia or Argolis. See ARGEIA.

ARGO, in antiquity, a ſhip or veſſel celebrated among the poets: being that wherein the Argonauts, of whom Jaſon was the chief, made their expedition in queſt of the golden fleece.

ARGO *Navis*, the *Ship Argo*, in aſtronomy, is a conſtellation in the ſouthern hemiſphere, whoſe ſtars in Ptolemy's catalogue are 45; in Tycho's, 11; in the Britannic catalogue, and Sharp's appendix, 64.

ARGONAUTA, the name of a genus of ſhell-fiſh belonging to the order of vermes teſtacea. The ſhell conſiſts of one ſpiral involuted valve. There are two ſpecies of Argonauta, *viz*. The argo, with a ſubdented carina, which is found in the Mediterranean and Indian oceans. (See Pl. 30.) This is the famous nautilus of authors. The ſhell ſeems no thicker nor ſtronger than a piece of paper; and the fiſh that inhabits it is a ſepia. It has been imagined, that men firſt learned the method of ſailing in veſſels from what they ſaw practiſed by this creature. When it is to ſail it extends two of its arms on high; and between theſe ſupports a membrane, which it throws out on this occaſion. This ſerves for its ſail; and the two other arms it hangs out of the ſhell, to ſerve occaſionally either as oars or as a ſteerage; but this laſt office is generally performed by the tail. When the ſea is calm, it is common to ſee numbers of theſe creatures diverting themſelves with ſailing about in this manner; but as ſoon as a ſtorm riſes, or any thing gives them diſturbance, they draw in their legs, and take in as much water as makes them ſomewhat heavier than the ſea-water in which they ſwim, and they then ſink to the bottom. The manner of their voiding this abundant water, when they would riſe again, is by a number of holes, of which their legs are full. 2. The cymbium, has a blunt plaited carina. This ſpecies is very ſmall, and is found in the Mediterranean.

ARGONAUTIC, ſomething belonging to the Argonauts. The argonautic expedition is one of the greateſt epochas or periods of hiſtory which Sir Iſaac Newton endeavours to ſettle, and from thence to rectify the ancient chronology. This he ſhows, by ſeveral authorities, to have been one generation or about thirty years earlier than the taking of Troy, and 43 years later than the death of Solomon. (See CHRONOLOGY.) Dr. Bryant, however, rejects the hiſtory of the Argonautic expedition as a Grecian fable, founded indeed on a tradition derived from Egypt, and ultimately referring to Noah's preſervation, &c. in the ark.

ARGONAUTICA, in literary hiſtory, denotes poems on the ſubject and expeditions of the Argonauts.

ARGONAUTS, in antiquity, a company of illuſtrious Greeks, who embarked along with Jaſon, in the ſhip Argo, from Colchis, with a deſign to obtain the golden fleece.

The occaſion of this expedition is thus repreſented by Greek writers. Phryxus, flying with his ſiſter Helle from the rage of their ſtepmother Ino, the daughter of Cadmus, went on board a ſhip, whoſe enſign was a golden ram, and ſailed to Colchis (now Mingrelia, part of Georgia). Helle was drowned by the way, in that ſea which from her was called the *Helleſpont*, now the *Dardanelles*. This, according to ſome, was the ground of the poetical fable, that a ram with a golden fleece ſwam away with them to Colchis; and that the Argonauts undertook their famed expedition, in order to find that fleece. But Strabo and Arrian inform us, that it was a practice of the Colchians to collect gold on mount Caucaſus by extending fleeces acroſs the beds of the torrents; and as the water paſſed, the metallic particles remained entangled in the wool: hence, according to thoſe hiſtorians, the adventure was named the *expedition of the golden fleece*. Sir Iſaac Newton thinks that this expedition was really an embaſſy ſent by the Greeks, during the inteſtine diviſions of Egypt in the reign of Amenophis, to perſuade the nations upon the coaſts of the Euxine and Mediterranean ſeas, to take that opportunity of ſhaking off the yoke of Egypt, which Seſoſtris had laid upon them; and that fetching the golden fleece, was only a pretence to cover their true deſign. A moſt judicious and ſatisfactory account of the Argonautic expedition may be found in the hiſtory of Greece by Dr. Gillies.

ARGONAUTS *of St. Nicholas*, was the name of a military order inſtituted by Charles III. king of Naples, in the year 1382, for the advancement of navigation, or, as ſome ſay, merely for preſerving amity among the nobles. They wore a collar of ſhells, incloſed in a ſilver creſcent, whence hung a ſhip with this device, *Non credo tempori*, "I do not truſt time." Hence theſe Argonaut knights came to be called *knights of the ſhell*. They received the order of St. Baſil, archbiſhop of Naples; and held their aſſemblies in the church of St. Nicholas, their patron.

ARGOPHYLLUM, WHITE-LEAF (*Forſt. Nov. Gen.*): A genus of the monogynia order, belonging to the pentandria claſs of plants. The capſule is trilocular; the nectarium is pyramidal, pentagonous, and the length of the corolla. There is but one ſpecies, the nitidum or gloſſy, a native of New Caledonia. This genus has great affinity with the ivy; but differs in the nectarium, and perhaps in the fruit.

ARGUIM, an iſland on the coaſt of Africa, about ſixteen miles diſtant from Cape Blanco, ſituated in W. long. 16. 30. N. lat. 20. 20.

ARGUMENT, in rhetoric and logic, an inference drawn from premiſes, the truth of which is indiſputable, or at leaſt highly probable. See LOGIC.

ARGUMENT, in matters of literature, denotes alſo the abridgment or heads of a book, hiſtory, comedy, chapter, &c. See SYLLABUS.

ARGUMENTATION, the act of inventing or framing arguments, of making inductions, and drawing concluſions. (See INDUCTION, &c.) Argumentation, according to Cicero, is the delivering or unfolding of an argument.—The matter of argumentations is propoſitions; the form, their due diſpoſition with regard to one another, ſo as a concluſion may be drawn from them. See ENTHYMEME, PROPOSITION, RATIOCINATION, SORITES, SYLLOGISM, &c.

ARGUS, in fabulous history, the son of Ariſtor, who had 100 eyes, 50 of which were always open. Juno made choice of him to guard Io, whom Jupiter had transformed into a white heifer.

ARGUS *ſhell*, a ſpecies of porcelain-ſhell, beautifully variegated with ſpots, reſembling in ſome meaſure thoſe in a peacock's tail.

ARGUTIÆ, witty and acute ſayings, which commonly ſignify ſomething further than what their mere words at firſt ſight ſeem to import.—Writers on rhetoric ſpeak of divers ſpecies of argutiæ, viz.

ARGUTIÆ *ab alieno*, when ſomething is ſaid, which ſeems repugnant either to the nature and property of a thing, or to common cuſtom, the laws, &c. which yet in reality is conſiſtent therewith; or when ſomething is given as a reaſon of another, which yet is not the reaſon of it. For inſtance, *Si Caius nihil didiciſſet, erraſſet minus:* again, *Aurcum hoc ſæculum eſt, quia plurimus jam auro honos venit.* ARGUTIÆ *ab alluſione*, thoſe wherein alluſion is made to ſome hiſtory, fable, ſentence, proverb, or the like, e. g. *Multi umbram captant & carnem amittunt.* ARGUTIÆ *a comparatis*, when two things are compared together, which yet at firſt ſight appear very different from each other, but ſo as to make a pretty kind of ſimile or diſſimile; e. g. *Par eſt pauper nil cupiens principi omnia habenti.* ARGUTIÆ *a repugnantibus*, when two things meet in a ſubject, which yet regularly cannot be therein; or when two things are oppoſed to each other, yet the epithet of the one is attributed to the other; e. g. *Dum tacent clamant.*

ARGYLESHIRE, a county of Scotland, bounded on the N. by Inverneſsſhire, on the E. by the counties of Perth and Dumbarton, on the S. and W. by the Atlantic Ocean, by which it is broken into iſlands and peninſulas. It is not quite 100 miles long from the Mull of Cantyre to its N. E. extremity: its breadth is unequal; about 30 miles where greateſt, and, in ſome parts, only one or two. To the N. W. is a peninſula, detached from the reſt of the county. It contains the diſtricts of Ardnamurchan, Morven, Sunart, and Ardgowar; the two laſt remarkable for numerous veins of lead, which, however, are not very productive. The peninſulas of Cantyre and Cowall are likewiſe very large. The ſoil of Argyleſhire, in the high grounds, though little fitted for cultivation, affords excellent paſture.

ARGYRASPIDES, or ARGYROASPIDES, in antiquity, perſons armed with ſilver bucklers, or bucklers ſilvered. The argyraſpides, according to Quintus Curtius, made the ſecond corps of Alexander's army; the firſt was the phalanx.—According to Juſtin's account, it ſhould ſeem, that Alexander's whole army were called *argyraſpides*.—After that prince's death, the argyraſpides deſpiſed all other chiefs of the army, diſdaining to obey any other having borne arms under Alexander.

ARHUSEN, a dioceſe of North Jutland in Denmark, to the S of Wilburg; E. long. 10. 0. N. lat. 56. 10.

ARIADNÆA, in Grecian antiquity, two feſtivals at Naxos, in honour of two women named *Ariadne*. One of them being the daughter of king Minos, they had, in the ſolemnity dedicated to her, a ſhew of ſorrow and mourning; and, in memory of her being left by Theſeus near the time of childbirth, it was uſual for a young man to lie down and counterfeit all the agonies of a woman in labour. This feſtival is ſaid to have been inſtituted by Theſeus, to atone for his ingratitude to that princeſs.—The other Ariadne was thought to be of a gay and ſprightly temper; and therefore her feſtival was obſerved with muſic and other expreſſions of mirth and joy.

ARIADNE, daughter of Minos, king of Crete. Theſeus being ſent to deſtroy the Minotaur, Ariadne was ſo taken with him, that, as a teſtimony of her love, ſhe gave Theſeus a clu of thread to guide him out of the labyrinth. Theſeus, having killed the Minotaur, carried off the Athenians he had relieved together with Ariadne; whom, however, he afterward forſook

ARIADNIA, in antiquity. See ARIADNÆA.

ARIANNA, a ſmall village ſix miles N. E. from the city of Tunis, remarkable for the beautiful remains of the ancien Carthaginian aqueduct, 74 feet high, ſupported by column 16 feet ſquare, and which ſtill increaſed in grandeur the neare it approached Carthage.

ARIANO, a town of Italy, in the kingdom of Naples, in the ulterior principality, with a biſhop's ſee. E. long. 15 19. N. lat. 41. 8.

ARIANS, followers of Arius, a preſbyter of the church of Alexandria about the year 315; who maintained that the Son of God was totally and eſſentially diſtinct from the Father; that he was the firſt and nobleſt of thoſe beings whom God had created, the inſtrument by whoſe ſubordinate operation he formed the univerſe; and therefore inferior to the Father both in nature and dignity; alſo, that the Holy Ghoſt was not God, but created by the power of the Son.

The Arians owned that the Son was the word, but denied that word to have been eternal. They held, that Chriſt had nothing of man in him but the fleſh, to which the λογος or word was joined, which was the ſame as the ſoul in us. (See *Lardner's Credibility*, &c. vol. ix. b. i. c. 69.) The Arians were firſt condemned and anathematized by a council at Alexandria in 320, and afterwards by 380 fathers in the general council of Nice, aſſembled by Conſtantine in the year 325. They alſo underwent various revolutions, perſecuting and being oppreſſed by turns, under ſucceeding emperors, according to the degree of intereſt they had in the civil power, till at length Theodoſius the Great exerted every poſſible effort to ſuppreſs and diſperſe them.—The Arians were divided into various ſects, of which ancient writers give an account under the names of *Semi-Arians*, *Euſebeans*, *Aetians*, *Eunomians*, *Acacians*, *Pſathyrians*, and others. But they have been commonly diſtributed into three claſſes, viz. the *Genuine Arians*, *Semi-Arians*, and *Eunomians*. Arianiſm was triumphant in many parts of Aſia, Africa, and Europe, but ſunk when the Vandals were driven out of Africa, and the Goths out of Italy, by the arms of Juſtinian. However, it revived again in Italy under the protection of the Lombards in the ſeventh century.—The appellation *Arian* has been indiſcriminately applied, in more modern times, to all thoſe who conſider Jeſus Chriſt as inferior and ſubordinate to the Father; and whoſe ſentiments cannot be ſuppoſed to coincide exactly with thoſe of the ancient Arians.

ARICA, a port town of South America, in the province of Los Charaes, in Peru. W. long. 70. 15. S. lat. 18. 26.

ARICINA, in mythology, a ſurname of Diana; under which appellation ſhe was honoured in the foreſt Aricine, ſo called from Aricia a princeſs of the blood-royal of Athens.

ARIDAS, a kind of taffety, manufactured in the Eaſt Indies, from a ſhining thread which is got from certain herbs, whence this kind of ſtuff is ſtyled *aridas of herbs*.

ARIDULLAM, in natural hiſtory, a kind of zarnich found in the Eaſt Indies. See ZARNICH.

ARIES, in zoology. See OVIS.

ARIES, the battering-ram. See BATTERING-*Ram*.

ARIES, in aſtronomy, a conſtellation of fixed ſtars, drawn on the globe, in the figure of a ram. It is the firſt of the twelve ſigns of the zodiac, from which a twelfth part of the ecliptic takes its denomination.

ARILLUS, an improper term, invented by Linnæus, for the proper exterior coat or covering of the ſeed, which falls off

ſpontaneouſly. All ſeeds are not furniſhed with an arillus; in many, a dry covering, or ſcarf-ſkin, ſupplies its place. But in jeſſamy; hound's tongue, *cynogloſſum*; cucumber; fraxinella, *dictamnus*; ſtaff-tree, *celaſtrus*; ſpindle-tree, *euonymus*; African ſpiræa, *dioſma*; and the coffee-tree, *coffea*; it is very conſpicuous. In the genus *hound's tongue*, four of theſe arilli, or proper coats, each enfolding a ſingle ſeed, are affixed to the ſtylus; and in this circumſtance, ſays Linnæus, does the eſſence of the genus conſiſt. In fraxinella, the arillus is common to two ſeeds. The *ſtaff-tree* has its ſeeds only half involved with this cover.—The arillus is either *Baccatus*, ſucculent, and of the nature of a berry; as in the ſpindle-tree, *euonymus*: *Cartilagineus*, cartilaginous, or griſtly; as in the African ſpiræa, *dioſma*: *Coloratus*, coloured; as in the ſtaff-tree: *Elaſticus*, endued with claſticity, for diſperſing the ſeeds; as is remarkable in the African ſpiræa, *dioſma*, and fraxinella: *Scaber*, rough and knotty; as in hound's tongue.—Although covered with an arillus or other dry coat, ſeeds are ſaid to be naked *(ſemina nuda)* when they are not incloſed in any ſpecies of pericarpium or fruit-veſſel; as in the graſſes, and the *labiati* or lipped flowers of Tournefort, which correſpond to the *didynamia gymnoſpermia* of Linnæus. Seeds are ſaid to be covered *(ſemina tecta)* when they are contained in a fruit-veſſel, whether capſule, pod, or pulpy pericarpium, of the apple, berry, or cherry kind. This exterior coat of the ſeed is, by ſome former writers, ſtyled *calyptra*, which ſee.

ARMANIUS, the evil god of the ancient Perſians. The Perſian Magi held two principles: a good dæmon or god, and an evil one: the firſt the author of all good, and the other of all evil: the former they ſuppoſed to be repreſented by light, and the latter by darkneſs, as their trueſt ſymbols. The good principle they named *Yezad* or *Yezden*, and *Ormozd* or *Hormizda*, which the Greeks wrote *Oromazdes*; and the evil dæmon they called *Abriman*, and the Greeks *Arimanius*.

ARIOLI, in antiquity, a kind of prophets, or religious conjurers, who by abominable prayers, and horrible ſacrifices at the altars of idols, procured anſwers to their queſtions concerning future events. (*Iſid. Orig.* lib. viii. cap. 9.) Theſe are alſo called *harioli*, and their operation *hariolation*. Sometimes they were denominated *aruſpices*, or *baruſpices*. The *arioli* were diſtinguiſhed by a ſlovenly dreſs, diſorderly and matted beards, hair, &c.

ARION, an admirable horſe, much more famous in poetic hiſtory than Bucephalus in that of Alexander. Authors ſpeak variouſly of his origin, though they agree in giving him a divine one.

ARIOSTO (Lodovico), the famous Italian poet, and author of Orlando Furioſo, was born at the caſtle of Reggio in Lombardy, in 1474. From his childhood, he ſhowed great marks of genius, eſpecially in poetry; and wrote a comedy in verſe on the ſtory of Pyramus and Thiſbe. At the age of 24, he was, for his good parts, taken into the ſervice of Don Hippolito, cardinal of Eſte, having at that time written only a few ſonnets. Reſolving now to make a poem, he choſe Bayardo's *Orlando Inamorato* for a ground-work, and employed his talents ſeveral years, though with long interruptions, in compoſing his *Orlando Furioſo*, a work that ſtands unrivalled in that ſpecies of poetical writing. But beſides this celebrated work, he wrote ſeveral comedies, which were univerſally admired, and which obtained him the patronage of the duke of Ferrara, and moſt of the people of rank in his time. Among many ſimilar anecdotes, it is reported of Arioſto, that coming by a potter's ſhop, he heard him ſinging a ſtave out of his Orlando, with ſo bad a grace, that, out of all patience, he broke with his ſtick ſeveral of his pots. The potter in a pitiful tone aſking what he meant by wronging a poor man that had never injured him? "You raſcal (he replied), I have not done thee half the wrong thou haſt done me: for I have broken but two or three pots of thine, not worth ſo many halfpence; whereas thou haſt broken and mangled a ſtanza of mine worth a mark of gold." Arioſto was tall, of a melancholy complexion, and ſo abſorbed in ſtudy and meditation, that he often forgot himſelf. His picture was drawn by Titian in a maſterly manner. He was honoured with the laurel by the hands of the emperor Charles V. He was naturally affable, always aſſuming leſs than was his due, yet never putting up with a known injury even from his ſuperiors. He enjoyed the friendſhip of the moſt eminent men of learning of his time, moſt of whom he mentions with great reſpect in the laſt canto of his Orlando Furioſo. His conſtitution was but weakly, ſo that he was obliged to have recourſe to phyſicians the greater part of his life. He bore his laſt ſickneſs with great reſolution and ſerenity; and died at Ferrara, on the 8th of July 1533, according to ſir John Harrington, being then 59 years of age. He was interred in the church of the Benedictine monks, who, contrary to their cuſtom, attended his funeral.

ARIPO, a ſtrong town of Aſia, on the W. coaſt of the iſland of Ceylon. E. long. 80. 25. N. lat. 8. 42.

ARISH, a Perſian long meaſure, containing about 38 Engliſh inches.

ARISI, the Indian name for the plant which produces the rice. See ORYZA.

ARISTA, or AWN, among botaniſts, a long needle-like beard, which ſtands out from the huſk of a grain of corn, graſs, &c.

ARISTÆUS, ſon of Apollo and Cyrene, whom, for the many ſervices he had rendered to mankind by his knowledge of all profitable arts, the gods placed amongſt the ſtars; ſo that he is the *Aquarius* in the zodiac.

ARISTIDA, in botany; a genus of the triandria digynia claſs, and, in the natural method, ranking under the 4th order, *Gramina*. The calyx has a double valve; the corolla has one valve, and three awns at the points. There are three ſpecies of Ariſtida, viz. the adſcenſionis, a native of the iſland of Aſcenſion; the Americana, a native of Jamaica; and the plumoſa, a native of America.

ARISTOCRACY, a form of government where the ſupreme power is veſted in a body of nobles or principal perſons of the ſtate. The word is derived from *αριστος optimus*, and *κρατεω impero*, I govern. Ancient writers on politics prefer the ariſtocratical form of government to all others; but with little reaſon, as it is a form of government, in fact, the leaſt favourable to liberty of any. The republic of Venice is a ſtriking inſtance of this. Ariſtocracy ſeems to coincide with oligarchy; which, however, is more ordinarily uſed to ſignify a corruption of an ariſtocratical ſtate, where the adminiſtration is in the hands of too few, or where ſome one or two uſurp the whole power.

ARISTOLOCHIA, BIRTHWORT; a genus of the hexandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. It has no calyx: the corolla conſiſts of one entire petal; and the capſule, which is below the flower, has ſix cells. The ſpecies are 21; but only the five following merit deſcription. 1. The rotunda, a native of the ſouth of France, of Spain, and Italy, from whence the roots are brought for medicinal uſe. The roots are roundiſh, grow to the ſize of ſmall turnips, being in ſhape and colour like the roots of cyclamens, which are frequently ſold inſtead of them. This ſort has three or four weak trailing branches, which lie on the ground when they are not ſupported, and extend two feet in length; the leaves are heart-ſhaped and rounded at their extremity; the flowers come out ſingly at every leaf, toward the upper part of the ſtalk. They are of a purpliſh black colour; and are fre-

quently ſucceeded by oval ſeed-veſſels having ſix cells full of flat ſeeds. 2. The longa, is a native of the ſame countries. This ſpecies has long tap-roots like carrots; the branches are weak and trailing, extending little more than a foot; the flowers come out from the wings of the leaves like the other, are of a pale purple colour, and are frequently ſucceeded by ſeed-veſſels like the other. 3. The ſerpentaria, is a native of Virginia and Carolina, from whence the *radix ſerpentaria*, or ſnake-root, ſo much uſed in medicine, is brought over. The plant riſes out of the ground in one, two, and ſometimes three pliant ſtalks, which at every little diſtance are crooked or undulated. The leaves ſtand alternately, and are about three inches long, in form ſomewhat like the ſmilax aſpera. The leaves grow cloſe to the ground on footſtalks an inch long, of a ſingular ſhape, and of a dark purple colour. A round canulated capſule ſucceeds the flower. It is filled with ſeeds, which are ripe in May. The uſual price of the root when dried is 6d. per pound, both in Virginia and Carolina, which is money hardly earned; yet the negro-ſlaves employ great part of the time allowed them by their maſters in ſearch of it, which is the reaſon that there are ſeldom found any but very ſmall plants of this ſpecies. When they are planted in gardens in thoſe countries where they are natives, the plants increaſe ſo much in two years time, that the hand can ſcarcely graſp the ſtalks of a ſingle one. This ſpecies delights in woods, and is uſually found near the roots of great trees. 4 The indica, or contrayerva of Jamaica, is a native of that iſland, where its roots are uſed inſtead of the true contrayerva. It has long trailing branches, which climb upon the neighbouring plants, and ſometimes riſe to a conſiderable height. The flowers are produced in ſmall cluſters towards the upper part of the ſtalks, which are of a dark purple colour. 5. The clematitis, with heart-ſhaped leaves, an upright ſtem, with the flowers crowded in the axillæ. The root is long and ſlender. The firſt, ſecond, and third ſorts are propagated from ſeeds, which ſhould be ſown in the autumn. When the ſtalks begin to decay, they muſt be watered. In winter they muſt be ſheltered; and in March, before the roots begin to ſhoot, they muſt be tranſplanted into ſmall ſeparate pots filled with light earth, when they may be removed into the open air. The next ſpring they may be planted in a warm border. The fourth ſpecies is tender; and muſt be kept in a ſtove during the winter. The roots of the long and round ſorts have a nauſeouſly bitter taſte. The root of the clematitis has an aromatic bitterneſs, which is not ungrateful. Their medical virtues are inconſiderable. The long ſort is ſaid to promote the healing of ulcers. The root of the ſerpentaria is ſmall, light, buſhy, and conſiſts of a number of ſtrings or fibres, matted together, iſſuing from one common head; of a browniſh colour on the outſide, and paler or yellowiſh within. It has an aromatic ſmell, like that of valerian, but more agreeable; and a warm, bitteriſh, pungent taſte. This root, as a warm diaphoretic, has been greatly celebrated; and is deſervedly eſteemed as a remedy in the malignant fevers and epidemic diſeaſes of warm climates. It is given in ſubſtance from 10 to 30 grains, and in infuſion to a dram or two. Both watery and ſpirituous menſtrua extract its virtue by infuſion, and elevate ſome ſhare of its flavour in diſtillation.

ARISTOPHANES, a celebrated comic poet of Athens. He was cotemporary with Plato, Socrates, and Euripides; and moſt of his plays were written during the Peloponneſian war. His imagination was warm and lively, and his genius particularly turned to raillery. He had alſo great ſpirit and reſolution; and was a declared enemy to ſlavery, and to all thoſe who wanted to oppreſs their country. The Athenians ſuffered themſelves in his time to be governed by men who had no other views than to make themſelves maſters of the commonwealth. Ariſtophanes expoſed the deſigns of theſe men, with great wit and ſeverity, upon the ſtage. He wrote above 50 comedies; but there are only 11 extant. *The Clouds*, which he wrote in ridicule of Socrates, is the moſt celebrated of all his comedies. Madam Dacier tells us, ſhe was charmed beyond meaſure with this performance, notwithſtanding the indignation which Ariſtophanes deſerved for employing his wit to ruin a man who was wiſdom himſelf, and the greateſt ornament of the city of Athens. He invented a peculiar kind of verſe, which was called by his name, and is mentioned by Cicero in his Brutus; and Suidas ſays, that he alſo was the inventor of the tetrameter and octameter verſe. Ariſtophanes was greatly admired among the ancients, eſpecially for the true Attic elegance of his ſtyle. The time of his death is unknown; but it is certain he was living after the expulſion of the tyrants by Thraſybulus, whom he mentions in his Plutus and other comedies.

ARISTOTELIA, in antiquity, annual feaſts celebrated by the citizens of Stagyris, in honour of Ariſtotle, who was born there; and in gratitude for his having procured from Alexander the rebuilding and repeopling of that city, which had been demoliſhed by king Philip.

ARISTOTELIAN *Philoſophy*, the philoſophy taught by Ariſtotle, and maintained by his followers. The Ariſtotelian is otherwiſe called the *Peripatetic Philoſophy*. See PERIPATETICS.

ARISTOTELIANS, a ſect of philoſophers, otherwiſe called *Peripatetics*, whoſe dogmata prevailed for a long while in the ſchools, even in ſpite of the Carteſians, Newtonians, and other corpuſcularians. But the ſyſtems of the latter have at length gained the pre-eminence; and the Newtonian philoſophy in particular is now very generally received. The principles of Ariſtotle's philoſophy, the learned agree, are chiefly laid down in the four books *de Cœlo*; the eight books of *Phyſical Auſcultation*, φυσικης ακροασεως, belonging rather to logic or metaphyſics than to phyſics. Inſtead of the more ancient ſyſtems, he introduced matter, form, and privation, as the principles of all things; but he does not ſeem to have derived much benefit from them in natural philoſophy. The reader will find a diſtinct account of the logical part of his philoſophy, by Dr. Reid, in Lord Kames's Sketches of the Hiſtory of Man; and Mr. Harris has publiſhed a ſenſible commentary on his Categories, under the title of *Philoſophical Arrangements*.

ARISTOTLE, the chief of the Peripatetic philoſophers, was born at Stagyra, a ſmall city in Macedon, in the 99th Olympiad, about 384 years before the birth of Chriſt. He was the ſon of Nicomachus, phyſician to Amyntas the grandfather of Alexander the Great. After the death of Alexander, his illuſtrious patron and protector, he became an object of jealouſy to the prieſts and ſophiſts; and, in order to avoid the cruelty of perſecution, ſecretly withdrew himſelf to Chalcis in Eubœa, where he ſurvived his retreat from Athens only a few months.

ARITHMETIC,

IS the ſcience of numbers, and teaches the art of computing by them.

At what time this ſcience was firſt introduced into the world, we can by no means determine. That it was early known, ſeems evident from the ages of the patriarchs delivered to us in the ſcriptures; and it is probable, that the four fundamental rules of Arithmetic have always been known to ſome nation or other. The Greeks very early made uſe of the letters of the alphabet to repreſent their numbers. The 24 letters taken according to their order, at firſt denoted the numbers 1, 2, 3, 4, 5, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 100, 200, 300, 400, 500, 600, 700, and 800; to which they added the three following, ϛ, Ϟ, ϡ), to repreſent 6, 90, and 900.

The Romans followed a like method; and beſides characters for each rank of claſſes, introduced others for five, fifty, and five hundred. Their method is ſtill uſed for diſtinguiſhing the chapters of books, and ſome other purpoſes. Their numeral letters and values are the following:

I	V	X	L	C	D	M
One,	five,	ten,	fifty,	one hundred,	five hundred,	one thouſand.

Any number may be repreſented by repeating and combining theſe according to the following rules:

1. When the ſame letter is repeated twice, or oftener, its value is repreſented as often. Thus II ſignifies two; XXX thirty, CC two hundred.

2. When a numeral letter is placed after one of greater value, their values are added: thus XI ſignifies eleven, LXV ſixty-five, MDCXXVIII one thouſand ſix hundred and twenty-eight.

3. When a numeral letter is placed before one of greater value, the value of the leſs is taken from that of the greater: thus IV ſignifies four, XL forty, XC ninety, CD four hundred.

Sometimes Iↀ is uſed inſtead of D for 500, and the value is increaſed ten times by annexing ↀ to the right hand.

Thus Iↀ ſignifies	500.	Alſo C Iↀ is uſed for	1000
I ↀↀ	5000	CC I ↀↀ for	10000
I ↀↀↀ	50000	CCC I ↀↀↀ for	100000

Sometimes thouſands are repreſented by drawing a line over the top of the numeral, $\overline{V}$ being uſed for five thouſand, $\overline{L}$ for fifty thouſand, $\overline{CC}$ two hundred thouſand.

About the year of Chriſt 200, a new kind of arithmetic, called *ſexageſimal*, was invented, as is ſuppoſed, by Ptolomy, to remedy the difficulties of the common method, eſpecially with regard to fractions. Every unit was ſuppoſed to be divided into 60 parts, and each of theſe into 60 others, and ſo on. Thus from one to 59 were marked in the common way: then 60 was called a *ſexageſima prima*, or firſt ſexageſimal integer, and had one ſingle daſh over it; ſo 60 was expreſſed thus I′; and ſo on to 59 times 60, or 3540, which was thus expreſſed LIX′. He now proceeded to 60 times 60, which he called a *ſexageſima ſecunda*, and was thus expreſſed I″. In like manner, twice 60 times 60, or 7200, was expreſſed by II″; and ſo on till he came to 60 times 3600, which was a third ſexageſimal, and expreſſed thus I‴. If any number leſs than 60 was joined with theſe ſexageſimals, it was added in its proper characters without any daſh: thus I′XV repreſented 60 and 15, or 75; I′VXXV is four times 60 and 25, or 265; X″II′XV is ten times 3600, twice 60 and 15, or 36, 135, &c. Sexageſimal fractions were marked by putting the daſh at the foot, or on the left hand of the letter: thus I,, or I′, denoted $\frac{1}{60}$; I,, or ″I, $\frac{1}{3600}$, &c.

The method of notation, which we now uſe, came into Europe from the Arabians, by the way of Spain. The Arabs, however, do not pretend to be the inventors of them, but acknowledge that they received them from the Indians. Some, however, contend that they were found out by the Greeks. But this is by no means probable; as Maximus Planudes, who lived towards the cloſe of the 13th century, is the firſt Greek who makes uſe of them: and Wallis is of opinion that theſe characters muſt have been uſed in England at leaſt as long ago as the year 1050, if not in ordinary affairs, at leaſt in mathematical ones, and in aſtronomical tables.

The oldeſt treatiſes extant upon the theory of arithmetic are the ſeventh, eighth, and ninth books of Euclid's elements, where he treats of proportion and of prime and compoſite numbers. About the ſame time, Nicomachus the Pythagorean, wrote a treatiſe of the theory of arithmetic, conſiſting chiefly of the diſtinctions and diviſions of numbers into claſſes, as plain, ſolid, triangular, quadrangular, and the reſt of the figurate numbers as they are called, numbers odd and even, &c. with ſome of the more general properties of the ſeveral kinds. His arithmetic was publiſhed at Paris in 1538. The next remarkable writer on this ſubject is Boethius, who is ſuppoſed to have copied moſt of his work from Nicomachus.

From this time no remarkable writer on arithmetic appeared till about the year 1200, when Jordanus of Namur wrote a treatiſe on this ſubject, which was publiſhed and demonſtrated by Joannes Faber Stapulenſis in the 15th century: and as learning advanced in Europe, the number of writers on arithmetic increaſed. About the year 1464, Regiomontanus, in his triangular tables, divided the radius into 10,000 parts inſtead of 60,000; and thus tacitly expelled the ſexageſimal arithmetic; which, however, ſtill remains in the diviſion of time. Ramus, in his arithmetic, written about the year 1550, and publiſhed by Lazarus Schonerus in 1586, uſes decimal periods in carrying on the ſquare and cube roots to fractions. The ſame had been done before by our countrymen Buckley and Record; but the firſt who publiſhed an expreſs treatiſe on decimals was Simon Stevinius, about the year 1582. Dr. Wallis is the firſt who took much notice of circulating decimals, and the honour of inventing logarithms is unqueſtionably due to lord Napier, baron of Merchiſton in Scotland about the end of the 16th or beginning of the 17th century. Arithmetic has thus advanced to a degree of perfection which the ancients could never have imagined poſſible, much leſs hoped to attain; and it may now be reckoned one of thoſe few ſciences which is in its nature capable of little further improvement.

Chap. I. NOTATION and NUMERATION.

The firſt elements of arithmetic are acquired during our infancy: for, when a child gathers as many ſtones together as ſuits his fancy, and then throws them away, he acquires the firſt elements of the two capital operations in arithmetic.

Small numbers are moſt eaſily apprehended: a child ſoon knows what two and what three is; but has not any diſtinct notion of ſeventeen. Experience removes this difficulty in ſome degree; and we become accuſtomed to handle larger collections, and to form many units into a claſs, and ſeveral of theſe claſſes into one of a higher kind, and thus to advance

through as many ranks of classes as occasion requires. If a boy arrange an hundred stones in one row, he would be tired before he could reckon them; but if he place them in ten rows of ten stones each, he will reckon an hundred with ease; and if he collect ten such parcels, he will reckon a thousand.

There does not seem to be any number naturally adapted for constituting a class of the lowest, or any higher rank to the exclusion of others. However, as ten has been universally used for this purpose by most nations who have cultivated this science, it is probably the most convenient for general use. Other scales, however, may be assumed: thus, if eight were the scale, 6 times 3 would be two classes and two units, and the number 18 would then be represented by 22. If 12 were the scale, 5 times 9 would be three classes and nine units, and 45 would be represented by 39, &c. By not observing the same scale in the various kinds of monies, weights, and the like, much of the difficulty in the practice of arithmetic arises.

All numbers are represented by the ten following characters.

1 2 3 4 5 6 7 8 9 0

One, two, three, four, five, six, seven, eight, nine, cypher.

The nine first are called *significant figures* or *digits*. When placed singly, they denote the simple numbers subjoined to the characters. When several are placed together, the first or right-hand figure only is to be taken for its simple value: the second signifies so many tens, the third so many hundreds, and the others so many higher classes, according to the order they stand in. And the cypher in any place denotes the want of a number in that place: thus, 20 denotes two tens and no units or simple number.

The following table shows the names and divisions of the classes.

8.	4	3	7,	9	8	2.	5	6	4,	7	3	8.	9	7	2,	6	4	5
Trillions						Billions						Millions						
Hundred thousand of billions	Ten thousand of billions	Thousand billions	Hundred billions	Ten billions		Hundred thousand of millions	Ten thousand of millions	Thousand millions	Hundred millions	Ten millions		Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units	

The first six figures from the right hand are called the *unit period*, the next six the *million period*, after which the *trillion*, *quadrillion*, *quintillion*, *sextillion*, *septillion*, *octillion*, and *nonillion* periods follow in their order.

The whole art of arithmetic is comprehended in two operations, *Addition and Subtraction*. But as methods have been invented for facilitating these operations, and distinguished by the names of *Multiplication* and *Division*; these four rules are the foundation of all arithmetical operations.

Chap. II. ADDITION.

Addition is that operation by which several numbers of the same denomination are collected into one total.

Rule. "Write the numbers distinctly, units under units, tens under tens; and so on. Then reckon the amount of the right-hand column. If it be under ten, mark it down. If it exceed ten, mark the units only, and carry the tens to the next place. In like manner, carry the tens of each column to the next, and mark down the full sum of the left-hand column."

Example.

346863
876734
123467
314213
712316
438987
279654
3092234

Addition is proved by the following method: Draw a line below the uppermost number, and suppose it cut off. Add all the rest together, and set their sum under the number to be proved. Add this last found number and the uppermost line together, and if their sum is the same as that found by the first addition, the question is right.

Compound Addition.

Compound Addition teacheth to collect several numbers of different denominations into one total.

Rule.

1. Place the numbers so that those of the same denomination may stand directly under each other, and draw a line below them.

2. Add up the figures in the lowest denomination, and find how many ones of the next higher denomination are contained in their sum.

3. Write down the remainder, and carry the ones to the next denomination; with which proceed as before; and so on, through all the denominations to the highest, whose sum must be all written down; and this sum, together with the several remainders, is the total sum required.

The method of proof is the same as in simple addition.

Examples of Money.

l.	*s.*	*d.*
17	13	4
13	10	2
10	17	3
8	8	7
3	3	4
-	8	8
54	1	4
36	8	0
54	1	4

l.	*s.*	*d.*
84	17	$5\frac{1}{2}$
75	13	$4\frac{1}{4}$
51	17	$8\frac{3}{4}$
20	10	$10\frac{1}{4}$
17	15	$4\frac{1}{2}$
10	10	11
261	5	$8\frac{1}{4}$
176	8	$2\frac{3}{4}$
261	5	$8\frac{1}{4}$

The reason of this rule is evident: for, in addition of money, as 1 in the pence is equal to 4 in the farthings; 1 in the shillings to 12 in the pence; and 1 in the pounds to twenty in the shillings; carrying as directed, is nothing more than providing a method of digesting the money arising from each column properly in the scale of denominations; and this reasoning will hold good in the addition of numbers of any denomination whatsoever.

Chap. III. SUBTRACTION.

Subtraction is the operation by which we take a less number from a greater, and find their difference. The greater is called the *minuend*, and the less the *subtrahend*.

If any figure of the subtrahend be greater than the corresponding figure of the minuend, we add ten to that of the minuend, and having found and marked the difference, we add one to the next place of the subtrahend. This is called *borrowing ten*. The reason will appear, if we consider that, when two numbers are equally increased by adding the same to both, their difference will not be altered. When we proceed as directed above, we add ten to the minuend, and we likewise add one to the higher place of the subtrahend, which is equal to ten of the lower place.

Rule. "Subtract units from units, tens from tens, and so on. If any figure of the subtrahend be greater than the corresponding one of the minuend, borrow ten."

Example.		
Minuend	173694	738641
Subtrahend	21453	379235
Remainder	152241	359406

To prove subtraction, add the subtrahend and remainder together; if their sum be equal to the minuend, the account is right.

Or subtract the remainder from the minuend. If the difference be equal to the subtrahend, the account is right.

Rule *for compound subtraction.* "Place like denominations under like, and borrow, when necessary, according to the value of the higher place."

Examples.

				C.	*qr.*	*lb.*	*A.*	*R.*	*F*	*E.*
L.	146	3	3	12	3	19	15	2	24	18
	58	7	6	4	3	24	12	2	36	7
L.	87	15	9	7	3	23	2	3	28	11

The reason for borrowing is the same as in simple subtraction. Thus in subtracting pence, we add 12 pence when necessary to the minuend, and at the next step, we add one shilling to the subtrahend.

When there are two places in the same denomination, if the next higher contain exactly so many tens, it is best to subtract the units first, borrowing ten when necessary; and then subtract the tens, borrowing, if there is occasion, according to the number of tens in the higher denomination.

If the value of the higher denomination be not an even number of tens, subtract the units and tens at once, borrowing according to the value of the higher denomination.

Some choose to subtract the place in the subtrahend, when it exceeds that of the minuend, from the value of the higher denomination, and add the minuend to the difference. This is only a different order of proceeding, and gives the same answer.

As custom has established the method of placing the subtrahend under the minuend, we follow it when there is no reason for doing otherwise; but the minuend may be placed under the subtrahend with equal propriety; and the learner should be able to work it either way, with equal readiness, as this last is sometimes more convenient.

The learner should also acquire the habit, when two numbers are marked down, of placing such a number under the less, that, when added together, the sum may be equal to the greater. The operation is the same as subtraction, though conceived in a different manner, and is useful in balancing accounts, and on other occasions.

Chap. IV. MULTIPLICATION.

Multiplication is a compendious mode of addition, and teacheth to find the amount of any given number by repeating t any proposed number of times. Thus, 8 multiplied by 5, or 5 times 8, is 40. The given numbers (8 and 5) are called *factors*; the first (8) the *multiplicand*; the second (5) the *multiplier*; and the amount (40) the *product*.

Ex.] 76859 multiplied by 4, or 76859 added 4 times.

4	76859
	76859
307436	76859
	307436

If the multiplier be 10, we annex a cypher to the multiplicand. If the multiplier be 100, we annex two cyphers; and so on. The reason is obvious, from the use of cyphers in notation.

Rule. "Place the multiplier under the multiplicand, and multiply the latter successively by the significant figures of the former; placing the right-hand figure of each product under the figure of the multiplier from which it arises; then add the product."

Ex.				
	7329	42785	37846	93956
	365	91	235	8704
	36645	42785	189230	375824
	43974	385065	113538	657692
	21987		75692	751648
	2675085	3893435	8893810	817793024

A number which cannot be produced by the multiplication of two others is called a *prime number*; as 3, 5, 7, 11.

A number which may be produced by the multiplication of two or more smaller ones, is called a *composite number*. For example, 27, which arises from the multiplication of 9 by 3; and these numbers (9 and 3) are called the *component parts* of 27.

If the multiplier be a composite number, we may multiply successively by the component parts.

Ex.] 7638 by 45 or 5 times 9			
45	7638	1st,	5492 by 72
	9	2d,	13759 by 56
		3d,	56417 by 144
38190	68742	4th,	73048 by 84
30552	5	5th,	166549 by 125
		6th,	378914 by 54
343710	343710	7th,	520813 by 63

Because the second product is equal to five times the first, and the first is equal to nine times the multiplicand, it is obvious that the second product must be five times nine, or forty-five times as great as the multiplicand.

If the multiplier be 5, which is the half of 10, we may annex a cypher and divide by 2. If it be 25, which is the fourth part of 100, we may annex two cyphers, and divide by 4. Other contractions of the like kind will readily occur to the learner.

To multiply by 9, which is one less than 10, we may annex a cypher; and subtract the multiplicand from the number it composes. To multiply by 99,999, or any number of 9's, annex as many cyphers, and subtract the multiplicand. The reason is obvious; and a like rule may be found, though the unit place be different from 9.

Multiplication is proved by repeating the operation, using the multiplier for the multiplicand, and the multiplicand for the multiplier.

Compound Multiplication.

Compound Multiplication teacheth to find the amount of any given number of different denominations by repeating it any proposed number of times.

Rule. 1. Place the multiplier under the lowest denomination of the multiplicand.

2. Multiply the number of the lowest denomination by the multiplier, and find how many ones of the next higher denomination are contained in the product.

3. Write down the excess, and carry the ones to the product of the next higher denomination, with which proceed as before; and so on, through all the denominations to the

higheſt, whoſe product, together with the ſeveral exceſſes, taken as one number, will be the whole amount required.

The method of proof is the ſame as in ſimple multiplication.

Examples of Money.

9 lb. of tobacco at 2s. 8½d. per lb.

2s. 8½d.
9

1l. 4s. 4½d. the anſwer.

The product of a number conſiſting of ſeveral parts, or denominations, by any ſimple number whatever, will, evidently, be expreſſed by taking the product of that ſimple number and each part by itſelf as ſo many diſtinct queſtions: thus, 25l. 12s. 6d. multiplied by 9 will be 225l. 108s. 54d. = (by taking the ſhillings from the pence, and the pounds from the ſhillings, and placing them in the ſhillings and pounds reſpectively) 230l. 12s. 6d. which is the ſame as the rule; and this will be true when the multiplicand is any compound number whatever.

Caſe I. If the multiplier exceed 12, multiply ſucceſſively by its component parts, inſtead of the whole number at once, as in ſimple multiplication.

Ex.] 16 cwt. of cheeſe at 1l. 18s. 8d. *per* cwt.

1l. 18s. 8d.
4

7 - 14 - 8
4

30l. 18s. 8d. the anſwer.

Caſe II. If the multiplier cannot be produced by the multiplication of ſmall numbers, find the neareſt to it, either greater or leſs, which can be ſo produced; then, multiply by the component parts as before, and for the odd parts, add or ſubtract according as is required.

Ex.] 17 ells of holland at 7s. 8½d. *per* ell.

7s. 8½d.
4

1 - 10 - 10
4

6 - 3 - 4
7 - 8½

6l. 11s. 0½d. the anſwer.

CHAP. V. DIVISION.

DIVISION teacheth to find how often one number is contained in another of the ſame denomination, and thereby performs the work of many ſubtractions.

The number to be divided is called the *dividend*.

The number you divide by is called the *diviſor*.

The number of times the dividend contains the diviſor is called the *quotient*.

If the dividend contains the diviſor any number of times, and ſome part or parts over, thoſe parts are called the *remainder*.

RULE 1. On the right and left of the dividend draw a curved line, and write the diviſor on the left hand, and the quotient as it ariſes on the right.

2. Find how many times the diviſor may be had in as many figures of the dividend as are juſt neceſſary, and write the number in the quotient.

3. Multiply the diviſor by the quotient figure, and ſet the product under that part of the dividend uſed.

4. Subtract the laſt found product from that part of the dividend under which it ſtands, and to the right hand of the remainder bring down the next figure of the dividend; which number divide as before; and ſo on, till the whole is finiſhed.

Method of Proof.

Multiply the quotient by the diviſor, and this product added to the remainder will be equal to the dividend, when the work is right.

According to the rule, we reſolve the dividend into parts, and find by trial the number of times the diviſor is contained in each of thoſe parts; the only thing then which remains to be proved is, that the ſeveral figures of the quotient, taken as one number, according to the order in which they are placed, is the true quotient of the whole dividend by the diviſor; which may be thus demonſtrated.

Demon. The complete value of the firſt part of the dividend, is, by the nature of notation, 10, 100, or 1000, &c. times the value of which it is taken in the operation; according as there are 1, 2, or 3, &c. figures ſtanding before it; and conſequently the true value of the quotient figure belonging to that part of the dividend is alſo 10, 100, or 1000, &c. times its ſimple value. But the true value of the quotient figure belonging to that part of the dividend, found by the rule, is alſo 10, 100, or 1000, &c. times its ſimple value: for there are as many figures ſet before it as the number of remaining figures in the dividend. Therefore this firſt quotient figure taken in its complete value, from the place it ſtands in, is the true quotient of the diviſor in the complete value of the firſt part of the dividend. For the ſame reaſon all the reſt of the figures of the quotient, taken according to their places, are each the true quotient of the diviſor in the complete value of the ſeveral parts of the dividend belonging to each; becauſe, as the firſt figure on the right hand of each ſucceeding part of the dividend has a leſs number of figures by one ſtanding before it, ſo ought their quotients to have; and ſo they are actually ordered: conſequently taking all the quotient figures in order as they are placed by the rule, they make one number, which is equal to the ſum of the true quotients of all the ſeveral parts of the dividend; and is, therefore, the true quotient of the whole dividend by the diviſor.

Ex.] Diviſor 36)85609 dividend.

1ſt part of the dividend	85000		
36 × 2000 =	72000	-	2000 the 1ſt quotient.
1ſt remainder —	13000		
add	- 600		
2d part of the dividend	13600		
36 × 300 =	10800	-	300 the 2d quotient.
2d remainder —	2800		
add	- 00		
3d part of the dividend	2800		
36 × 70 =	2520	-	70 the 3d quotient.
3d remainder —	280		
add	- 9		
4th part of the dividend	289		
36 × 8 =	288	-	8 the 4th quotient.
Laſt remainder —	1	-	2378 ſum of all the quotients, or the anſwer.

Explanation. It is evident that the dividend is reſolved into theſe parts, 85000 + 600 + 00 + 9: for the firſt part of the dividend is conſidered only as 85, but yet it is truly 85000; and therefore its quotient, inſtead of 2, is 2000, and the remainder 13000; and ſo of the reſt, as may be ſeen in the operation.

When there is no remainder to a diviſion, the quotient is the abſolute and perfect anſwer to the queſtion; but where there is a remainder, it may be obſerved, that it goes ſo much towards another time as it approaches to the diviſor: thus, if the remainder be a fourth part of the diviſor, it will go one-fourth of a time more; if half the diviſor, it will go the half of a time more; and ſo on. In order, therefore, to complete the quotient, put the laſt remainder at the end of it, above a ſmall line, and the diviſor below it.

It is ſometimes difficult to find how often the diviſor may be had in the numbers of the ſeveral ſteps of the operation: the beſt way will be to find how often the firſt figure of the diviſor may be had in the firſt, or two firſt, figures of the dividend, and the anſwer made leſs by one or two is generally the figure wanted: beſides, if after ſubtracting the product of the diviſor and quotient from the dividend, the remainder be equal to, or exceed the diviſor, the quotient figure muſt be increaſed accordingly.

If, when you have brought down a figure to the remainder, it is ſtill leſs than the diviſor, a cypher muſt be put in the quotient, and another figure brought down, and then proceed as before.

The reaſon of the method of proof is plain; for ſince the quotient is the number of times the dividend contains the diviſor, the product of the quotient and diviſor muſt, evidently, be equal to the dividend.

When the diviſor does not exceed 12, the whole computation may be performed without ſetting down any figures except the quotient.

Ex.] 7)35868(5124 or 7)35868
5124

When the diviſor is a compoſite number, and one of the component parts alſo meaſures the dividend, we may divide ſucceſſively by the component parts.

Ex. 1ſt.] 30114 by 63 2d.] 975 by 105 = 5 × 7 × 3

9)30114 5)975
7) 3346 3)195
Quotient 478 7) 65
Quotient $9\frac{2}{7}$

This method might be alſo uſed, although the component parts of the diviſor do not meaſure the dividend; but the learner will not underſtand how to manage the remainder till he be acquainted with the doctrine of vulgar fractions.

When there are cyphers annexed to the diviſor, cut them off, and cut off an equal number of figures from the dividend; annex theſe figures to the remainder.

Ex.] To divide 378643 by 5200.

52 | 00)3786 | 43($72\frac{4}{5}\frac{24}{200}\frac{3}{8}$
364

146
104

4243

The reaſon will appear by performing the operation at large, and comparing the ſteps.

Compound Diviſion.

Compound Diviſion teacheth to find how often one given number is contained in another of different denominations.

Rule 1. Place the numbers as in ſimple diviſion.

2. Begin at the left hand, and divide each denomination by the diviſor, ſetting the quotients under their reſpective dividends.

3. But if there be a remainder, after dividing any of the denominations except the leaſt, find how many of the next lower denomination it is equal to, and add it to the number, if any, which was in this denomination before; then divide the ſum as uſual, and ſo on till the whole is finiſhed.

The method of proof is the ſame as in ſimple diviſion.

Examples of Money.

Divide 225l. 2s. 4d. by 2.

2)225l. 2s. 4d.

112l. 11s. 2d. the quotient.

Caſe I. If the diviſor exceed 12, divide continually by its component parts, as in ſimple diviſion.

Ex.] What is cheeſe *per* cwt. if 16 cwt. coſt 30l. 18s. 8d.?

4)30l. 18s. 8d.

4) 7l. 14s. 8d.

1l. 18s. 8d. the anſwer.

Caſe II. If the diviſor cannot be produced by the multiplication of ſmall numbers, divide by it after the manner of long diviſion.

Ex.] Divide 74l. 13s. 6d. by 17.

17) 74l. 13s. 6d. (4l. 7s. 10d. the quotient.
68

6
20

133
119

14
12

174
170

4

Some accountants prove the operations of arithmetic by a method which they call caſting out the 9's, depending on the following principles:

If ſeveral numbers be divided by any diviſor (the remainders being always added to the next number), the ſum of the quotients, and the laſt remainder, will be the ſame as thoſe obtained when the ſum of the numbers is divided by the ſame diviſor. Thus, 19, 15, and 23, contain, together, as many 5's, as many 7's, &c. as their ſum 57 does, and the remainders are the ſame; and, in this way, addition may be proven by diviſion. It is from the correſpondence of the remainders, that the proof, by caſting out the 9's, is deduced.

If any figure, with cyphers annexed, be divided by 9, the quotient conſiſts entirely of that figure; and the remainder is alſo the ſame. Thus, 40 divided by 9, quotes 4, remainder 4;

and 400 divided by 9, quotes 44, remainder 44. The ſame holds with all the digits; and the reaſon will be eaſily underſtood; every digit, with a cypher annexed, contains exactly ſo many tens; it muſt therefore contain an equal number of 9's, beſides a remainder of an equal number of units.

If any number be divided by 9, the remainder is equal to the ſum of the figures of the number, or to the remainder obtained, when that ſum is divided by 9. For inſtance, 3765, divided by 9, leave a remainder of 3, and the ſum of 3, 7, 6, and 5, is 21; which divided by 9, leaves a remainder of 3. The reaſon of this will appear from the following illuſtration:

3000	divided by 9 quotes	333;	remainder 3
700	quotes	77;	remainder 7
60	quotes	6;	remainder 6
5	quotes	0;	remainder 5
3765		416	Sum of Rem. 21
Again 21	divided by 9 quotes	2;	remainder 3

therefore, 3765 divid. by 9 quotes 418; remainder 3; for the reaſon given. Hence we may collect the following rules for practice.

To caſt the 9's out of any number, or to find what remainder will be left when any number is divided by 9: Add the figures; and, when the ſum exceeds 9, add the figures which would expreſs it. Paſs by the 9's; and, when the ſum comes exactly to 9, neglect it, and begin anew. For example, if it be required to caſt the 9's out of 3573294, we reckon thus: 3 and 5 is 8, and 7 is 15: 1 and 5 is 6, and 3 is 9, which we neglect; 2 and (paſſing by 9) 4 is 6; which is the remainder or RESULT. If the article out of which the 9's are to be caſt contains more denominations than one, we caſt the 9's out of the higher, and multiply the reſult by the value of the lower, and carry on the product (caſting out the 9's, if neceſſary) to the lower.

To prove addition, caſt the 9's out of the ſeveral articles, carrying the reſults to the following articles; caſt them alſo out of the ſum. If the operation be right, the reſults will agree.

To prove ſubtraction, caſt the 9's out of the minuend; caſt them alſo out of the ſubtrahend and remainder together; and if you obtain the ſame reſult, the operation is preſumed right.

To prove multiplication, caſt the 9's out of the multiplicand, and alſo out of the multiplier, if above 9. Multiply the reſults together, and caſt the 9's, if neceſſary, out of their product. Then caſt the 9's out of the product, and obſerve if this reſult correſpond with the former.

Ex.] 9276 ref. 6 × 8 = 48 ref. 3.
8

74208 ref. 3.

The reaſon of this will be evident, if we conſider multiplication under the view of repeated addition.

To prove diviſion, caſt the 9's out of the diviſor, and alſo out of the quotient; multiply the reſults, and caſt the 9's out of the product. If there be any remainder, add to it the reſult, caſting out the 9's, if neceſſary. If the account be right, the laſt reſult will agree with that obtained from the dividend.

Ex.] 42)2490(59 ref. 5 × 6 = 30 ref. 3.
ref. 6 210

390
378

Rem. 12 - - - ref. 3.

And the reſult of the dividend is 6.

This depends on the ſame reaſon as the laſt; for the dividend is equal to the product of the diviſor and quotient added to the remainder.

We cannot recommend this method, as it lies under the following diſadvantages:

Firſt, If an error of 9, or any of its multiples, be committed, the reſults will nevertheleſs agree; and ſo the error will remain undiſcovered. And this will always be the caſe, when a figure is placed or reckoned in a wrong column; which is one of the moſt frequent cauſes of error.

Secondly, When it appears by the diſagreement of the reſults, that an error has been committed, the particular figure or figures in which the error lies are not pointed out; and, conſequently, it is not eaſily corrected.

CHAP. VI. THE RULE OF THREE DIRECT.

The Rule of Three direct teacheth, by having three numbers given to find a fourth, that ſhall have the ſame proportion to the third as the ſecond has to the firſt.

RULE 1. State the queſtion: that is, place the numbers ſo, that the firſt and third may be the terms of ſuppoſition and demand, and the ſecond of the ſame kind with the anſwer required.

2. Bring the firſt and third numbers into the ſame denomination, and the ſecond into the loweſt name mentioned.

3. Multiply the ſecond and third numbers together, and divide the product by the firſt, and the quotient will be the anſwer to the queſtion, in the ſame denomination you left the ſecond number in; which may be brought into any other denomination required.

Two or more ſtatings are ſometimes neceſſary, which may always be known from the nature of the queſtion.

The method of proof is by inverting the queſtion.

Ex.] If 24lb. of raiſins coſt 6s. 6d. what will 18 frails coſt, each weighing neat 3 qrs. 18lb?

If 24lb. : 6s. 6d. : : 18 frails each 3 qrs. 18 lb.

12 28

78 102
18

816
102

1836
78

14688
12852

24)143208 (5967
120

232
216

160
144

168
168

000

12)5967

2,0)49,7-3

24 · 17 - 3

Note. This rule, on account of its great and extenſive uſefulneſs, is oftentimes called *The Golden Rule of Proportion*: for,

on a proper application of it, and the preceding rules, the whole buſineſs of arithmetic, as well as every mathematical enquiry, depends. The rule itſelf is founded on this obvious principle, that the magnitude or quantity of any effect varies conſtantly in proportion to the varying part of the cauſe: thus, the quantity of goods bought is in proportion to the money laid out; the ſpace gone over by an uniform motion is in proportion to the time, &c.—As the idea annexed to the term proportion is eaſily conceived, it would be more perplexing than inſtructive to explain, in this place, what is meant by it, in a ſtrict geometrical ſenſe. It may be ſufficient, therefore, to obſerve, that independent of the preciſe meaning of that word, and its deducible properties, the truth of the rule, as applied to ordinary enquiries, may be made very evident, by attending only to principles already explained.—It is ſhewn in multiplication of money, that the price of one multiplied by the quantity is the price of the whole: and in diviſion, that the price of the whole divided by the quantity is the price of one. Now, in all caſes of valuing goods, &c. where one is the firſt term of the proportion, it is plain that the anſwer found by this rule will be the ſame as that found by multiplication of money; and where one is the laſt term of the proportion, it will be the ſame as that found by diviſion of money. In like manner, if the firſt term be any number whatever, it is plain that the product of the ſecond and third terms will be greater than the true anſwer required, by as much as the price in the ſecond term exceeds the price of one, or as the firſt term exceeds an unit. Conſequently this product divided by the firſt term will give the true anſwer required, and is the rule.

THE RULE OF THREE INVERSE.

The *Rule of Three Inverſe* teacheth by having three numbers given to find a fourth, that ſhall have the ſame proportion to the ſecond as the firſt has to the third.

If *more* require *more*, or *leſs* require *leſs*, the queſtion belongs to the rule of three direct.

But if *more* require *leſs*, or *leſs* require *more*, it belongs to the rule of three inverſe.

Rule 1. State and reduce the terms as in the rule of three direct.

2. Multiply the firſt and ſecond terms together, and divide their product by the third, and the quotient is the anſwer to the queſtion, in the ſame denomination you left the ſecond number in.

The method of proof is by inverting the queſtion.

Ex.] What quantity of ſhalloon that is 3 quarters of a yard wide, will line $7\frac{1}{2}$ yards of cloth, that is $1\frac{1}{2}$ yard wide?

1 yd. 2 qrs. : 7 yds. 2 qrs. :: 3 qrs.

4 4

6 30

6

3)180

4)60

15 yards, the anſwer.

More requiring *more*, is when the third term is greater than the firſt, and requires the fourth term to be greater than the ſecond.

And *leſs* requiring *leſs*, is when the third term is leſs than the firſt, and requires the fourth term to be leſs than the ſecond.

In like manner, *more* requiring *leſs*, is when the third term is greater than the firſt, and requires the fourth term to be leſs than the ſecond.

And *leſs* requiring *more*, is when the third term is leſs than the firſt, and requires the fourth term to be greater than the ſecond.

The reaſon of this rule may be explained from the principles of compound multiplication and diviſion, in the ſame manner as the direct rule. *For example*, If 6 men can do a piece of work in 10 days, in how many days will 12 men do it?

$$\text{As } 6 \textit{ men} : 10 \textit{ days} :: 12 \textit{ men} : \frac{6 \times 10}{12} = 5 \textit{ days},$$

the anſwer. And here the product of the firſt and ſecond terms, i. e. 6 times 10, or 60, is evidently the time in which one man would perform the work; therefore 12 men will do it in one twelfth part of that time, or 5 days; and this reaſoning is applicable to any other inſtance whatever.

Chap. VII. COMPOUND PROPORTION.

Compound Proportion teacheth to reſolve ſuch queſtions as require two or more ſtatings by ſimple proportion; and that whether they are direct or inverſe.

Rule 1. Let that term be put in the ſecond place which is of the ſame denomination with the term ſought.

2. Place the terms of ſuppoſition, one above another, in the firſt place; and the terms of demand, one above another, in the third place.

3. The firſt and third term of every row will be of one name, and muſt be reduced to the ſame denomination.

4. Examine every row ſeparately: by ſaying, if the firſt term give the ſecond, does the third require more or leſs? If it require *more*, mark the *leſs* extreme with a croſs; but if *leſs*, mark the *greater* extreme.

5. Multiply all thoſe numbers together which are marked for a diviſor, and thoſe which are not marked for a dividend, and the quotient will be the anſwer ſought.

Note. When the ſame numbers are found in the diviſor as in the dividend, they may be thrown out of both. Or any numbers may be divided by their greateſt common diviſor, and the quotients taken inſtead of them.

Ex.] If 16 horſes can eat up 9 buſhels of oats in 6 days, how many horſes would eat up 24 buſhels in 7 days at the ſame rate?

$$\begin{array}{rcl} +\ 9 \textit{ buſhels} & : & 16 \textit{ horſes} \\ 6 \textit{ days} & : & \end{array} :: \begin{array}{l} 24 \textit{ buſhels.} \\ 7 \textit{ days} + \end{array}$$

$\frac{6 \times 16 \times 24}{9 \times 7}$, by contraction $= \frac{2 \times 16 \times 24}{3 \times 7} = \frac{2 \times 16 \times 8}{1 \times 7}$

$= \frac{256}{7} = 36\frac{4}{7}$ horſes, the anſwer.

The reaſon of this rule may be readily ſhown from the nature of direct and inverſe proportion: for every row in this caſe is a particular ſtating in one of thoſe rules; and therefore if all the ſeparate dividends be collected together into one dividend, and all the diviſors into one diviſor, their quotient muſt be the anſwer ſought. Thus, in example the firſt:

As 9 buſh. : 16 horſes :: 24 buſh. : $\frac{24 \times 16}{9}$ by rule of three direct. As 6 days : $\frac{24 \times 16}{9}$ horſes :: 7 days $\frac{24 \times 16 \times 6}{9 \times 7}$ by rule of three inverſe, which is the ſame as the rule.

Chap. VIII. PRACTICE.

Practice is a contraction of the rule of three direct, when the firſt term happens to be an unit, or one; and has its name from its daily uſe amongſt merchants and tradeſmen, being an eaſy and conciſe method of working moſt queſtions that occur in trade and buſineſs.

The method of proof is by the rule of three direct.

An aliquot part of any number, is ſuch a part of it, as being taken a certain number of times doth exactly make that number.

General Rule.

1. Suppoſe the price of the given quantity to be 1l. or 1s. as is moſt convenient; then will the quantity itſelf be the anſwer at the ſuppoſed price.

2. Divide the given price into aliquot parts, either of the ſuppoſed price, or of one another, and the ſum of the quotients belonging to each will be the true anſwer required.

Ex.] What is the value of 526 yards of cloth, at 3s. $10\frac{1}{4}$d. per yard.

	526			Anſ. at 1l.				
3s. 4d. is $\frac{1}{6}$	87	13	4	ditto	at	0	3	4
4d. is $\frac{1}{10}$	8	15	4	ditto	at	0	0	4
2d. is $\frac{1}{2}$	4	7	8	ditto	at	0	0	2
$\frac{1}{4}$ is $\frac{1}{8}$	0	10	$11\frac{1}{2}$	ditto	at	0	0	$0\frac{1}{4}$
the full price.	101	7	$3\frac{1}{2}$	ditto	at	0	3	$10\frac{1}{4}$

In the above example, it is plain that the quantity 526 is the anſwer at 1l. conſequently, as 3s. 4d. is the $\frac{1}{6}$ of a pound, $\frac{1}{6}$ part of that quantity, or 87l. 13s. 4d. is the price at 3s. 4d. In like manner, as 4d. is the $\frac{1}{10}$ part of 3s. 4d. ſo $\frac{1}{10}$ of 87l. 13s. 4d. or 8l. 15s. 4d. is the anſwer at 4d. And by reaſoning in this way 4l. 7s. 8d. will be ſhewn to be the price at 2d. and 10s. $11\frac{1}{2}$d. the price at $\frac{1}{4}$. Now as the ſum of all theſe parts is equal to the whole price (3s. $10\frac{1}{4}$d.), ſo the ſum of the anſwers belonging to each price will be the anſwer at the full price required. And the ſame will be true in any example whatever.

Chap. IX. VULGAR FRACTIONS.

IN order to underſtand the nature of vulgar fractions, we muſt ſuppoſe unity (or the number 1) divided into ſeveral equal parts. One or more of theſe parts is called a *fraction*, and is repreſented by placing one number in a ſmall character above a line, and another under it: For example, two-fifth parts is written thus, $\frac{2}{5}$. The number under the line (5) ſhows how many parts unity is divided into, and is called the *denominator*. The number above the line (2) ſhows how many of theſe parts are repreſented, and is called the *numerator*.

It follows from the manner of repreſenting fractions, that when the numerator is increaſed, the value of the fraction becomes greater; but, when the denominator is increaſed, the value becomes leſs. Hence we may infer, that, if the numerator and denominator be both increaſed, or both diminiſhed, in the ſame proportion, the value is not altered; and therefore, if we multiply both by any number whatever, or divide them by any number which meaſures both, we ſhall obtain other fractions of equal value. Thus, every fraction may be expreſſed in a variety of forms, which have all the ſame ſignification.

A fraction annexed to an integer, or whole number, makes a mixed number. For example, five and two third-parts, or $5\frac{2}{3}$. A fraction whoſe numerator is greater than its denominator is called an *improper fraction*. For example, ſeventeen third-parts, or $\frac{17}{3}$. Fractions of this kind are greater than unity. Mixed numbers may be repreſented in the form of improper fractions, and improper fractions may be reduced to mixed numbers, and ſometimes to integers. A whole number may be treated as a fraction by making its denominator unity.

"To reduce mixed numbers to improper fractions: Multiply the integer by the denominator of the fraction, and to the product add the numerator. The ſum is the numerator of the improper fraction ſought, and is placed above the given denominator." *Ex.* $5\frac{2}{3} = \frac{17}{3}$

5 integer.
3 denominator.
—
15 product.
2 numerator given.
—
17 numerator ſought.

Becauſe one is equal to two halves, or 3 third-parts, or four quarters, and every integer is equal to twice as many halves, or four times as many quarters, and ſo on; therefore, every integer may be expreſſed in the form of an improper fraction, having any aſſigned denominator. The numerator is obtained by multiplying the integer into the denominator. Hence the reaſon of the foregoing rule is evident. 5, reduced to an improper fraction, whoſe denominator is 3, makes $\frac{15}{3}$, and this added to $\frac{2}{3}$, amount to $\frac{17}{3}$.

"To reduce improper fractions to whole or mixed numbers: Divide the numerator by the denominator."

Ex. $\frac{112}{17} = 6\frac{10}{17}$

17)112(6
102
—
10

1. $\frac{248}{10}$ 2. $\frac{34}{12}$ 3. $\frac{7536}{27}$ 4. $\frac{15764}{328}$ 5. $\frac{365}{13}$ 6. $\frac{7304}{36}$ 7. $\frac{86442}{93}$ 8. $\frac{43652}{218}$

This problem is the converſe of the former, and the reaſon may be illuſtrated in the ſame manner.

"To reduce fractions to lower terms: Divide both numerator and denominator by any number which meaſures both, and place the quotients in the form of a fraction."

Example. $\frac{135}{360} = \frac{27}{72} = \frac{3}{8}$

Here we obſerve that 135 and 360 are both meaſured by 5; and the quotients form $\frac{27}{72}$, which is a fraction of the ſame value as $\frac{135}{360}$ in lower terms. Again, 27 and 72 are both meaſured by 9, and the quotients form $\frac{3}{8}$, which is ſtill of equal value, and in lower terms.

To find the greateſt common meaſure of two numbers: Divide the greater by the leſs, and the diviſor by the remainder continually, till nothing remain; the laſt diviſor is the greateſt common meaſure.

Ex. Required the greateſt number which meaſures 475 and 589?

475)589(1
475
—
114)475(4
456
—
19)114(6
114
—
0

Here we divide 589 by 475, and the remainder is 114; then we divide 475 by 114, and the remainder is 19; then we divide 114 by 19, and there is no remainder: from which we infer, that 19 the laſt diviſor, is the greateſt common meaſure.

To explain the reaſon of this, we muſt obſerve, that any number which meaſures two others, will alſo meaſure their ſum, and their difference, and will meaſure any multiple of either. In the foregoing example, any number which meaſures 589 and 475, will meaſure their difference 114, and will meaſure 456, which is a multiple of 114; and any number which meaſures 475, and 456, will alſo meaſure their difference 19. Conſequently, no number greater than 19 can meaſure 589 and 475. Again, 19 will meaſure them both, for it meaſures 114, and therefore meaſures 456, which is a multiple of 114, and 475, which is juſt 19 more than 456; and, becauſe it meaſures 475 and 114, it will meaſure their ſum 589. To reduce $\frac{47}{589}$ to the loweſt poſſible terms, we divide both numbers by 19, and it comes to $\frac{2}{31}$.

If there be no common meaſure greater than 1, the fraction is already in the loweſt terms.

If the greateſt common meaſure of 3 numbers be required, we find the greateſt meaſure of the two firſt, and then the greateſt meaſure of that number, and the third. If there be more numbers, we proceed in the ſame manner.

"To reduce fractions to others of equal value that have the ſame denominator: 1ſt, Multiply the numerator of each fraction by all the denominators except its own. The products are numerators to the reſpective fractions ſought." 2d, "Multiply all the denominators into each other; the product is the common denominator."

Ex. $\frac{4}{5}$ and $\frac{7}{9}$ and $\frac{3}{8} = \frac{288}{360}$ and $\frac{280}{360}$ and $\frac{135}{360}$.

$4 \times 9 \times 8 = 288$ firſt numerator.
$7 \times 5 \times 8 = 280$ ſecond numerator.
$3 \times 5 \times 9 = 135$ third numerator.
$5 \times 9 \times 8 = 360$ common denominator.

Here we multiply 4, the numerator of the firſt fraction, by 9 and 8, the denominators of the two others; and the product 288 is the numerator of the fraction ſought, equivalent to the firſt. The other numerators are found in like manner, and the common denominator 360, is obtained by multiplying the given denominators 5, 9, 8, into each other. In the courſe of the whole operation, the numerators and denominators of each fraction are multiplied by the ſame number, and therefore their value is not altered.

Addition of Vulgar Fractions.

Rule. "Reduce them, if neceſſary, to a common denominator; add the numerators, and place the ſum above the denominator."

Ex. 1ſt.] $\frac{3}{5} + \frac{2}{9} = \frac{27}{45} + \frac{10}{45} = \frac{37}{45}$

2d.] $\frac{5}{7} + \frac{8}{9} + \frac{5}{10} = \frac{450}{630} + \frac{560}{630} + \frac{567}{630} = \frac{1577}{630}$

The numerators of fractions that have the ſame denominator ſignify like parts; and the reaſon for adding them is equally obvious, as that for adding ſhillings or any other inferior denomination.

Subtraction of Vulgar Fractions.

Rule. "Reduce the fractions to a common denominator; ſubtract the numerator of the ſubtrahend from the numerator of the minuend, and place the remainder above the denominator."

Ex. Subtract $\frac{3}{7}$ from $\frac{5}{12}$ remainder $\frac{11}{84}$.

$\frac{5}{12} = \frac{35}{84}$
$\frac{3}{7} = \frac{24}{84}$

from 35
take 24
rem. 11

To ſubtract a fraction from an integer: ſubtract the numerator from the denominator, and place the remainder above the denominator; prefix to this the integer diminiſhed by unity.

Ex. Subtract $\frac{3}{5}$ from 12 remainder $11\frac{2}{5}$

Multiplication of Vulgar Fractions.

Rule. "Multiply the numerators of the factors together for the numerator of the product, and the denominators together for the denominator of the product."

Ex. 1ſt.] $\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$
$2 \times 5 = 10$ num.
$3 \times 7 = 21$ den.

2d.] $8\frac{2}{5} \times 7\frac{3}{4} = \frac{1302}{20} = 65\frac{2}{20}$
$8\frac{2}{5} = \frac{42}{5}$
$7\frac{3}{4} = \frac{31}{4}$
$42 \times 31 = 1302$
$5 \times 4 = 20$

To multiply $\frac{5}{7}$ by $\frac{2}{3}$ is the ſame as to find what two-third parts of $\frac{5}{7}$ comes to; if one-third part only had been required, it would have been obtained by multiplying the denominator 7 by 3, becauſe the value of fractions is leſſened when their denominators are increaſed; and this comes to $\frac{5}{21}$; and, becauſe two-thirds were required, we muſt double that fraction, which is done by multiplying the numerator by 2, and comes to $\frac{10}{21}$. Hence we infer that fractions of fractions, or compound fractions, ſuch as $\frac{2}{7}$ of $\frac{3}{5}$, are reduced to ſimple ones by multiplication. The ſame method is followed when the compound fraction is expreſſed in three parts or more.

If a number be multiplied by any integer, its value is increaſed: If it be multiplied by 1, or taken one time, it undergoes no alteration. If it be multiplied by a proper fraction, or taken for one half, two-thirds, or the like, its value is diminiſhed, and the product is leſs than the number multiplied.

Division of Vulgar Fractions.

Rule I. "Multiply the numerator of the dividend by the denominator of the diviſor. The product is the numerator of the quotient."

II. "Multiply the denominator of the dividend by the numerator of the diviſor. The product is the denominator of the quotient."

Ex. Divide $\frac{2}{5}$ by $\frac{7}{9}$ Quotient $\frac{18}{35}$

$2 \times 9 = 18$
$5 \times 7 = 35$

To explain the reaſon of this operation, let us ſuppoſe it required to divide $\frac{2}{5}$ by 7, or to take one-ſeventh part of that fraction. This is obtained by multiplying the denominator by 7; for the value of fractions is diminiſhed by increaſing their denominators, and comes to $\frac{2}{35}$. Again, becauſe $\frac{7}{9}$ is nine times leſs than ſeven, the quotient of any number divided by $\frac{7}{9}$ will be nine times greater than the quotient of the ſame number divided by 7. Therefore we multiply $\frac{2}{35}$ by 9, and obtain $\frac{18}{35}$.

If the diviſor and dividend have the ſame denominator, it is ſufficient to divide the numerators.

Ex. $\frac{12}{17}$ divided by $\frac{3}{17}$ quotes 4.

The quotient of any number divided by a proper fraction is greater than the dividend. It is obvious, that any integer contains more halves, more third parts, and the like, than it contains units; and, if an integer and fraction be divided alike, the quotients will have the ſame proportion to the numbers divided; but the value of an integer is increaſed when the diviſor is a proper fraction; therefore the value of a fraction in the like caſe is increaſed alſo.

The foregoing rule may be extended to every caſe, by reducing integers and mixed numbers to the form of improper fractions.

Chap. X. DECIMAL FRACTIONS.

A decimal fraction is a fraction whose denominator is ten or some power of ten, but instead of writing down the denominator, a comma is placed before the number to mark the fraction, and whatever number of figures follows the comma, the same is the index of the power of ten in the denominator, or there must be as many cyphers after unit in the denominator, as figures after the comma.

Thus 4,7 is 4 and $\frac{7}{10}$

.47	signifies	Forty-seven hundredth parts.
.047		Forty-seven thousandth-parts.
.407		Four hundred and seven thousandth parts.
4.07		Four, and seven hundredth-parts.
4.007		Four, and seven thousandth-parts.

To reduce vulgar fractions to decimal ones: "Annex a cypher to the numerator, and divide it by the denominator, annexing a cypher continually to the remainder."

Ex. 1st.] $\frac{12}{75} = .16$

75)120(16
75
450
450
0

2d.] $\frac{5}{64} = .078125$

64)500(078125
448
520
512
80
64
160
128
320
320

3d.] $\frac{2}{3} = .666.$

3)20(666
18
20
18
20

The reason of this operation will be evident, if we consider that the numerator of a vulgar fraction is understood to be divided by the denominator; and this division is actually performed when it is reduced to a decimal.

Some vulgar fractions may be reduced exactly to decimals, and are called *terminate* or *finite decimals*. Others cannot be exactly reduced, because the division always leaves a remainder; but, by continuing the division, we shall perceive how the decimal may be extended to any length whatever. These are called *infinite decimals*. If the same figure continually returns, they are called *repeaters*. If two or more figures return in their order, they are called *circulates*. If this regular succession go on from the beginning, they are called *pure repeaters*, or *circulates*. If otherwise, they are mixed repeaters or circulates, and the figures prefixed to those in regular succession are called the *finite part*. Repeating figures are generally distinguished by a dash, and circulates by a comma, or other mark at the beginning and end of the circle; and the beginning of a repeater or circulate is pointed out in the division by an asterisk.

Lower denominations may be considered as fractions of higher ones, and reduced to decimals accordingly.

The value of decimal places decreases like that of integers, ten of the lower place in either being equal to one of the next higher; and the same holds in passing from decimals to integers. Therefore, all the operations are performed in the same way with decimals, whether placed by themselves or annexed to integers, as with pure integers. The only peculiarity lies in the arrangement and pointing of the decimals.

In addition and subtraction. "Arrange units under units, tenth-parts under tenth-parts, and proceed as in integers."

32.035	from 13.348	from 12.248
116.374	take 9.2993	take 10.6752
160.63		
12.3645	4.0487	1.5728
321.4035		

In multiplication. "Allow as many decimal places in the product as there are in both factors. If the product has not so many places, supply them by prefixing cyphers on the left hand."

Ex. 1st.] 1.37
1.8
1096
137
2.466

2d.] .1572
.12
.18864

The reason of this rule may be explained, by observing, that the value of the product depends on the value of the factors; and since each decimal place in either factor diminishes its value ten times, it must equally diminish the value of the product.

To multiply decimals by 10, move the decimal point one place to the right; to multiply by 100, 1000, or the like, move it as many places to the right as there are cyphers in the multiplier.

In division. "Point the quotient so that there may be an equal number of decimal places in the dividend as in the divisor and quotient together."

Therefore, if there be the same decimal places in the divisor and dividend, there will be none in the quotient.

If there be more in the dividend, the quotient will have as many as the dividend has more than the divisor.

If there be more in the divisor, we must annex (or suppose annexed) as many cyphers to the dividend as may complete the number in the divisor, and all the figures of the quotient are integers.

If the divisor leave a remainder, the quotient may be extended to more decimal places; but those are not regarded in fixing the decimal point.

The reason for fixing the decimal point, as directed, may be inferred from the rule followed in multiplication. The quotient multiplied by the divisor produces the dividend; and therefore the number of decimal places in the dividend is equal to those in the divisor and quotient together.

The first figure of the quotient is always at the same distance from the decimal point, and on the same side as the figure of the dividend, which stands above the unit place of the first product. This also takes place in integers; and the reason is the same in both.

Some decimals, though extended to any length, are never complete; and others, which terminate at last, sometimes consist of so many places, that it would be difficult in practice to extend them fully. In these cases, we may extend the decimal to three, four, or more places, according to the nature of the articles, and the degree of accuracy required, and reject the rest of it as inconsiderable. In this manner we may perform any operation with ease by the common rules, and the answers we obtain are sufficiently exact for any purpose in business. Decimals thus restricted are called *approximates*.

Chap. XI. CIRCULATING DECIMALS.

Circulating Decimals are produced from vulgar fractions whofe denominators do not meafure their numerators, and are diſtinguiſhed by the continual repetition of the fame figures.

1. The circulating figures are called *repetends*; and if one figure only repeats, it is called a *ſingle repetend*; as .1111, &c. .3333, &c.

2. A *compound repetend* hath the fame figures circulating alternately; as .010101 &c.; .123123123 &c.

3. If other figures arife before thofe that circulate, the decimal is called a *mixed repetend*; thus, .283333 &c. is a *mixed ſingle repetend*, and .573.21321 &c. a *mixed compound repetend*.

4. A ſingle repetend is expreſſed by writing only the circulating figure with a point over it: thus .1111 &c. is denoted by $.\dot{1}$, and .333 &c. by $.\dot{3}$.

5. Compound repetends are diſtinguiſhed by putting a point over the firſt and laſt repeating figure; thus, .0101 &c. is written $.\dot{0}\dot{1}$, and .123123 &c. $.\dot{1}2\dot{3}$.

6. *Similar circulating decimals* are ſuch as conſiſt of the fame number of figures, and begin at the ſame place, either before or after the decimal point; thus, $.\dot{2}$ and $.\dot{3}$ are ſimilar circular circulates; as are alſo $2.\dot{3}4\dot{}$ and $3.7\dot{6}$ &c.

7. *Diſſimilar repetends* conſiſt of an unequal number of figures, and begin at different places.

8. *Similar and conterminous circulates* are ſuch as begin and end at the ſame place; as $56.7\dot{8}9\dot{8}4$, $8.52\dot{6}8\dot{3}$ and $.0\dot{5}67\dot{8}$, &c.

Reduction of Circulating Decimals.

Case I.

To reduce a ſimple repetend to its equivalent vulgar fraction.

Rule 1. Make the given decimal the numerator, and let the denominator be a number conſiſting of as many nines as there are recurring places in the repetend.

2. If there are integral figures in the circulate, as many cyphers muſt be annexed to the numerator as the higheſt place of the repetend is diſtant from the decimal point.

If unity, with cyphers annexed, be divided by 9 *ad infinitum*, the quotient will be 1 continually; *i. e.* if $\frac{1}{9}$ be reduced to a decimal, it will produce the circulate $.\dot{1}$; and ſince $.\dot{1}$ is the decimal equivalent to $\frac{1}{9}$, $.\dot{2}$ will $= \frac{2}{9}$, $\dot{3} = \frac{3}{9}$, and ſo on till $\dot{9} = \frac{9}{9} = 1$.

Therefore every ſingle repetend is equal to a vulgar fraction, whoſe numerator is the repeating figure, and denominator 9.

Again, $\frac{1}{99}$, or $\frac{1}{999}$, being reduced to decimals, make .010101 &c. and .001001 &c. *ad infinitum*, $= .\dot{0}\dot{1}$ and $.\dot{0}0\dot{1}$; that is $\frac{1}{99} = .\dot{0}\dot{1}$ and $\frac{1}{999} = .\dot{0}0\dot{1}$; conſequently $\frac{2}{99} = .\dot{0}2\dot{}$, $\frac{3}{99} = .\dot{0}3\dot{}$ &c.; and $\frac{2}{999} = .\dot{0}0\dot{2}$, $\frac{3}{999} = .\dot{0}0\dot{3}$ &c. and the ſame will hold univerſally.

Example.

Required the leaſt vulgar fractions equal to $.\dot{6}$ and $.\dot{1}2\dot{3}$.

Anſ. $.\dot{6} = \frac{6}{9} = \frac{2}{3}$; *and* $.\dot{1}2\dot{3} = \frac{123}{999} = \frac{41}{333}$.

Case II.

To reduce a mixed repetend to its equivalent vulgar fraction.

Rule 1. To as many nines as there are figures in the repetend, annex as many cyphers as there are finite places, for a denominator.

2. Multiply the nines in the ſaid denominator by the finite part, and add the repeating decimal to the product for the numerator.

3. If the repetend begins in ſome integral place, the finite value of the circulating part muſt be added to the finite part.

In like manner for a mixed circulate; conſider it as diviſible into its finite and circulating parts, and the ſame principle will be ſeen to run through them alſo; thus the mixed circulate $.1\dot{6}$ is diviſible into the finite decimal .1 and the repetend $.0\dot{6}$ but $.1 = \frac{1}{10}$ and $.0\dot{6}$ would be $= \frac{6}{9}$ provided the circulation began immediately after the place of units; but as it begins after the place of tens, it is $\frac{6}{9}$ of $\frac{1}{10} = \frac{6}{90}$, and ſo the vulgar fraction $= .1\dot{6}$ is $\frac{1}{10} + \frac{6}{90} = \frac{9}{90} + \frac{6}{90} = \frac{15}{90}$, and is the ſame as by the rule.

Example.

What is the vulgar fraction equivalent to $.13\dot{8}$.

$9 \times 13 + 8 = 125$ = *numerator, and* 900 *the denominator*

$\therefore .13\dot{8} = \frac{125}{900} = \frac{5}{36}$ *the anſwer.*

Case III.

To make any number of diſſimilar repetends ſimilar and conterminous.

Rule. Change them into other repetends, which ſhall each conſiſt of as many figures as the leaſt common multiple of the ſeveral numbers of places, found in all the repetends, contains units.

Examples.

Diſſimilar		*Made ſimilar and conterminous.*
$9.\dot{8}1\dot{4}$	=	$9.\dot{8}1481481\dot{}$
$87.2\dot{6}$	=	$87.2666666\dot{}$
$124.\dot{0}\dot{9}$	=	$124.0\dot{9}0\dot{9}0\dot{9}$

Any given repetend whatever, whether ſingle, compound, pure or mixed, may be tranſformed into another repetend, that ſhall conſiſt of an equal, or greater number of figures at pleaſure; thus $.\dot{4}$ may be tranſformed to $.4\dot{4}$, or $.44\dot{4}$, or $.4\dot{4}$, &c. Alſo $.\dot{5}\dot{7} = .5\dot{7}5\dot{7} = .57\dot{5}7\dot{} = .\dot{5}7\dot{5}$; and ſo on; which is too evident to need any farther demonſtration.

Case IV.

To find whether the decimal fraction, equal to a given vulgar one, be finite or infinite, and how many places the repetend will conſiſt of.

Rule 1. Reduce the given fraction to its leaſt terms, and divide the denominator by 2, 5 or 10 as often as poſſible.

2. Divide 9999 &c. by the former reſult till nothing remains, and the number of 9's uſed will ſhew the number of places in the repetend; which will begin after as many places of figures as there were 10's, 2's or 5's divided by.

If the whole denominator vaniſhes in dividing by 2, 5 or 10, the decimal will be finite, and will conſiſt of as many places as you perform diviſions.

In dividing 1.0000 &c. by any prime number whatever, except 2 or 5, the figures in the quotient will begin to repeat over again as ſoon as the remainder is 1. And ſince 9999 &c. is leſs than 10000 &c. by 1, therefore 9999 &c. divided by any number whatever will leave 0 for a remainder, when the repeating figures are at their period. Now whatever number of repeat-

ing figures we have when the dividend is 1, there will be exactly the same number when the dividend is any other number whatever. For the product of any circulating number, by any other given number, will consist of the same number of repeating figures as before. Thus, let .507650765076 &c. be a circulate whose repeating part is 5076. Now every repetend (5076) being equally multiplied, must produce the same product. For though these products will consist of more places, yet the overplus in each, being alike, will be carried to the next, by which means each product will be equally increased, and consequently every four places will continue alike. And the same will hold for any other number whatever.

Now from hence it appears, that the dividend may be altered at pleasure, and the number of places in the repetend will still be the same; thus, $\frac{1}{11} = \dot{0}\dot{9}$, and $\frac{3}{11}$ or $\frac{1}{11} \times 3 = .\dot{2}\dot{7}$ where the number of places in each are alike, and the same will be true in all cases.

Example.

Required to find whether the decimal equal to $\frac{210}{1120}$ be finite or infinite; and if infinite, how many places that repetend will consist of.

First $10)\frac{210}{1120} = \frac{21}{112}$, $2)112 = 56^{(2)} = 28^{(2)} = 14^{(2)} = 7$

Then $7)\frac{999999}{142857}$; *and therefore the decimal is infinite, and the circulate consists of* 6 *places, beginning at the decimal point.*

Addition of Circulating Decimals.

Rule 1. Make the repetends similar and conterminous, and find their sum as in common addition.

2. Divide this sum by as many nines as there are places in the repetend, and the remainder is the repetend of the sum; which must be set under the figures added, with cyphers on the left hand when it has not so many places as the repetends.

3. Carry the quotient of this division to the next column, and proceed with the rest as in finite decimals.

Example.

Let $3.\dot{6} + 78.\dot{3}47\dot{6} + 735.\dot{3} + 375 + .\dot{2}\dot{7} + 187.\dot{4}$ be added together.

Dissimilar		*Sim. and Conterminous.*
$3.\dot{6}$	=	$3.6666666\dot{6}$
$78.\dot{3}47\dot{6}$	=	$78.347647\dot{6}$
$735.\dot{3}$	=	$735.3333333\dot{3}$
$375.$	=	$375.0000000\dot{0}$
$.\dot{2}\dot{7}$	=	$0.2727272\dot{7}$
$187.\dot{4}$	=	$187.4444444\dot{4}$

$1380.0648193\dot{6}$ *the product.*

In this question the sum of the repetends is 2648191, *which divided by* 999999 *gives* 2, *to carry, and the remainder* 648193.

Subtraction of Circulating Decimals.

Rule. Make the repetend similar and conterminous, and subtract as usual; observing, that if the repetend of the number to be subtracted, be greater than the repetend of the number it is to be taken from, then the right-hand figure of the remainder must be less by unity than it would be if the expressions were finite.

Example.

From $85.\dot{6}\dot{2}$ take $13.7643\dot{2}$.

$85.\dot{6}\dot{2} = 85.6262\dot{6}$

$13.7643\dot{2} = 13.7643\dot{2}$

$71.8619\dot{3}$ *the difference.*

Multiplication of Circulating Decimals.

Rule 1. Turn both the terms into their equivalent vulgar fractions, and find the product of those fractions as usual.

2. Turn the vulgar fraction, expressing the product, into an equivalent decimal one, and it will be the product required.

Example.

Multiply $.\dot{3}\dot{6}$ by $.25$

$.\dot{3}\dot{6} = \frac{36}{99} = \frac{4}{11}$

$.25 = \frac{23}{90}$

$\frac{4}{11} \times \frac{23}{90} = \frac{92}{990} = .0929\dot{2}$ *the product.*

Division of Circulating Decimals.

Rule 1. Change both the divisor and dividend into their equivalent vulgar fractions, and find their quotient as usual.

2. Turn the vulgar fraction, expressing the quotient, into its equivalent decimal, and it will be the quotient required.

Ex.] Divide $.\dot{3}\dot{6}$ by $.\dot{2}\dot{5}$.

$.\dot{3}\dot{6} = \frac{36}{99} = \frac{4}{11}$

$.\dot{2}\dot{5} = \frac{23}{90}$

$\frac{4}{11} \div \frac{23}{90} = \frac{4}{11} \times \frac{90}{23} = \frac{360}{253} = 1\frac{107}{253}$ the quotient.

Chap. XII. ON THE EXTRACTING OF ROOTS.

The *root* is a number, whose continual multiplication into itself produces the power, and is denominated the square, cube, 4th, 5th, root, &c. according as it is, when raised to the 2d, 3d, 4th, 5th, &c. power, equal to that power. Thus 2 is the square root of 4, because $2 \times 2 = 4$; and 4 is the cube root of 64, because $4 \times 4 \times 4 = 64$; and so on.

Although there is no number of which we cannot find any power exactly, yet there may be many numbers of which a precise root can never be determined. But, by the help of decimals, we can approximate towards the root, to any assigned degree of exactness.

The roots which approximate are called *surd roots*, and those which are perfectly accurate are called *rational roots*.

Roots are sometimes denoted, as in algebra, by writing the character $\surd$ before the power, with the index of the root against it: thus, the third root of 70 is expressed $\sqrt[3]{70}$, and the second root of it is $\surd 70$, the index 2 being always omitted when the square root is designed.

If the power be expreſſed by ſeveral numbers, with the ſign + or − between them, a line is drawn from the top of the ſign over all the parts of it; thus, the third root of 28 − 13 is $\sqrt[3]{28-13}$.

Sometimes roots are deſigned like powers, with fractional indices; thus, the ſquare root of 5 is $5^{\frac{1}{2}}$, the third root of 19 is $19^{\frac{1}{3}}$, and the fourth root of 40 − 12 is $\overline{40-12}^{\frac{1}{4}}$, &c.

To extract the Square Root.

Rule 1. Diſtinguiſh the given number into periods of two figures each, by putting a point over the place of units, another over the place of hundreds, and ſo on.

2. Find a ſquare number either equal to, or the next leſs than the firſt period, and put the root of it to the right hand of the given number, after the manner of a quotient figure in diviſion, and it will be the firſt figure of the root required.

3. Subtract the aſſumed ſquare from the firſt period, and to the remainder bring down the next period for a dividend.

4. Place the double of the root, already found, on the left hand of the dividend, for a diviſor.

5. Conſider what figure muſt annexed to the diviſor, ſo that if the reſult be multiplied by it, the product may be equal to, or the next leſs than the dividend, and it will be the ſecond figure of the root.

6. Subtract the product from the dividend, and to the remainder bring down the next period, for a new dividend.

7. Find a diviſor as before, by doubling the figures already in the root; and from theſe find the next figure of the root, as in the laſt article; and ſo on through all the periods to the laſt.

Note. If there are decimals in the given number, it muſt be pointed both ways from unity, and the root be made to conſiſt of as many whole numbers and decimals as there are periods belonging to each; and when the figures belonging to the given number are exhauſted, the operation may be continued at pleaſure by adding cyphers.

Examples.

1. Required the ſquare roots of 5499025, and 184.2.

```
  5499025(2345 the root.
    4
  ----
  43)149
     129
  -----
  464)2090
      1856
  ------
  4685)23425
       23425
       -----

  184.2000(13.57 the root.
    1
  ----
  23)84
     69
  -----
  265)1520
      1325
  -------
  2707)19500
       18949
       -----
         551 remainder.
```

Extraction of the Cube Root.

Rule 1. Separate the given number into periods of three figures each, by putting a point over every third figure from the place of units.

2. Find the greateſt cube in the firſt period, and put its root in the quotient.

3. Subtract the cube thus found from the ſaid period, and to the remainder prefix the next period, and call this the *reſolvend.*

4. Under this reſolvend write the triple ſquare of the root, ſo that units in the latter may ſtand under the place of hundreds in the former; and under the ſaid triple ſquare write the triple root, removed one place to the right hand, and call the ſum of thoſe the *diviſor.*

5. Seek how often the diviſor may be had in the reſolvend, excluſive of the place of units, and write the reſult in the quotient.

6. Under the diviſor write the product of the triple ſquare of the root by the laſt quotient figure, ſetting down the units place of this line under the place of tens in the diviſor; under this line write the product of the triple root by the ſquare of the laſt quotient figure, ſo as to be removed one place beyond the right-hand figure of the former; and under this line, removed one place forward to the right-hand, write down the cube of the laſt quotient figure, and call their ſum the *ſubtrahend.*

7. Subtract the ſubtrahend from the reſolvend, and to the remainder bring down the next period for a new reſolvend, with which proceed as before, and ſo on till the whole is finiſhed.

Note. The ſame rule muſt be obſerved for continuing the operation, and pointing for decimals, as in the ſquare root.

Ex.] Required the cube root of 48228544.

```
  48228544(364
  27
  -----
  21228 reſolvend.
  -----
   27 triple ſquare of 3.
    9 triple of 3.
  -----
  279 diviſor.
  -----
  162 triple ſquare of 3, multiplied by 6
  324 triple of 3, multiplied by the ſquare of 6.
  216 cube of 6.
  -----
  19656 ſubtrahend.
  -------
  1572544 ſecond reſolvend.
  -------
   3888 triple ſquare of 36.
    108 triple of 36.
  -----
  38988 ſecond diviſor.
  -------
   15552 triple ſquare of 36, multiplied by 4.
    1728 triple of 36, multiplied by the ſquare of 4.
      64 cube of four.
  -------
  1572544 ſecond ſubtrahend.
  -------
    * *
  -------
```

To extract the Roots of Powers in general.

Rule 1. Prepare the given number for extraction, by pointing off from the units place as the root required directs.

2. Find the firſt figure of the root by trial, and ſubtract its power from the given number.

3. To the remainder bring down the firſt figure in the next period, and call it the *dividend*.

4. Involve the root to the next inferior power to that which is given, and multiply it by the number denoting the given power for a *diviſor*.

5. Find how many times the diviſor may be had in the dividend, and the quotient will be another figure of the root.

6. Involve the whole root to the given power, and ſubtract it from the given number as before.

7. Bring down the firſt figure of the next period to the remainder for a new dividend, to which find a new diviſor, and ſo on till the whole is finiſhed.

Ex.] What is the cube root of 53157376?

$$\begin{array}{r} 53157376(376 \\ 27 = 3^3 \\ \hline 3^2 \times 3 = 27)261 \text{ dividend.} \\ \hline 50653 = 37^3 \\ \hline 3^2 \times 3 = 4107)25043 \text{ ſecond dividend.} \\ 53157376 \\ \hline 0 \end{array}$$

For the proof of the Extraction of Roots ſee Algebra.

ARIUS, a divine of the fourth century, the head and founder of the Arians, a ſect which denied the eternal divinity and ſubſtantiality of the Word. He was born in Lybia, near Egypt.

ARK, a floating veſſel built by Noah, for the preſervation of his family, and the ſeveral ſpecies of animals during the deluge. (See Pl. 28). The ark has afforded ſeveral points of curious inquiry among the critics and naturaliſts, relating to its form, capacity, materials, &c.

The wood whereof the ark was built is called in the Hebrew *Gopher-wood*, and in the Septuagint *ſquare timbers*. Some tranſlate the original *cedar*, others *pine*, others *box*, &c. In what place Noah built his ark is no leſs made a matter of diſpute: but the moſt probable opinion is, that it was built in Chaldea, in the territories of Babylon; and this conjecture is confirmed by the Chaldean tradition, which makes Xithurus (another name for Noah) ſet ſail from that country.

The dimenſions of the ark, as given by Moſes, are 300 cubits in length, 50 in breadth, and 30 in height; which ſome have thought too ſcanty, conſidering the number of things it was to contain; and hence an argument has been drawn againſt the authority of the relation. To ſolve this difficulty many of the ancient fathers and the modern critics have been put to very miſerable ſhifts. But Buteo and Kircher have proved geometrically, that taking the common cubit of a foot and a half, the ark was abundantly ſufficient for all the animals ſuppoſed to be lodged in it. Snellius computes the ark to have been above half an acre in area. Father Lamy ſhows, that it was 110 feet longer than the church of St. Mary at Paris, and 64 feet narrower: and if ſo, it muſt have been longer than St. Paul's church in London, from weſt to eaſt, and broader than that church is high in the inſide, and 54 feet of our meaſure in height: and Dr. Arbuthnot computes it to have been 81062 tons.

The things contained in it were, beſides eight perſons of Noah's family, one pair of every ſpecies of unclean animals, and ſeven pair of every ſpecies of clean animals, with proviſions for them all during the whole year. The former appears, at firſt view, almoſt infinite; but if we come to a calculation, the number of ſpecies of animals will be found much leſs than is generally imagined; out of which, in this caſe, are excepted ſuch animals as can live in the water; and biſhop Wilkins ſhows that only 72 of the quadruped kind needed a place in the ark. By the deſcription Moſes gives of the ark, it appears to have been divided into three ſtories, each ten cubits or 15 feet high; and it is agreed on, as moſt probable, that the loweſt ſtory was for the beaſts, the middle for the food, and the upper for the birds, with Noah and his family; each ſtory being ſubdivided into different apartments, ſtalls, &c. But it muſt be obſerved, that, beſides the places requiſite for the beaſts and birds, and their proviſions, there was room required for Noah to lock up houſehold utenſils, the inſtruments of huſbandry, grains and ſeeds to ſow the earth with after the deluge; for which purpoſe it is thought that he might ſpare room in the third ſtory for 36 cabbins, beſides a kitchen, a hall, four chambers, and a ſpace about 48 cubits in length to walk in.

Ark *of the Covenant*, a ſmall cheſt or coffer, three feet nine inches in length, two feet three inches in breadth, and two feet three inches in height, in which were contained the golden pot that had manna, and Aaron's rod, and the tables of the covenant. This coffer was made of ſhittim-wood, and covered with a lid, which was made of ſolid gold. (See Pl. 28). The ark was depoſited in the holieſt place of the tabernacle. It was taken by the Philiſtines, and detained 20, ſome ſay 40 years, at Kirjath-jearim; but the people being afflicted with emerods on account of it, returned it with divers preſents; and it was afterwards placed in the temple.—The lid or covering of the ark was called the *propitiatory* or *mercy-ſeat*; over which were two figures placed called *Cherubims*, with expanded wings of a peculiar form. Here the Schechinah reſted both in the tabernacle and temple in a viſible cloud: hence were iſſued the Divine oracles by an audible voice; and the high prieſt appeared before this mercy-ſeat once every year on the great day of expiation; and the Jews, wherever they worſhipped, turned their faces towards the place where the ark ſtood.

In the ſecond temple there was alſo an ark, made of the ſame ſhape and dimenſions with the firſt, and put in the ſame place, but without any of its contents and peculiar honours. It was uſed as a repreſentative of the former on the day of expiation, and a repoſitory of the original copy of the holy Scriptures, collected by Ezra and the men of the great ſynagogue, after the captivity: and in imitation of this, the Jews to this day have a kind of ark in their ſynagogues, wherein their ſacred books are depoſited. This they call *aron*. Leo of Modena gives a deſcription of it in his Account of the Cuſtoms and Ceremonies of thoſe of his Nation. Tertullian calls this ark *Armarium Judaicum*; whence the phraſe, *to be in the armory of the ſynagogue*, q. d. in the number of canonical

writings.—A chest or coffer, very nearly resembling the Jewish ark, and called the *house of the God*, was found in Huaheine, one of the islands in the South Seas. The particulars are given in *Hawkesworth's Account*, &c. vol. ii. p. 252.

ARKLOW, a sea port town of Ireland, in the county of Wicklow. W. long. 6. 15. N. lat. 52. 55.

ARLES, a large and ancient city of France, in the department of the mouth of the Rhone, and late province of Provence. It is seated on the east side of the Rhone, was lately an archbishop's see, and is celebrated for its antiquities. E. long. 4. 48 N. lat. 43. 4.

ARLEUX, an ancient town of the Netherlands, in Cambresis, with a castle. E. long. 3. 16. N. lat. 59. 17.

ARLON, an ancient town of the Austrian Netherlands, formerly a strong place. E. long. 15. 50. Lat. 49. 4.

ARM, a well known part of the human body. See ANATOMY.

ARM, among sportsmen, is applied to a horse, when, by pressing down his head, he endeavours to defend himself against the bit, to prevent his being checked by it. The remedy is, to have a wooden ball covered with velvet, or other matter, put on his chaul, which will so press him between the jawbones as to prevent his bringing his head so near his breast.

ARM, in geography, is used for the branch of a sea or river. Italy and Sicily are only parted by an arm of the sea. St. George's arm in the Mediterranean is the Thracian Bosphorus.

ARM is also used figuratively for power. The secular arm is the lay or temporal authority of a secular judge; to which recourse is had for the execution of the sentences passed by ecclesiastical judges. The church sheds no blood: even the judges of inquisition, after they have found the person guilty, surrender him to the secular arm. The council of Antioch, held in 341, decrees, that recourse be had to the secular arm to repress those who refuse obedience to the church: for secular arm, they here use exterior power.

ARM, in respect of the magnet. A loadstone is said to be armed, when it is capped, cased, or set in iron or steel, in order to make it take up the greater weight, and also to distinguish readily its poles. See MAGNETISM.

ARMADA, a Spanish term signifying a fleet of men of war. The *armada* which attempted to invade England in the time of queen Elizabeth, is famous in history; it was partly scattered by the wind, and partly subdued by the English fleet. On which occasion a medal was struck with this motto, *Afflavit Deus, et dissipantur*.

ARMADILLA, in Spanish America, denotes a squadron of six or eight men of war, each furnished with from twenty-four to fifty pieces of cannon. These the king maintains, to prevent foreigners from trading with the Spaniards and the Indians, both in time of war and peace. The vessels of this armadilla are those that have been so much talked of, under the name of *guarda costas*. They have even power to take all Spanish merchant-ships they meet with on the coasts that have not licences from the king. The South sea has its armadilla as well as the North sea. The ordinary abode of the former is at Calao, a port of Lima; that of the latter at Carthagena.

ARMADILLO, in zoology, a synonime of the dasypus. See DASYPUS.

ARMAGEDDON, a place spoken of in the Revelations (xvi. 16.) which literally signifies the mountain of Mageddon or Megiddo, a city situated in the great plain at the foot of mount Carmel, where king Josiah received his mortal wound in the battle against Necho king of Egypt.

ARMAGH, a county of Ireland, 32 miles in length, and 17 in breadth; bounded on the E. by Down, on the W. by Tyrone and Monaghan, on the N. by Lough Neagh, and on the S. by Louth. It contains forty nine parishes, and sends six members to parliament; namely, two for the county, two for Armagh, and two for Charlemont.

ARMAGNAC, a late province of Guienne in France, now forming a part of the department of Gers. It is 55 miles in length and 40 in breadth: Auch is the capital town.

ARMAMAXI, in antiquity, a kind of Scythian chariots or carriages, composed of two wheels, variously adorned with crowns, shields, breast plates, and other spoils, carried in procession after the images of the gods and great men.

ARMATURA, in a general sense, is the same with what we otherwise call armour. But it is more particularly used in the ancient military art, for a kind of exercise, performed with missive weapons, as darts, spears, arrows, and the like. In this sense, armatura stands contradistinguished from palaria; the latter being the exercise of the heavy-armed, the former of the light-armed The armatura was practised with great diligence among the Romans; they had their *campidoctores*, on purpose to instruct the *tyrones* or young soldiers in it. Under it were included, the throwing of the spear or javelin, shooting with bows and arrows, &c. The soldiers themselves were also called ARMATURA.

ARMATURA is also a denomination given to the soldiers in the emperor's retinue. Of these we find two schools, mentioned in the *Notitia imperii*, called the *armaturæ seniores* and *armaturæ juniores*. Their commander was intitled *tribunus armaturarum*.

ARMED, in the sea-language. A cross-bar shot is said to be armed, when some rope-yarn or the like is rolled about the end of the iron-bar, which runs through the shot.

ARMED, in heraldry, is used when the horns, feet, beak, or talons, of any beast or bird of prey are of a different colour from the rest of the body.

ARMED-*Ship*, a vessel occasionally taken into the service of the government in time of war, and employed to guard some particular coast, or attend on a fleet. She is therefore armed and equipped in all respects like a ship of war, and commanded by an officer of the navy, who has the rank of master and commander. All ships of this sort are upon the establishment of the king's sloops, having a lieutenant, master, purser, surgeon, &c.

ARMENIA, a large country, bounded on the W. by the Euphrates, on the S. by Diarbeker, Curdistan, and Aderbijan, on the E. by Schirvan, and on the N. by Georgia. It is one of the finest countries in Asia, being watered by several large rivers. It had its own kings, but could not keep them long. Part of it belongs to the Persians, and part to the Turks. The inhabitants are much attached to commerce, and undertake long journies to carry it on. They are Christians, and have a patriarch and an archbishop.

ARMENIACA. See PRUNUS.

ARMENIAN, something belonging to or produced in Armenia: thus we say, *Armenian bole*, *Armenian stone*, &c. See BOLE, and ARMENUS *Lapis*.

ARMENTIERS, a small handsome town of France, in the department of the North and late French Flanders, seated on the river Lis, 8 miles N. W. of Lisle. Lon. 3. 3. E. lat. 50. 40. N.

ARMENUS LAPIS, *Armenian stone*, in natural history, a mineral substance, which is but improperly called a *stone*; being no other than an ochreous earth, and properly called *blue ochre*. It is a very valuable substance in painting, being a bright and lively blue. It was in so high esteem as a paint among the ancients, that counterfeits were continually attempted to serve in its place. It is a very beautiful earth, of an even and regular texture; and of a fine blue, sometimes deeper, sometimes paler, and frequently mixed with green. It is soft, tender, and light; of an even, but somewhat dusty surface; it adheres firmly to the tongue, and is dry, but not harsh to the

touch. It eaſily breaks between the fingers, and does not ſtain the hands. It is of a brackiſh diſagreeable taſte, and does not ferment with acids. It is a very ſcarce foſſil; but is found very pure, though in but ſmall quantities, in the mines at Goſſelaer in Saxony.

AMIERS, a town of the late French Hainhault, now in the department of the North. E. long. 3. 45. N. lat. 50. 15.

ARMIGER, a title of dignity, belonging to ſuch gentlemen as bear arms: and theſe are either by courteſy, as ſons of noblemen, eldeſt ſons of knights, &c.; or by creation, ſuch as the king's ſervants, &c. See ESQUIRE.

ARMILLARY, in a general ſenſe, ſomething conſiſting of rings or circles.

ARMILLARY *Sphere*, an artificial ſphere compoſed of a number of circles of the mundane ſphere, put together in their natural order, to eaſe and aſſiſt the imagination in conceiving the conſtitution of the heavens, and the motions of the celeſtial bodies. The armillary ſphere revolves upon its axis within a ſilvered horizon, which is divided into degrees, and moveable every way upon a braſs ſupporter. The other parts are the equinoctial, zodiac, meridian, the two tropics, and the two polar circles. See GEOGRAPHY.

ARMILUSTRIUM, in Roman antiquity, a feaſt held among the Romans, in which they ſacrificed, armed, to the ſound of trumpets.

ARMINIANS, a religious ſect, or party, which aroſe in Holland by a ſeparation from the Calviniſts. They followed the doctrine of Arminius, who thinking the doctrines of Calvin, with regard to free-will, predeſtination, and grace, too ſevere, began to expreſs his doubts concerning them in the year 1591; and upon farther inquiry adopted ſentiments more nearly reſembling thoſe of the Lutherans than of the Calviniſts. The controverſies on this ſubject became very general after the death of Arminius, in the year 1609, and threatened to involve the United Provinces in civil diſcord. The Arminian tenets gained ground under the mild and favourable treatment of the magiſtrates of Holland; though in the reſult of the conteſt, the Arminians were overpowered and oppreſſed, and reduced to a ſtate of exile, till after the death of prince Maurice, in 1625. The Arminian ſyſtem has very much prevailed in England ſince the time of archbiſhop Laud, and its votaries in other countries are very numerous.

The diſtinguiſhing tenets of the Arminians may be compriſed in the following five articles; relating to predeſtination, univerſal redemption, the corruption of man, converſion, and perſeverance. 1. With reſpect to the firſt, they maintained, "That God, from all eternity, determined to beſtow ſalvation on thoſe who he foreſaw would perſevere unto the end in their faith in Chriſt Jeſus; and to inflict everlaſting puniſhments on thoſe who ſhould continue in their unbelief, and reſiſt unto the end his divine ſuccours: ſo that election was conditional, and reprobation in like manner the reſult of foreſeen infidelity and perſevering wickedneſs." 2. On the ſecond point the Arminians taught, "That Jeſus Chriſt, by his ſufferings and death, made an atonement for the ſins of all mankind in general, and of every individual in particular; that, however, none but thoſe who believe in him can be partakers of their divine benefit." 3. On the third article, they held, "That true faith cannot proceed from the exerciſe of our natural faculties and powers, nor from the force and operation of free will; ſince man, in conſequence of his natural corruption, is incapable either of thinking or doing any good thing; and that therefore it is neceſſary, in order to his converſion and ſalvation, that he be regenerated and renewed by the operation of the Holy Ghoſt, which is the gift of God through Jeſus Chriſt." 4. "That this divine grace, or energy of the Holy Ghoſt, begins and perfects every thing that can be called good in man, and conſequently all good works are to be attributed to God alone; that, nevertheleſs, this grace is offered to all, and does not force men to act againſt their inclination, but may be reſiſted and rendered ineffectual by the perverſe will of the impenitent ſinner." Some modern Arminians interpret this and the laſt article with a greater latitude. 5. "That God gives to the truly faithful, who are regenerated by his grace, the means of preſerving themſelves in this ſtate;" and though the firſt Arminians made ſome doubt with reſpect to the cloſing part of this article, their followers uniformly maintain, "that the regenerate may loſe true juſtifying faith, forfeit their ſtate of grace, and die in their ſins." The modern ſyſtem of Arminianiſm likewiſe extends the limits of the Chriſtian church in ſuch a manner, that Chriſtians of all ſects and denominations, Papiſts excepted, may be formed into one religious body, and live together in brotherly love and concord. The Arminians are alſo called *Remonſtrants*, from an humble petition entitled *Remonſtrance*, which in the year 1610 they addreſſed to the States of Holland. Their principal writers are Arminius, Epiſcopius, Vorſtius, Grotius, Curcellæus, Limborch, Le Clerc, Wetſtein, and many others of more modern date.

ARMIRO, a town of Macedonia, in European Turkey, ſeated on the Gulph de Velo. E. long. 23. 40. N. lat. 38. 34.

ARMISTICE, in military affairs, a temporary truce or ceſſation of arms for a very ſhort ſpace of time. The word is Latin, *armiſtitium*; and compounded of *arma* arms, and *ſto* to ſtand, or ſtop.

ARMOISIN, a ſilk ſtuff, or kind of taffety, manufactured in the Eaſt Indies, at Lyons in France, and at Lucca in Italy. That of the Indies is ſlighter than thoſe made in Europe.

ARMONIAC. See AMMONIAC.

ARMONICA. See HARMONICA.

ARMORIAL, ſomething relating to arms or coats of arms. See HERALDRY.

ARMORIC, or AREMORIC, ſomething that belongs to the province of Bretagne, or Brittany, in France. The name *Armorica* was anciently given to all the northern and weſtern coaſt of Gaul, from the Pyreneans to the Rhine; under which name it was known even in Cæſar's time. The word is of Bas Breton origin, and denotes as much as *maritime*; compounded, according to M. Menage, of *ar* upon, and *mare* ſea.

ARMORIST, a perſon ſkilled in the knowledge of armoury.

ARMORUM CONCUSSIO, the claſhing of armour practiſed by the Roman armies previous to an engagement, and intended to ſtrike a panic into their enemies: it always followed the Claſſicum and the Barritus.

ARMOUR, a defenſive habit, wherewith to cover and ſecure the body from the effects of any offenſive weapon. In ancient ſtatutes this is frequently called *harneſs*. A complete armour anciently conſiſted of a caſque or helm, a gorget, cuiraſs, gantlets, taſſes, braſſets, cuiſhes, and covers for the legs, to which the ſpurs were faſtened. This they called *armour cap-a-pie*; and was worn by cavaliers and men at arms. The infantry had only part of it; viz. a pot or head-piece, a cuiraſs, and taſſes; but all of them made light. Laſtly, the horſes themſelves had their armour, wherewith to cover the head and neck. Of all this furniture of war, ſcarcely any thing is now retained except the cuiraſs; the gorget or neck-piece, worn by officers, being at preſent only a badge of honour, and of no defence.

ARMOUR, *Coat*, is the eſcutcheon of any perſon, or family, with its ſeveral charges and other furniture; as mantling, creſt, ſupporters, mottos, &c. Thus we ſay, a gentleman of coat-armour; meaning one who bears arms.

ARMOURER, a maker of arms, or armour. The Ro-

man armourers were diſpoſed in certain places in the empire, it being forbid either to ſell, or buy, or make arms elſewhere. They were exempt from all offices and taxes, and received a ſalary from the public. When once they had taken the employment on themſelves, neither they, nor their children, were allowed to quit it. To prevent this, they had a kind of note, or ſtigma, impreſſed on the arm, whereby they might be known. If any of them fled, or ſecreted their ware, the reſt were obliged to anſwer for him; on account of which, the effects of ſuch as died without a legal heir went to the college. There were 15 armamentaries, or repoſitories of arms, in the Eaſtern empire, placed near the frontiers, and 19 in the Weſtern.

ARMOURER *of a ſhip*, a perſon whoſe office is to take care that the arms be in a condition fit for ſervice.

ARMOURY, a ſtore-houſe of arms, or a place wherein military habiliments are kept, to be ready for uſe. There are armouries in the Tower, and in all arſenals, citadels, caſtles, &c.

ARMOURY is alſo uſed for a branch of heraldry; being the knowledge of coat-armours, as to their blazons, and various intendments.

ARMS, ARMA, in a general ſenſe, includes all kinds of weapons, whether for defence or offence. Nicod derives the word from the Latin phraſe *quod operiunt armos*, becauſe they cover the ſhoulders or ſides; but Varro derives *arma*, *ab arcendo*, *eo quod arceant hoſtes*. It is ſuppoſed that the firſt artificial arms were of wood, and were only employed againſt beaſts. Arms of ſtone, and even of braſs, appear to have been uſed before they came to iron and ſteel. Joſephus aſſures us, that the patriarch Joſeph firſt taught the uſe of iron arms in Egypt, arming the troops of Pharaoh with a caſque and buckler. The principal arms of the ancient Britons were hatchets, ſcythes, lances, ſwords, and bucklers: the Saxons, &c. brought in the halberd, bow, arrows, arbalets, &c. By the ancient laws of England, every man was obliged to bear arms, except the judges and clergy; and under Henry VIII. it was expreſsly enjoined of all perſons to be regularly inſtructed in the exerciſe of the arms then in uſe. The arms of offence in uſe among us at preſent are, the ſword, piſtol, muſket, bayonet, &c.

ARMS, *arma*, in law, are extended to any thing which a man takes in his hand in his wrath, to caſt at, or ſtrike another. By the common law, it is an offence for perſons to go or ride armed with dangerous weapons: but gentlemen may wear common armour, according to their quality, &c. 3d Inſt. The king may prohibit force of arms, and puniſh offenders according to law; and herein every ſubject is bound to be aiding. Stat. 7 Edw. I. None ſhall come with force and arms before the king's juſtices, nor ride armed in affray of the peace, on pain to forfeit their armour, and to ſuffer impriſonment, &c. 2d Edw. III. c. 3. The importation of arms and ammunition is prohibited by 1 Jac. II. c. 8. and by 1 W. and M. ſtat. 2. c. 2. Proteſtant ſubjects may have arms for their defence. So likewiſe arms, &c. ſhipped after prohibition, are forfeited, by 29 Geo. I. c. 16. ſec. 2.

Fire-ARMS are thoſe charged with powder and ball: ſuch are cannon, mortars, and other ordnance; muſkets, carabines, piſtols, and even bombs, granadoes, carcaſſes, &c.

ARMS, *paſs of*, was a kind of combat in uſe among the ancient cavaliers.

ARMS, *ſtand of*. A ſtand of arms conſiſts of a muſket, a bayonet, a ſword, belt, and cartridge-box.

ARMS *of parade*, or *courteſy*, were thoſe uſed in the ancient liſts and tournaments; which were commonly unſhod lances, ſwords without edge or point, wooden ſwords, and even canes.

ARMS denote the natural weapons, or parts of defence of beaſts: as claws, teeth, tuſks of elephants, beaks of birds, &c.

ARMS is a term alſo uſed figuratively for the profeſſion of a ſoldier. Thus we ſay, he was bred to arms.

ARMS, or *armories*, are alſo uſed in heraldry for marks of dignity and honour, regularly compoſed of certain figures and colours, given or authoriſed by ſovereigns, and borne in banners, ſhields, coats, &c. for the diſtinction of perſons, families, and ſtates; and paſſing by deſcent to poſterity. They were called *arms*, becauſe they were borne principally on the buckler, cuiraſs, banners, and other apparatus of war. They are alſo called *coats of arms*, *coat armour*, &c. becauſe anciently embroidered on ſur-coats, &c. (See HERALDRY.) Some will have the name to have been firſt occaſioned by the ancient knights, who in their juſts and tournaments bore certain marks, which were frequently their miſtreſs's favours, in their helmets or ſhields, to diſtinguiſh them from each other. ARMS, at preſent, follow the nature of titles, which being made hereditary, theſe are alſo become ſo, being the ſeveral marks for diſtinguiſhing of families and kindreds, as names are of perſons and individuals.

ARMS are variouſly diſtinguiſhed by the *Heralds*. Thus, ARMS *of alliance*, are thoſe which families or private perſons join to their own, to denote the alliances which they have contracted by marriage. ARMS, *aſſumptive*, are ſuch as a man has a right to aſſume of himſelf, in virtue of ſome gallant action. As, if a man who is no gentleman, of blood, nor has coat armour, takes a gentleman, lord, or prince, priſoner, in any lawful war; he becomes intitled to bear the ſhield of ſuch priſoner, and enjoy it to him and his heirs. The foundation hereof is that principle in military law, that the dominion of things taken in lawful war paſſes to the conqueror. ARMS, *canting*, are thoſe wherein the figures bear an alluſion to the name of the family. Such are thoſe of the family of La Tour in Auvergne, who bear a tower; that of the family of Prado in Spain, whoſe field is a meadow. Moſt authors hold theſe the moſt noble and regular, as is ſhown by an infinity of inſtances produced by father Varenne and Menetrier. They are much debaſed when they come to partake of the *Rebus*. ARMS, *charged*, are ſuch as retain their ancient integrity and value, with the addition of ſome new honourable charge or bearing, in conſideration of ſome noble action. ARMS *of community*, are thoſe of biſhoprics, cities, univerſities, and other bodies corporate. ARMS *of conceſſion*, or augmentation of honour, are either entire arms, or elſe one or more figures given by princes, as a reward for ſome extraordinary ſervice. ARMS *of dominion*, are thoſe which emperors, kings, and ſovereign ſtates bear: being annexed to the territories which they poſſeſs. Thus the three lions are the arms of England; and the fleurs de lys were thoſe of France, before ſhe became a republic. ARMS *of family*, or *paternal arms*, are ſuch as belong to a particular family, and which no other perſon has a right to aſſume. ARMS, *full*, or *entire*, are ſuch as retain their primitive purity, integrity, or value; without any alterations, diminutions, abatements, or the like. It is a rule, that the ſimpler and leſs diverſified the arms, the more noble and ancient they are. For this reaſon Garcias Ximenes, firſt king of Navarre, and his ſucceſſors for ſeveral ages, bore only gules, without any figure at all. The arms of princes of the blood, of all younger ſons, and junior families, are not pure and full; but diſtinguiſhed and diminiſhed by proper differences, &c. ARMS *of patronage*, are thoſe which governors of provinces, lords of manors, &c. add to their family arms, in token of their peculiar ſuperiority and juriſdiction. ARMS *of pretenſion*, are thoſe of ſuch kingdoms or territories to which a prince or lord has ſome claim, and which he adds to his own, though the kingdoms or territories be poſſeſſed by a foreign prince or other lord. Thus the kings of England have quartered the arms of France with their own, ever ſince the claim

of Edward III. to that kingdom, in 1330. ARMS *of ſucceſſion*, are aſſumed by thoſe who inherit eſtates, manors, &c. by will, entail, or donation, and which they either impale or quarter with their own arms. ARMS are alſo ſaid to be *parted*, *couped*, *quartered*, &c. ARMS are ſaid to be *falſe* and *irregular*, when there is ſomething in them contrary to the eſtabliſhed rules of heraldry. As, when metal is put on metal, or colour on colour, &c. The laws, and other affairs of arms, with the cognizance of offences committed therein, belong, among us, to the earl-marſhal and college of arms.

ARMS, in falconry, denote the legs of an hawk, from the thigh to the foot. See FALCONRY.

ARMSTRONG (Dr. John), an eminent phyſician, poet, and miſcellaneous writer, was born in Caſtleton pariſh, Roxburghſhire, where his father and brother were miniſters. He completed his education in the univerſity of Edinburgh, where he took his degree in phyſic, Feb. 4, 1732. The particulars which form the hiſtory of the life of this great poet and phyſician, are ſufficient to convince us, that we ought not to blame antiquity for acknowledging "one power of phyſic, melody, and ſong." He died in Sept. 1779.

ARMUYDEN, a ſea-port town of the United Provinces, in the iſland of Walcherin. E. long. 340. N. lat. 51. 30.

ARMY, a large number of ſoldiers, conſiſting of horſe and foot, completely armed, and provided with artillery, ammunition, proviſion, &c. under the command of one general, having lieutenant-generals, major-generals, brigadiers, and other officers, under him. An army is compoſed of ſquadrons and battalions; and is uſually divided into three corps, and formed into three lines: the firſt line is called the *vanguard*, the ſecond the *main-body*, and the third the *rear-guard*, or *body of reſerve*. The centre is poſſeſſed by the foot; the cavalry form the right and left wing of each line; and ſometimes they place ſquadrons of horſe in the intervals between the battalions. When the army is drawn up in order of battle, the horſe are placed at five feet diſtance from each other, and the foot at three. In each line the battalions are diſtant from each other 180 feet, which is nearly equal to the extent of their front; and the ſame holds good of the ſquadrons, which are about 300 feet diſtant, the extent of their own front. Theſe intervals are left for the ſquadrons and battalions of the ſecond line to range themſelves againſt the intervals of the firſt, that both may more readily march through theſe ſpaces to the enemy. The firſt line is uſually 300 feet diſtant from the ſecond, and the ſecond from the third, that there may be ſufficient room to rally when the ſquadrons and battalions are broken. (See the article WAR.)

It has been obſerved, that in Europe a prince with a million of ſubjects cannot keep an army of above 10,000 men, without ruining himſelf. It was otherwiſe in the ancient republics: the proportion of ſoldiers to the reſt of the people, which is now as about 1 to 100, might then be as about 1 to 8. The reaſon ſeems owing to that equal partition of lands which the ancient founders of commonwealths made among their ſubjects; ſo that every man had a conſiderable property to defend, and means to defend it with: whereas, among us, the lands and riches of a nation being ſhared among a few, the reſt have no way of ſubſiſting but by trades, art, and the like; and have neither any free property to defend, nor means to enable them to go to war in defence of it, without ſtarving their families. A large part of our people are either artiſans or ſervants, and ſo only miniſter to the luxury and effeminacy of the great. While the equality of lands ſubſiſted, Rome, though only a little ſtate, being refuſed the ſuccours which the Latins were obliged to furniſh after the taking of the city in the conſulate of Camillus, preſently raiſed ten legions within its own walls, which was more, Livy aſſures us, than they were able to do in his time, though maſters of the greateſt part of the world: "A full proof (adds the hiſtorian) that we are not grown ſtronger; and that what ſwells our city is only luxury, and the means and effects of it."

Our armies anciently were a ſort of militia, compoſed chiefly of the vaſſals and tenants of the lords. When each company had ſerved the number of days or months enjoined by their tenure, or the cuſtoms of the fees they held, they returned home. The armies of the empire conſiſt of divers bodies of troops furniſhed by the ſeveral circles. The groſs of the French armies under the Merovingian race conſiſted of infantry. Under Pepin and Charlemagne, the armies conſiſted almoſt equally of cavalry and foot: but ſince the declenſion of the Carlovingian line, the fees being become hereditary, the national armies, ſays Le Gendre, are chiefly cavalry.

A well-regulated ſtanding army is greatly ſuperior to a militia; although a militia, it is to be obſerved, after ſerving two or three campaigns, may become equal to a ſtanding army, and in every reſpect a match for veteran troops. (See MILITIA.) But even admitting the ſuperiority of the former, as a means of *defence*, which is perhaps the only juſtifiable part of the ſyſtem of war, a ſtanding army is to be dreaded and abhorred in a *political view*, as the engine of deſpotiſm, and the certain means of ſlavery to that people or nation in which it once obtains a footing. Hence the jealous regard of the Britiſh conſtitution to this important particular: and hence the annual vote of parliament, without which the ſovereign is not able to pay the military forces exiſting in this kingdom or its foreign poſſeſſions.

ARNAY-LE-DUC, a town of France, in the department of Côte d'Or, and late province of Burgundy. E. long. 4. 26. N. lat. 47. 7.

ARNHEIM, a town of the Low Countries, in the province of Guelderland. E. long. 5. 55. N. lat. 52. 0.

ARNICA, LEOPARDS BANE, in botany; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-diſcoides*. The receptacle is naked; the pappus is ſimple; and the filaments are five, without anthcræ. The *Species* are ſeven, all natives of Ethiopia, except the two following: 1. The montana, with oval leaves, grows naturally on the Alps, and other cold parts of Europe. The roots of this ſpecies, when planted in a proper ſoil and ſituation, ſpread very far under the ſurface, and put out many entire oval leaves, from between which the flower-ſtems ariſe, which grow about a foot and an half high. The top is terminated by a ſingle yellow flower, like the dandelion. 2. The ſcorpioides, with ſawed leaves growing alternately, a native of Bohemia and Siberia. The roots of this ſort are much jointed, and divide into many irregular fleſhy off-ſets, which are variouſly contorted. Both ſpecies are very hardy, and require little care in the cultivation. The montana has an acrid bitter taſte, and, when bruiſed, emits a pungent odour, which excites ſneezing. Hence the Germans uſe it in ſnuff, and ſmoke it like tobacco. Of late it has been recommended in paralytic affections, and in caſes where a loſs or diminution of ſenſe ariſes from an affection of the nerves, as in caſes of amauroſis. From a dram to half an ounce of the flowers has been infuſed in a pint of boiling water, and given in different doſes in the courſe of the day. Sometimes it produces vomiting, ſweating, and diureſis; but frequently it acts inſenſibly. It is alſo ſaid to be good in fevers, particularly of the intermittent kind, and likewiſe in caſes of gangrene, as a ſubſtitute for the Peruvian bark. But theſe alleged virtues remain to be determined by future obſervations. It is, however, one of thoſe active ſubſtances from which ſomething may be expected.

ARNOLDISTS, in church-hiſtory, a ſect ſo called from their leader Arnold of Breſcia.

ARNOT, in botany, the Engliſh name of the bunium. See BUNIUM.

ARNOTTO. The ſame with Anotta. See ANOTTA and BIXA.

ARNSTADE, a town of Germany, in Thuringia, on the river Gera. E. long. 11. 3. N. lat. 50. 54.

ARNUS, now *Arno*, a very rapid river of Tuſcany, which it divides, and in its courſe waſhes Florence and Piſa.

AROBE. See AROBAS.

AROLEO, an American weight, equal to 25 of our pounds.

AROMA PHILOSOPHORUM, denotes either ſaffron, or the aroph of Paracelſus; as *aroma germanicum* denotes elecampane. See AROPH.

AROMATIC, an appellation given to ſuch plants as yield a briſk fragrant ſmell, and a warm taſte; as all kinds of ſpices, &c. See MATERIA MEDICA.

ARONA, a town of Italy, in the duchy of Milan, on the lake Maggoire. E. long. 8. 25. N. lat. 45. 41.

ARONCHES, a town of Portugal, in Alantejo, on the confines of Spain. W. long. 5. 16. N. lat. 14. 39.

AROOI, a town of the empire of Ruſſia, in the Ukraine; E. long. 38. 15. N. lat. 51. 48.

AROPH, a contraction of *aroma philoſophorum*; a name given to ſaffron.—AROPH *Paracelſi*, is the name of a kind of chemical flowers, probably of the ſame nature with the Eas Veneris.

AROPH is alſo a term uſed frequently by Paracelſus in a ſenſe ſynonimous with *lithontriptic*.

AROSBAY, a town of the Eaſt Indies, on the coaſt of the iſland of Madura. E. long. 14. 30. N. lat. 9. 30.

AROURA, a Grecian meaſure of 50 feet. It was more frequently uſed for a ſquare meaſure of half the plethron. The Egyptian aroura was the ſquare of 100 feet.

ARPAGIUS, or HARPAGIUS, among the ancients, a perſon who died in the cradle, at leaſt in early youth. The word is formed from the Greek αρπαζω *I ſnatch*. The Romans made no funerals for their *arpagii*. They neither burnt their bodies, nor made tombs, monuments, or epitaphs for them. In after times, it became the cuſtom to burn ſuch as had lived to the age of 40 days, and had cut any teeth; and theſe they called Αρπακτοι, or Αρπαγμοι, q. d. *rapti*, *raviſhed*. The uſage ſeems to have been borrowed from the Greeks; among whom, Euſtathius aſſures us, it was the cuſtom never to bury their children either by night or full day, but at the firſt appearance of the morning; and that they did not call their departure by the name of *death*, but by a ſofter appellation, Ημιφα; αρπαγη, importing that they were raviſhed by Aurora, or taken away to her embraces.

ARPENT, ſignifies an acre or furlong of ground; and according to the old French account in Domeſday-book, 100 perches make an arpent. The moſt ordinary acre, called *arpent de France*, is 100 perches ſquare: but ſome account it but half an acre.

ARQUA, a town of Italy, in the Padua, and territory of Venice, remarkable for the tomb of Petrarch. E. long. 11. 43. N. lat. 45. 43.

ARQUEBUS. See HARQUEBUS.

ARQUES, a town of France, in the department of Lower Seine, and late province of Normandy. E. long. 1. 30. N. lat. 49. 54.

ARRACHEE, in heraldry, a term applied to the repreſentations of plants torn up by the roots.

ARRACHIS, in botany. See ARACHIS.

ARRACK. See ARACK.

ARRAGON, a province of Spain, bounded on the North by the Pyrenean mountains, which ſeparate it from France; on the weſt by Navarre and the two Caſtiles; on the ſouth by Valencia; and on the eaſt by Catalonia.

ARRAIGNMENT, in law, the arraigning or ſetting a thing in order, as a perſon is ſaid to arraign a writ of novel diſſeiſin, who prepares and fits it for trial. The term is moſt properly uſed to call a perſon to anſwer in form of law upon an indictment, &c. When brought to the bar, the criminal is called upon by name to hold up his hand; which though it may ſeem a trifling circumſtance, yet is of this importance, that by holding up of his hand *conſtat de perſona*, and he owns himſelf to be of that name by which he is called. However, it is not an indiſpenſable ceremony; for, being calculated merely for the purpoſe of identifying the perſon, any other acknowledgement will anſwer the purpoſe as well: therefore, if the priſoner obſtinately and contemptuouſly refuſes to hold up his hand, but confeſſes he is the perſon named, it is fully ſufficient. Then the indictment is to be read to him diſtinctly in the Engliſh tongue (which was law, even while all other proceedings were in Latin), that he may fully underſtand his charge. After which it is to be demanded of him, whether he be guilty of the crime whereof he ſtands indicted, or not guilty? When a criminal is arraigned, he either ſtands mute, or confeſſes the fact, or elſe he pleads to the indictment.—1. If he ſays nothing, the court ought *ex officio* to impannel a jury to enquire whether he ſtands obſtinately mute, or whether he be dumb *ex viſitatione Dei*. If the latter appears to be the caſe, the judges of the court (who are to be of counſel for the priſoner, and to ſee that he hath law and juſtice) ſhall proceed to the trial, and examine all points as if he had pleaded not guilty. But whether judgment of death can be given againſt ſuch a priſoner, who hath never pleaded, and can ſay nothing in arreſt of judgment, is a point yet undetermined.—If he be found to be obſtinately mute (which a priſoner hath been held to be that had cut out his own tongue), then, if it be on an indictment of high treaſon, it hath long been clearly ſettled, that ſtanding mute is equivalent to a conviction, and he ſhall receive the ſame judgment and execution.—The Engliſh judgment of penance for ſtanding mute was, till of late years, a ſpecies of torture, effected by loading the body of the priſoner with heavy weights till a plea of ſome kind was drawn from him; but the doubts entertained as to its legality, and the repugnance of its theory to the humanity of the laws of England, concurred to require a legiſlative abolition of this cruel proceſs, and a reſtitution of the ancient common law; whereby the ſtanding mute in felony, as well as in treaſon and in treſpaſs, amounted to a confeſſion of the charge.—2. If the priſoner make a ſimple and plain confeſſion, the court hath nothing to do but to award judgment: but it is uſually very backward in receiving and recording ſuch confeſſion, out of tenderneſs to the life of the ſubject; and will generally adviſe the priſoner to retract it, and,—3. Plead to the indictment; as to which, ſee the article PLEA *of Indictment*.

ARRAN, an iſland of Scotland, in the Frith of Clyde, between Kintyre and Cunningham. In this iſland there are many of thoſe rude monuments called *cairns*, *druidical circles*, &c.

ARRANGEMENT, or RANGEMENT, the diſpoſition of the parts of a whole, in a certain order. Modern philoſophy ſhows us, that the diverſity of the colours of bodies depends entirely on the ſituation and arrangement of their parts, which reflect the light differently; the diverſity of taſtes and ſmells on the different arrangement of their pores, by which they become differently ſenſible; and the general diverſity of bodies on the different arrangement of their parts. The happy arrangement of words conſtitutes one of the greateſt beauties of diſcourſe.

ARRAS, a large, ancient, and handſome town of France,

in the department of the Straits of Calais and late province of Artois, containing 22,000 inhabitants. A great part of its fortifications were erected by Vauban. Lon. 2. 51. E. lat. 50. 17. N.

Arras, or *Araxes*, is alſo the name of a river of Georgia, which diſcharges itſelf into the Caſpian ſea.

ARRAY, in law, the ranking or ſetting forth of a jury, or inqueſt of men impanelled on a cauſe.

Battle-Array, the order or diſpoſition of an army, drawn up with a view to engage the enemy. See Army.

ARRAYERS, or Arragers, Arraitores, is uſed in ſome ancient ſtatutes, for ſuch officers as had care of the ſoldiers' armour, and ſaw them duly accoutred in their kinds. In ſome reigns, commiſſioners have been appointed for this purpoſe. Such were the commiſſioners of array appointed by king Charles I. in the year 1642.

ARREARS, the remainder of a ſum due, or money remaining in the hands of an accountant. It likewiſe ſignifies the money due for rent, wages, &c. or what remains unpaid of penſions, taxes, &c.

ARRENTATION, in the foreſt laws, implies the licenſing the owner of lands in a foreſt to encloſe them with a low hedge and a ſmall ditch, in conſideration of a yearly rent.

ARREST, in Engliſh law, from the French word *arreſter*, to *ſtop* or *ſtay*, is the reſtraint of a man's perſon, obliging him to be obedient to the law; and is defined to be the execution of the command of ſome court of record or office of juſtice. An arreſt is the beginning of impriſonment; where a man is firſt taken, and reſtrained of his liberty by power or colour of a lawful warrant. Arreſts are either in *civil* or *criminal* caſes.

1. An arreſt in a *civil cauſe* is defined to be the apprehending or reſtraining one's perſon by proceſs in execution of the command of ſome court. An arreſt muſt be by corporal ſeizing or touching the defendant's body; after which the bailiff may juſtify breaking open the houſe in which he is, to take him: otherwiſe he has no ſuch power; but muſt watch his opportunity to arreſt him. For every man's houſe is looked upon by the law to be his caſtle of defence and aſylum, wherein he ſhould ſuffer no violence. Which principle is carried ſo far in the civil law, that, for the moſt part, not ſo much as a common citation or ſummons, much leſs an arreſt, can be executed upon a man within his own walls. Peers of the realm, members of parliament, and corporations, are privileged from arreſts; and of courſe from outlawries. And againſt them the proceſs to enforce an appearance muſt be by ſummons and diſtreſs *infinite*, inſtead of a *capias*. Alſo clerks, attorneys, and all other perſons attending the courts of juſtice (for attorneys being officers of the court, are always ſuppoſed to be there attending), are not liable to be arreſted by the ordinary proceſs of the court, but muſt be ſued by bill (called uſually a *bill of privilege*), as being perſonally preſent in court. Clergymen performing divine ſervice, and not merely ſtaying in the church with a fraudulent deſign, are for the time privileged from arreſts, by ſtatute 50 Edw. III. c. 5. and 1 Rich. II. c. 16.; as likewiſe members of convocation actually attending thereon, by ſtatute 8 Hen. VI. c. 1. Suitors, witneſſes, and other perſons neceſſarily attending any courts of record upon buſineſs, are not to be arreſted during their actual attendance, which includes the neceſſary coming and returning. Seamen in the king's ſervice are privileged from arreſts for debts under 20l. (1 Geo. II. c. 14. and 14 Geo. II. c. 38.); and ſoldiers or marines are not liable to arreſts for a debt of leſs than 10l. (30 Geo. II. c. 6, 11). And no arreſt can be made in the king's preſence, nor within the verge of his royal palace, nor in any place where the king's juſtices are actually ſitting. The king hath moreover a ſpecial prerogative (which indeed is very ſeldom exerted), that he may by his *writ of protection* privilege a defendant from all perſonal, and many real ſuits, for one year at a time, and no longer; in reſpect of his being engaged in his ſervice out of the realm. And the king alſo by the common law might take his creditor into his protection, ſo that no one might ſue or arreſt him till the king's debt was paid: but by the ſtatute 25 Edw. III. c. 19. notwithſtanding ſuch protection, another creditor may proceed to judgment againſt him, with a ſtay of execution till the king's debt be paid; unleſs ſuch creditor will undertake for the king's debt, and then he ſhall have execution for both. And laſtly, by ſtatute 29 Car. II. c. 7. no arreſt can be made, nor proceſs ſerved, upon a Sunday, except for treaſon, felony, or breach of the peace.

2. An arreſt in a *criminal cauſe* is the apprehending or reſtraining one's perſon, in order to be forthcoming to anſwer an alleged crime. To this arreſt all perſons whatſoever are, without diſtinction, equally liable; and doors may be broken open to arreſt the offender: but no man is to be arreſted, unleſs charged with ſuch a crime as will at leaſt juſtify holding him to bail when taken. There is this difference alſo between arreſts in civil and criminal caſes, that none ſhall be arreſted for debt, treſpaſs, or other cauſe of action, but by virtue of a precept or commandment out of ſome court; but for treaſon, felony, or breach of the peace, any man may arreſt with or without warrant or precept. But the king cannot command any one by word of mouth to be arreſted; for he muſt do it by writ, or order of his courts, according to law: nor may the king arreſt any man for ſuſpicion of treaſon, or felony, as his ſubjects may; becauſe, if he doth wrong, the party cannot have an action againſt him.—Arreſts by private perſons are in ſome caſes commanded. Perſons preſent at the committing of a felony muſt uſe their endeavours to apprehend the offender, under penalty of fine and impriſonment; and they are alſo, with the utmoſt diligence, to purſue and endeavour to take all thoſe who ſhall be guilty thereof out of their view, upon a hue and cry levied againſt them. By the vagrant act 17 Geo. II. c. 5. every perſon may apprehend beggars and vagrants; and every private perſon is bound to aſſiſt an officer requiring him to apprehend a felon.—In ſome caſes likewiſe arreſts by private perſons are rewarded by law. By the 4 and 5 William and Mary, c. 8. perſons apprehending highwaymen, and proſecuting them to a conviction, are entitled to a reward of 40l. and if they are killed in the attempt, their executors, &c. are entitled to the like reward. By the 6 and 7 William III. c. 17. perſons apprehending counterfeiters and clippers of the coin, and proſecuting them to conviction, are entitled to 40l.

By 5 Ann, c. 31. perſons who ſhall take any one guilty of burglary, or the felonious breaking and entering any houſe in the day time, and proſecute them to conviction, ſhall receive the ſum of 40l. within one month after ſuch conviction.—With regard to arreſts by public officers, as watchmen, conſtables, &c. they are either made by their own authority, which differs but very little from the power of a private perſon; or they are made by a warrant from a juſtice of peace. See Warrant.

Arrest *of Judgment*, in law, the aſſigning juſt reaſon why judgment ſhould not paſs: as, Want of notice of the trial; a material defect in the pleading; when the record differs from the deed impleaded; when perſons are miſnamed; where more is given by the verdict than is laid in the declaration, &c. This may be done either in criminal or civil caſes.

ARRESTO facto super bonis, &c. a writ brought by a denizen againſt the goods of aliens found within this kingdom, as a recompenſe for goods taken from him in a foreign country.

ARRESTS, in farriery, mangy tumours upon a horſe's hinder-legs, between the ham and the paſtern.

ARRHABONARII, a ſect of Chriſtians, who held that the euchariſt is neither the real fleſh or blood of Chriſt, nor yet the ſign of them; but only the pledge or earneſt thereof.

ARRHEPHORIA, a feaſt among the Athenians, inſtituted in honour of Minerva, and Herſe daughter of Cecrops. The word is compounded of *αρρητον myſtery*, and *φερω I carry*; on account of certain myſterious things which were carried in proceſſion at this ſolemnity.—Boys, or, as ſome ſay, girls, between ſeven and twelve years of age were the miniſters that aſſiſted at this feaſt, and were denominated *αρρηφοροι*. This feaſt was alſo called *Herſiphoria*, from the daughter of Cecrops, already mentioned.

ARRIERE, the hinder or poſterior part of any thing.

ARRIERE *Ban*, in the former French cuſtoms, was a general proclamation, whereby the king ſummoned to the war all that held of him, both his vaſſals, i. e. the nobleſſe, and the vaſſals of his vaſſals.

ARRIERE, *Fee*, or *Fief*, is a fee dependent on a ſuperior one. Theſe fees commenced, when the dukes and counts, rendering their governments hereditary in their families, diſtributed to their officers parts of the royal domains which they found in their reſpective provinces, and even permitted thoſe officers to gratify the ſoldiers under them in the ſame manner

ARROBAS, or AROBAS, a weight uſed in Spain, Portugal, and the foreign dominions of both. The Arrobas of Portugal is alſo called *Arata*, and contains thirty-two Liſbon pounds; that of Spain contains twenty-five Spaniſh pounds. In Peru it is called *Arroue*.

ARROE, a ſmall iſland in Denmark, in the Baltic Sea; E. long. 9. 40. N. lat. 55. 20.

ARROJO, DE ST. SERVAN, a town of Spain, in Eſtramadura. W. long. 5. 20. N. lat. 38. 40.

ARRONDEE, in heraldry, a croſs, the arms of which are compoſed of ſections of a circle, not oppoſite to each other, ſo as to make the arms bulge out thicker in one part than another; but the ſections of each arm lying the ſame way, ſo that the arm is every where of an equal thickneſs, and all of them terminating at the edge of the eſcutcheon like the plain croſs.

ARROW, a miſſive weapon of offence, ſlender, pointed, and barbed, to be ſhot with a bow. See ARCHERY.

ARROW-*Makers*, formerly called *fletchers*; were, as well as bowyers, perſons of great conſequence in the commonwealth. By law it was required, that arrow-heads and quarrels were to be well boched or braſed, and hardened at the points with ſteel: and the doing of this ſeems to have been the buſineſs of the arrow-ſmith.

ARROW-*Head*, in botany. See SAGITTARIA.

ARROW-*Root*. See MARANTA.

ARSCHIN, in commerce, a long meaſure uſed in China to meaſure ſtuffs. Four arſchins make three yards of London.

ARSENAL, a royal or public magazine, or place appointed for the making and keeping of arms, neceſſary either for defence or aſſault. The derivation of this word has been variouſly repreſented, but it moſt probably comes from the Arabic *darſenaa*, which ſignifies *arſenal*. The arſenal of Venice is the place where the galleys are built and laid up. The arſenal of Paris is that where the great guns are caſt. There are arſenals, or ſtore-houſes, appropriated to naval furniture and equipments. At Marſeilles is the arſenal for the galleys; and at Toulon, Rochfort, and Breſt, are thoſe for the men of war.

ARSENIC, *arſenicum*, in mineralogy and chemiſtry, an heavy mineral ſubſtance, volatile and uninflammable, which gives a whiteneſs to ſeveral metals in fuſion, and proves extremely cauſtic, or corroſive, to animals, ſo as to become a violent poiſon. The word is compounded of *ανηρ man*, or *αρσην male*, and *νικαω I kill*, alluding to its poiſonous quality.

Arſenic is dug out of mines in Saxony, near Goſlar; in Bohemia, in the valley of Joachim; and in England, in the Mendip hills, in great quantities. All the three kinds of *arſenic* are extracted from it; and it likewiſe ſerves to make *zaffera*, uſed by potters in giving a blue colour to their veſſels; and the *encauſtum cæruleum*, or that kind of blue ſometimes uſed by painters; and often by women, to mix with their ſtarch. The way to make all theſe is taught by Kunckel, in his Art of making Glaſs. *Arſenic* is alſo collected by ſublimation from COBALT: the method of which, as practiſed in Hungary, is given us in the Philoſophical Tranſactions, No. 293. From what remains of the *cobalt*, they make SMALT.

Arſenic conſiſts of an acid ſalt, and a kind of mercurial metallic ſubſtance, which diſcovers itſelf when it is diſtilled in a retort, mixed with ſoap, ſuet, oil, or any fat or oily ſubſtance: for with a ſtrong degree of fire, the *arſenic* will be raiſed into the neck of the retort in a metallic form, like *antimony*. The ſulphur contained in *arſenic* is in ſo ſmall a proportion, that it does not flame when caſt on burning coals; though *cobalt* contains a great quantity of ſulphur, which conſequently has been ſeparated from the *arſenical* parts in the calcination and deflagration, and ſo evaporated; but the ſmell of *arſenic* proves, that ſome ſulphur ſtill remains in it. It is very volatile; for if any quantity of it be put into a crucible, and ſet over a fire, it neither burns, nor perfectly melts, but it will preſently evaporate in white fumes, without leaving any reſidue. *Arſenic* is attracted with a different force by different metals, and attracts them reciprocally. Of all metals, it abſorbs iron moſt greedily; after this, copper, tin, lead, ſilver, and gold, in this order of ſucceſſion; therefore, all metals may be freed from the foulneſs of *arſenic* by iron. The *ſcoriæ* may be uſed for this purpoſe in fuſion, in an open fire; for though they do not produce this effect as *ſcoriæ*, yet here being reduced to iron again, they act in the ſame manner as if pure iron had been put in. Lead mixed with *arſenic*, and expoſed to the fire, is, in great part, immediately carried away in form of a thick ſmoke; the remainder is a glaſs of a fine ſaffron colour. Silver is alſo penetrated by *arſenic* in the ſame manner, and loſes its malleability; but the *arſenic* vaniſhes from it in a ſtrong fire, in the form of a ſmoke. Gold, penetrated by *arſenic*, becomes very brittle, and loſes its colour; and, being ſuddenly thrown into a violent fire, part of it is ſublimed.

The ſmalleſt quantity of *cryſtalline arſenic* being mixed with any metal renders it friable, and abſolutely deſtroys its malleability. Hence the refiners dread nothing ſo much as *arſenic* in their metals; nor could any thing be ſo advantageous to them, were ſuch a thing to be had, as a *menſtruum* that would abſorb, or act on *arſenic* alone, for then their metals would be readily purified, without flying off, or evaporating. A ſingle grain of *arſenic* will turn a pound of copper into a beautiful white metal, called *alchemy*, looking like ſilver. This hint many perſons have endeavoured to improve on, for making ſilver, but in vain, as the mixture could never be brought to ſuſtain the hammer.

The chemiſts furniſh ſeveral preparations of *arſenic*, in which its deleterious properties are ſaid to be corrected. Theſe chiefly turn on repeated ablutions and ſublimations. Mr. Boyle mentions a balſam made of *arſenic*, with nitre and ſpirit of wine, or vinegar, as efficacious in the cure of venereal ulcers. Dr. Cheyne mentions pills made of *arſenic*, as uſed for the cure of obſtinate quartans: and in fact, it has lately been adopted by many phyſicians for this particular purpoſe. Surgeons have alſo employed it in the cure of cancers; and various formulæ,

into which *arſenic* enters as an ingredient, are to be found in the *pharmacopœia chirurgica*. It is doubtful, however, whether the uſe of this remedy has done more good or harm in the trials that have been made.

Arſenic is applied to many mechanical purpoſes. It is uſed by dyers, as an ingredient in their compoſition for ſcarlets, and other fine red colours; by goldſmiths, for enamelling; by makers of glaſs, for promoting the fuſion of frit, and the tranſparency of glaſs; by potters, for a white glazing; by aſſayers, in form of glaſs, for promoting the ſcorification of ores which contain tin and antimony, for the preparations of compound metals, and for whitening copper and braſs. Neumann obſerves, that a beautiful metal, like the fineſt ſteel, may be made by melting caſt iron with *arſenic*, glaſs, and a little tin; and that a metal reſembling ſilver may be made from iron, tin, *arſenic*, and perhaps a little copper. Mr. Brandt (Act. Upſal. 1733) propoſes to make a varniſh for ſhips of *arſenic*, with pitch, ſulphur, or roſin, to preſerve the timber from rotting, and from worms. *Arſenic* is by ſome ranked in the claſs of *ſulphurs*. There are divers kinds of *arſenics*, viz. yellow, red, and cryſtalline or white. Many abſurd remedies have been propoſed as antidotes againſt this very active poiſon; but the fact is, that nothing hitherto diſcovered has proved equal to the taſk. The moſt rational ſcheme, perhaps, is the attempt to decompoſe it in the ſtomach by ſwallowing fixed alkali in conſiderable quantity.

ARSENIC, *native*, called ORPIMENT, is of a yellow or orange colour; whence it is alſo denominated *auripigmentum*. There is, beſides this, a yellow factitious *arſenic*, made of white *arſenic*, ſublimed with one tenth of its weight of ſulphur: with one fifth it becomes red. Both the yellow and the red foſſil *arſenics*, when of a red texture, are called *zarnichs*; but when compoſed of ſmall ſcales or leaves, they are called *auripigmenta*.

ARSENIC, *regulus of*, is the moſt fixed and compact part thereof, prepared by mixing white *arſenic* with pot-aſhes and ſoap, then fuſing the whole, and caſting it into a mortar; upon which the heavieſt part, which is the regulus, falls to the bottom.

ARSENIC, *cauſtic oil of*, is a butyrous liquor, like butter of antimony, prepared of *arſenic* and corroſive ſublimate, being a combination of marine acid with the *arſenic*. Surgeons employ it to eat off fungous excreſcences, and to deſtroy carious bone, &c.

ARSENICAL MAGNET, *magnes arſenicalis*, is a preparation of antimony, with ſulphur and white *arſenic*.

ARSENOTHELYS, among *Antient Naturaliſts*, the ſame with hermaphrodite.

ARSHOT, a town of the Auſtrian Netherlands. E. long. 4. 45. N. lat. 51. 5.

ARSIS *and* THESIS, in muſic, is a term applied to compoſitions in which one part riſes and the other falls.

ARSMART, in botany. See PERSICARIA.

ARSON, in Engliſh law, is the malicious and wilful burning of the houſe or out-houſe of another man; which is felony at common law. This is an offence of very great malignity, and much more pernicious to the public than ſimple theft; becauſe, firſt, it is an offence againſt that right of habitation which is acquired by the law of nature as well as by the laws of ſociety: next, becauſe of the terror and confuſion that neceſſarily attend it; and, laſtly, becauſe in ſimple theft, the thing ſtolen only changes its maſter, but ſtill remains *in eſſe* for the benefit of the public; whereas, by burning, the very ſubſtance is abſolutely deſtroyed. It is alſo frequently more deſtructive than murder itſelf, of which too it is often the cauſe: ſince murder, atrocious as it is, ſeldom extends beyond the felonious act deſigned, whereas fire too frequently involves in the common calamity perſons unknown to the incendiary, and not intended to be hurt by him, and friends as well as enemies.

ARSURA, in ancient cuſtoms, a term uſed for the melting of gold or ſilver, either to refine them, or to examine their value. The method of doing this is explained at large in the Black Book of the Exchequer, aſcribed to Gervaiſe, in the chapter *De Officio Militis Argentarii*, being in thoſe days of great uſe, on account of the various places and different manners in which the king's money was paid.

ARSURA alſo ſignified the loſs or diminution of the metal in the trial. In this ſenſe, a pound was ſaid *tot ardere denarios*, to loſe ſo many penny-weights.

ARSURA is alſo a name given to the duſt and ſweepings of ſilver-ſmiths, when melted together.

ART is defined to be a habit of the mind preſcribing rules for the due production of certain effects; or the introducing the changes of bodies from ſome fore-knowledge and deſign in a perſon endued with a principle or faculty of acting. The word *art* is derived from αρος, *utility, profit*; and is found in that ſenſe in Æſchylus. According to lord Bacon, it is a proper diſpoſition of the things of nature by human thought and experience, ſo as to make them anſwer the deſigns and uſes of mankind.

Some uſeful arts muſt be nearly coeval with the human race; for food, clothing, and habitation, even in their original ſimplicity, require ſome art. Many other arts are of ſuch antiquity as to place the inventors beyond the reach of tradition. Several have gradually crept into exiſtence without an inventor. The buſy mind, however, accuſtomed to a beginning in things, cannot reſt till it finds or imagines a beginning to every art. The moſt probable conjectures of this nature the reader may ſee in the hiſtorical introductions to the different articles.

Nature, according to lord Bacon, is ſometimes free, and at her own diſpoſal; and then ſhe manifeſts herſelf in a regular order; as we ſee in the heavens, plants, animals, &c. Sometimes ſhe is irregular and diſorderly, either through ſome uncommon accident, or depravation in matter, when the reſiſtance of ſome impediment perverts her from her courſe; as in the production of monſters. At other times ſhe is ſubdued and faſhioned by human induſtry, and made to ſerve the ſeveral purpoſes of mankind. This laſt is what we call *art*; in which ſenſe, *art* ſtands oppoſed to *nature*. Hence the knowledge of nature may be divided into the hiſtory of *generation*, of *praeter-generation*, and of *arts*. The firſt conſiders NATURE at *liberty*; the ſecond, her *errors*; and the third, her *reſtraints*.

ART is alſo uſed for ſcience, or knowledge reduced into *practice*. Several of the ſchoolmen hold logic and ethics to be *arts*; in as much as they do not terminate in mere *theory*, but tend to *practice*. In this ſenſe ſome branches of the mathematics alſo are *arts*; others, matters of *doctrine*, or *ſcience*. *Statics* is wholly ſcientifical, as it comprehends the mere contemplation of motion: *mechanics*, on the contrary, is an *art*, as it reduces the doctrine of *ſtatics* into practice.

ART is more commonly uſed to denote a certain ſyſtem or collection of rules, precepts, and inventions or experiments, which being duly obſerved, make the things a man undertakes ſucceed, and render them advantageous and agreeable. In this ſenſe, *art* is oppoſed to *ſcience*, which is a collection of ſpeculative principles and concluſions. According to the foregoing definition, arts may be divided into *active* and *effective*, ſuch as leave no external effect after their operation, as dancing, fiddling, &c. are called *active* or *practical arts*: thoſe which do leave an effect behind them, as painting, &c. are called *effective arts*.

Farther, with reſpect to their ſcope and object, they may be divided into *human*, as *medicine*; and *divine*, as *theology*.

Human arts again may be ſubdivided into *civil*, as *law*, *politics*, &c. *military*, as *fortification*, &c. *phyſical*, as *agriculture*, *chemiſtry*, *anatomy*, &c. *metaphyſical*, as *logic*, pure *mathematics*, &c. *philological*, as *grammar*, *criticiſm*, &c. *mercantile*, to which belong the *mechanical arts* and *manufactures*. But *arts* are more properly divided into *liberal* and *mechanical*; *liberal arts* are thoſe that are noble, and *ingenious*; or which are worthy of being cultivated without any immediate regard to the lucre ariſing from them. Such are *poetry*, *muſic*, *painting*, *grammar*, *rhetoric*, the *military art*, *architecture*, and *navigation*. *Mechanical arts*, are thoſe, wherein the hand and body are more concerned than the mind; and which are chiefly cultivated for the ſake of the profit attending them. Of this kind are moſt of thoſe that furniſh us with the neceſſaries of life, and are popularly known by the name of trades: ſuch are *weaving*, *turnery*, *brewing*, *maſonry*, *clock-making*, *joincry*, &c.

The *mechanical arts* take their denomination from μηχανη *machine*; as being all practiſed by means of ſome machine or inſtrument. With the *liberal arts* it is otherwiſe; there being ſeveral of them which may be learnt and practiſed without any inſtrument at all; as *logic*, *eloquence*, *medicine*, properly ſo called, &c. The *arts* which relate to the ſight and hearing, lord Bacon obſerves, are reputed *liberal*, beyond thoſe which regard the other ſenſes, and are chiefly employed in matters of luxury: theſe are uſually called the *fine arts*; ſuch are *poetry*, *painting*, *ſculpture*, *muſic*, *gardening*, and *architecture*. Uſeful arts will never be neglected in a country where there is any police; for every man finds his account in them. Fine arts are more precarious. They are not reliſhed but by perſons of taſte, who are rare; and ſuch as can ſpare great ſums for ſupporting them are ſtill more rare. For that reaſon, they will never flouriſh in any country, unleſs patronized by the ſovereign, or by men of power and opulence. They merit ſuch patronage, as one of the ſprings of government; and a capital ſpring they make, by multiplying amuſements, and humanizing manners; upon which account they have always been encouraged by good princes. It has been well remarked by philoſophers, that, during the riſe and growth of ſtates, the *military arts* chiefly flouriſh; when arrived at their height, the *liberal arts*; and when in a declining ſtate, the *voluptuary arts*.

There are alſo divers particular *arts*; the *art* of *memory*, the *art of deciphering*, the *art* of *ſwimming*, the *art* of *diving*, &c. Democritus maintained, that men learnt all their *arts* from brutes; that the *ſpider* taught them *weaving*; the *ſwallow*, *building*; the *nightingale*, *muſic*, &c.

The progreſs of the arts ſeldom fails to be rapid, when a people happen to be roufed out of a torpid ſtate by ſome fortunate change of circumſtances. Proſperity, contrafted with former abaſement, gives to the mind a ſpring, which is vigorouſly exerted in every new purſuit. The Athenians made but a mean figure under the tyranny of Piſiſtratus; but upon regaining freedom and independence, they were converted into heroes. Miletus, a Greek city of Ionia, being deſtroyed by the king of Perſia, and the inhabitants made ſlaves, the Athenians, deeply affected with the miſery of their brethren, boldly attacked the king in his own dominions, and burnt the city of Sardis. In leſs than 10 years after, they gained a ſignal victory at Marathon; and, under Themiſtoeles, made head againſt that prodigious army with which Xerxes threatened utter ruin to Greece. Such proſperity produced its uſual effect; arts flouriſhed with arms, and Athens became the chief theatre for ſciences, as well as for fine arts. The reign of Auguſtus Cæſar, which put an end to the rancour of civil war, and reſtored peace to Rome, with the comforts of ſociety, proved an auſpicious æra for literature; and produced a cloud of Latin hiſtorians, poets, and philoſophers, to whom the moderns are indebted for their taſte and talents. One who makes a figure rouſes emulation in all: one catches fire from another, and the national ſpirit is every where triumphant: claſſical works are compoſed, and uſeful diſcoveries made in every art and ſcience.

ART is alſo an appellation given to ſeveral ſuperſtitious practices, ſuch as curing wounds by touching the linen that covered them, &c. Theſe were called *St. Anſelhm's art*, *St. Paul's art*, &c.

ART *and Part*, is a phraſe uſed in the north of England, and in Scotland. When any one is charged with a crime, they ſay he is *art and part* in committing the ſame; that is, he was concerned both in the contrivance and in the execution of it. See ACCESSORY.

ARTA, by ſome called *Larta*, a town of Lower Albania, in Turkey in Europe. E. long. 31. 30. N. lat. 39. 28.

ARTABA, an ancient meaſure of capacity uſed by the Perſians, Medes, and Egyptians. The Perſian artaba is repreſented by Herodotus as bigger than the Attic medimnus by three Attic chœnixes: from which it appears that it was equal to $6\frac{2}{3}$ Roman modii; conſequently, that it contained $166\frac{2}{3}$ pounds of wine or water, or $126\frac{2}{3}$ pounds of wheat. The Egyptian artaba contained five Roman modii, and fell ſhort of the Attic medimnus by one modius; conſequently held $133\frac{1}{3}$ pounds of water or wine, 100 pounds of wheat, or 60 of flour.

ARTEDIA, in botany, a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The involucra are pinnatifid; the floſcules of the diſc are maſculine; and the fruit is hiſpid with ſcales. There is but one ſpecies, the *ſquamata*, with ſquamoſe ſeeds, a native of the Eaſt: Rewvolf found it growing on mount Libanus. It is an annual plant, whoſe ſtalks riſe about two feet high, ſending out a few ſide-branches, which are garniſhed with narrow compound leaves, reſembling thoſe of dill; the extremity of the ſtalk is terminated by a large umbel of white flowers, compoſed of five unequal petals. Theſe are ſucceeded by roundiſh compreſſed fruit, each having two ſeeds, whoſe borders are ſcaly.

ARTEMISIA, MUGWORT, SOUTHERNWOOD, and WORMWOOD; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-nucamentaceæ*. The receptacle is either naked or a little downy; it has no pappus; the calyx is imbricated with roundiſh ſcales; and the corolla has no radii. The *ſpecies* are 23; of which the moſt noted are the following. 1. The *vulgaris*, or common mugwort, which grows naturally by the ſides of foot-paths in many parts of Britain, and flowers in June. 2. The *dracunculus*, or tarragon, which is frequently uſed in ſallads, eſpecially by the French, is a very hardy plant, and ſpreads greatly by its creeping roots. 3. The *abrotanum*, or ſouthernwood, which is kept in gardens for the ſake of its agreeable ſcent, is a low ſhrub, univerſally known. 4. The *ſantonicum*, which produces the ſemen ſantonicum, formerly given as an anthelmintic. It grows naturally in Perſia, from whence the ſeeds are brought to Europe; and has the appearance of our wild mugwort. 5. The *maritima*, or ſea-wormwood, grows naturally on the ſea coaſts in moſt parts of Britain, where there are ſeveral varieties, if not diſtinct ſpecies, to be found. 6. The *pontica*, commonly called *Roman wormwood*, is a low herbaceous plant, garniſhed with finely-divided leaves, whoſe under-ſides are woolly; and the upper part of the ſtalks furniſhed with globular flowers. 7. The *abſinthium*, or common wormwood, grows naturally in England in uncultivated places, and is too well known to require any deſcription. 8. The *arboreſcens*, or tree-wormwood, grows naturally in Italy and the Levant near the ſea, and riſes,

with a woody ſtalk, ſix or ſeven feet, ſending out many ligneous branches, garniſhed with leaves ſomewhat like thoſe of the common wormwood, but whiter. The branches are terminated by ſpikes of globular flowers in the autumn, which are ſeldom ſucceeded by ſeeds in this country. Southernwood and ſantonicum are propagated by ſlips or cuttings planted in a ſhady border about the beginning of April, obſerving to water them duly in dry weather. The true wormwood is eaſily propagated in the ſame manner. In autumn ſome of the young plants ſhould be potted, that they may be ſheltered in winter; the others may be planted in a warm border, where they will live, provided the winter proves favourable. The other ſorts ſpread by their creeping roots, and will thrive any where. The ſeeds of the ſantonicum, as we have already ſaid, were once famed for their antheimintic virtues, when taken with melaſſes or ſugar. They are not very often met with genuine in the ſhops, nor indeed are they much to be depended on for medical purpoſes. The leaves of the ſea, common, and Roman wormwoods, are uſed as ſtomachics, but are all very naufeous and diſagreeable. The leaves of the vulgaris, which have a light aromatic ſmell, and an herbaceous bitteriſh taſte, were formerly celebrated as an uterine and antihyſteric remedy; but the London College have long ſince rejected it from their pharmacopœia. The *moxa*, ſo famous in the eaſtern countries for curing the gout by burning it on the part affected, is the lanugo or down growing on the under ſide of the leaves of a ſpecies of mugwort, ſuppoſed to be the ſame with our common ſort.

ARTERIOTOMY, the opening an artery, with deſign to procure an evacuation of blood. See SURGERY.

ARTERY, in anatomy, a conical tube or canal which conveys the blood from the heart to all parts of the body. See ANATOMY.

ARTHRITIS, in medicine, the GOUT. See MEDICINE.

ARTHRODIA, in natural hiſtory, a genus of imperfect cryſtals, found always in complex maſſes, and forming long ſingle pyramids, with very ſhort and ſlender columns.

ARTHRODIA, in anatomy, a ſpecies of articulation, wherein the flat head of one bone is received into a ſhallow ſocket in the other. The humerus and ſcapula are joined by this ſpecies of articulation.

ARTHUR, the celebrated hero of the Britons, is ſaid to have been the ſon of Uther Pendragon, king of Britain, and to have been born in 501. His life is a continued ſcene of wonders. It is ſaid that he killed four hundred and ſeventy Saxons with his own hand in one day; and after having ſubdued many mighty nations, and inſtituted the order of the Knights of the Round Table, died A. D. 542, of wounds which he received in battle. The moſt particular detail of his ſtory and his exploits is that given by Geoffrey of Monmouth: but the probable is there ſo blended with the marvellous and the extravagant, that not only the truth of the whole, but even the reality of Arthur's exiſtence, has been called in queſtion. Mr. Whittaker, however, has taken much pains to vindicate the exiſtence, and diſcriminate between the real and the fabulous tranſactions, of the Britiſh worthy.

ARTHUR'S *Seat*, a high hill in the neighbourhood of Edinburgh, ſaid to have been ſo denominated from a tradition that king Arthur ſurveyed the country from its ſummit, and had alſo defeated the Saxons in its neighbourhood.

ARTICHOAK, in botany. See CINARA.

ARTICLE, a clauſe or condition of a contract, treaty, &c. It is alſo a ſmall part or diviſion of a diſcourſe, book, or writing, &c.

ARTICLE *of Death*, the laſt pangs or agony of one juſt expiring.

ARTICLE *of Faith*, is by ſome defined a point of Chriſtian doctrine, which we are obliged to believe, as having been revealed by God himſelf, and allowed and eſtabliſhed as ſuch by the church. The thirty-nine articles are founded, for the moſt part, upon a body of articles compiled and publiſhed in the reign of Edward VI. They were firſt paſſed in the convocation, and confirmed by royal authority in the year 1562. They were afterwards ratified anew in the year 1571, and again by Charles I. The law requires a ſubſcription to theſe articles of all perſons ordained to be deacons or prieſts, 13 El. cap. 12. of all clergymen inducted to any eccleſiaſtical living, by the ſame ſtatute, and of licenſed lecturers and curates, 13 El. cap. 12. and 13 and 14 Ch. II. cap. 4. of the heads of colleges, of chancellors, officials and commiſſaries, and of ſchool-maſters. By 1 Will. and Mary, cap. 18. diſſenting teachers were to ſubſcribe all, except the 34th, 35th, and 36th, and part of the 20th (and in the caſe of Anabaptiſts, except alſo part of the 27th); otherwiſe they were exempted from the benefits of the act of toleration: but this clauſe was repealed in 1779, by 19 Geo. III.

ARTICLE, in grammar, denotes a particle uſed in moſt languages for the declining of nouns, and denoting their ſeveral caſes and genders. The uſe of articles ariſes chiefly hence, that in languages which have no different terminations, to expreſs the different ſtates and circumſtances of nouns, there is ſomething required to ſupply that office. The Latins have no articles; but the Greeks, and moſt of the modern languages, have had recourſe to them, for fixing and aſcertaining the vague ſignification of common and appellative names. The Greeks have their ο, the eaſtern tongues their *he emphaticum*; the Italians their *il*, *lo*, and *la*. The French their *le*, *la*, and *les*. The Germans their *der*, *das*, *dat*. The Engliſh alſo have two articles *a* and *the*; which being prefixed to ſubſtantives, apply their general ſignification to ſome particular things. Some grammarians make the article a diſtinct part of ſpeech; others will have it a pronoun, and others a noun adjective. (See GRAMMAR.) Articles are of great ſervice in a language, as they contribute to the more neat and preciſe expreſſing of ſeveral properties and relations, which muſt otherwiſe be loſt. And hence one great advantage of ſuch languages over the Latin, is, that the article being either expreſſed or left out, makes an alteration in the ſenſe, which the Latins cannot diſtinguiſh. Thus, when the devil ſaid to our Saviour, *Si tu es Filius Dei*, it may either be underſtood "if thou art *a* ſon of God," or, "if thou art *the* ſon of God." The Italians even prefix articles to proper names, which do not naturally need any, becauſe they themſelves ſignify things individually. Thus they ſay, *il Arioſto*, *il Taſſo*, *il Petrarcha*. Even the French join the article to the proper names of kingdoms, provinces, &c. as *la Suede*, *la Normandie*. And we likewiſe annex it to the names of certain mountains and rivers; as the *Rhine*, the *Danule*, the *Alps*, &c.

ARTICULATE SOUNDS, are ſuch ſounds as expreſs the letters, ſyllables, or words, of any alphabet or language: ſuch are formed by the human voice, and by ſome few birds, as parrots, &c.

ARTICULATION, or JOINTING, is the joining of bones together. See ANATOMY.

ARTICULATION, in botany, is the connection of parts that conſiſt of joints or knees, ſuch as the pods of French honeyſuckles, which when ripe divide into ſo many parts as there are knees or joints; alſo thoſe parts of plants which ſwell into nodes or joints, and which uſually ſend forth branches.

ARTIFICER, a perſon whoſe employment it is to manufacture any kind of commodity, as in iron, braſs, wood, &c. ſuch are ſmiths, braziers, carpenters, &c. The Roman artificers had their peculiar temples, where they aſſembled and choſe their own patron to defend their cauſes; and they were exempted from all perſonal ſervices. Taruntenus Paternus rec

kons 32 ſpecies of artificers, and Conſtantine 35, who enjoyed this privilege. The artificers were incorporated into divers colleges or companies, each of which had their tutelar gods, to whom they offered their worſhip. Several of theſe, when they quitted their profeſſion, hung up their tools, a votive offering to their gods. Artificers were held a degree below merchants, and *argentarii* or money-changers, and their employment more ſordid.—By the Engliſh laws, artificers in wood, iron, ſteel, braſs, or other metals, going out of the kingdom into any foreign country without licence, are to be impriſoned three months, and fined in a ſum not exceeding one hundred pounds. And ſuch as going abroad, and not returning on warning given by our ambaſſadors, &c. ſhall be diſabled from holding lands by deſcent or deviſe, from receiving any legacy, &c. and be deemed aliens. Stat. 5 Geo. I. cap. 27. By 23 Geo. II. cap. 13. § 1. penalty is alſo inflicted on ſeducing artificers to go abroad.

ARTIFICIAL, in a general ſenſe, denotes ſomething made, faſhioned, or produced by art, in contradiſtinction from the productions of nature. The term is alſo uſed for *factitious*. Thus we have artificial ſal ammoniac, artificial borax, &c.

Artificial *Fire-works* are compoſitions of inflammable materials, chiefly uſed on ſolemn occaſions, by way of rejoicing. See Pyrotechny.

Artificial *Lightning*. See Electricity & Lightning.

Artificial *Lines*, on a ſector or ſcale, are certain lines ſo contrived, as to repreſent the logarithmic ſines and tangents; which, by the help of the line of numbers, will ſolve all queſtions in trigonometry, navigation, &c. pretty exactly.

Artificial *Magnets*. See Magnets.

ARTILLERY, the heavy equipage of war; comprehending all ſorts of large fire arms, with their appurtenances; as cannon, mortars, howitzers, balls, ſhells, petards, muſquets, carbines, &c. being what is otherwiſe called *Ordnance*. The term is alſo applied to the larger inſtruments of war uſed by the antients, as the catapult, baliſta, battering ram, &c.

The term *Artillery*, or *Royal Artillery*, is alſo applied to the perſons employed in that ſervice; and likewiſe to the art or ſcience itſelf; and formerly it was uſed for what is otherwiſe called *pyrotechnia*, or the art of fire-works, with the apparatus and inſtruments belonging to the ſame.

There have been many authors on the ſubject of artillery; the principal of which are, Bucherius, Braunius, Tartalea, Collado, Sardi, Ufano, Hanzelet, Digges, Moretti, Simienowitz, Mieth, d'Avelour, Maneſſon, Mallet, St. Julien; and the later authors, of ſtill more conſequence, are Belidor, St. Remy, le Blond, Valiere, Morogue, Puget, Coudray, Robins, Muller, Antoni, Tignola, Scheele; to which may be added the extenſive and accurate experiments publiſhed in Dr. Hutton's volume of Tracts, and in the Philoſ. Tranſ. for 1778.

Park of Artillery, is that place in a camp which is ſet apart for the Artillery, or large fire arms.

Traile or *Train* of Artillery, a number of pieces of ordnance, mounted on carriages, with all their furniture fit for marching. To this commonly belong mortars, cannon, balls, ſhells, &c.—There are trains of Artillery in moſt of the royal magazines; as in the Tower, at Portſmouth, Plymouth, &c. but, above all, at Woolwich, from whence the ſhips commonly receive their ordnance, and where they are all completely proved before they are received into the public ſervice.

The offices and men of the artillery were formerly called alſo the train of artillery, but are now called the royal regiment of artillery; conſiſting at preſent of four battalions, beſides a battalion of invalids, and four troops of horſe or cavalry artillery.

Artillery-*Company*, a band of infantry, conſiſting of 600 men, making part of the militia or city-guard of London.

ARTIST, in a general ſenſe, a perſon ſkilled in ſome art, or, according to Mr. Harris's definition, a perſon poſſeſſing an habitual power of becoming the cauſe of ſome effect, according to a ſyſtem of various and well-approved precepts. Evelyn tells us of a privilege granted at Vicenza to artiſts, like that of *clergy* in England; in virtue whereof, criminals adjudged to death ſaved their lives if they could prove themſelves the moſt excellent and conſummate workmen in any uſeful art.

Artist, *Artiſta*, in an academical ſenſe, denotes a philoſopher or proficient in the faculty of arts. In the early ages of univerſities, the ſeven liberal arts completed the whole courſe of ſtudy, or philoſophy, as it was called; whence the maſters of this faculty were denominated *Artiſts*. What they underſtood by the liberal arts uſed to be ſummed up in the following Latin verſe:—

Lingua, Tropus, Ratio, Numerus, Tonus, Angulus, Aſtra.

Artist is a term more peculiarly uſed, by Paracelſus and other adepts, for a chemiſt or alchemiſt.—We find frequent mention, in authors of this claſs, of Elias Artiſta, or Elias the artiſt, who is to come ſome time before the diſſolution of the world, and make perfect all arts and ſciences, but eſpecially the gold-making art, &c.

ARTOCARPUS, from αρτος *bread*, and καρπος *fruit*, the bread-fruit tree; a genus of the monandria order, belonging to the monœcia claſs of plants. It has a cylindric amentum or catkin, which thickens gradually, and is covered with flowers; the male and female in a different amentum. In the *male*, the calyx is two-valved, and the corolla is wanting. In the *female*, there is no calyx nor corolla; the ſtylus is one, and the drupa is many-celled.

Though this tree has been mentioned by many voyagers, particularly by Dampier, by Rumphius, and by Lord Anſon, yet very little notice ſeems to have been taken of it till the return of Captain Wallis from the South Seas, and ſince that time by others who have touched at Otaheite and ſome countries in the Eaſt Indies. Captain Cook, in his voyage, obſerves, that this fruit not only ſerves as a ſubſtitute for bread among the inhabitants of Otaheite and the neighbouring iſlands, but alſo, variouſly dreſſed, compoſes the principal part of their food. It grows on a tree that is about the ſize of a middling oak (ſee Pl. 30.); its leaves are frequently a foot and a half long, of an oblong ſhape, deeply ſinuated like thoſe of the fig-tree, which they reſemble in colour and conſiſtence, and in the exſuding of a milky juice upon being broken. The fruit is about the ſize and ſhape of a new-born child's head; and the ſurface is reticulated, not much unlike a truffle; it is covered with a thin ſkin, and has a core about as big as the handle of a ſmall knife. The eatable part lies between the ſkin and the core; it is as white as ſnow, and ſomewhat of the conſiſtence of new bread; it muſt be roaſted before it is eaten, being firſt divided into three or four parts; its taſte is inſipid, with a ſlight ſweetneſs ſomewhat reſembling that of the crumb of wheaten bread mixed with a Jeruſalem artichoke. This fruit is alſo cooked in a kind of oven, which renders it ſoft, and ſomething like a boiled potatoe; not quite ſo farinaceous as a good one, but more ſo than thoſe of the middling ſort. Of the bread-fruit they alſo make three diſhes, by putting either water or the milk of the cocoa-nut to it, then beating it to a paſte with a ſtone peſtle, and afterwards mixing it with ripe plantains, bananas, or the ſour paſte which they call *mahie*.

The mahie, which is likewiſe made to ſerve as a ſucceda-neum for ripe bread-fruit before the ſeaſon comes on, is thus made: the fruit of the bread-tree is gathered juſt before it is perfectly ripe; and being laid in heaps, is cloſely covered with leaves: in this ſtate it undergoes a fermentation, and becomes diſagreeably ſweet; the core is then taken out entire, which is done by gently pulling out the ſtalk, and the reſt of the fruit is thrown into a hole which is dug for that purpoſe generally in

the houſes, and neatly lined in the bottom and ſides with graſs: the whole is then covered with leaves and heavy ſtones laid upon them; in this ſtate it undergoes a ſecond fermentation, and becomes ſour, after which it will ſuffer no change for many months. It is taken out of the hole as it is wanted for uſe; and being made into balls, it is wrapped up into leaves and baked: after it is dreſſed, it will keep five or ſix weeks. It is eaten both cold and hot; and the natives ſeldom make a meal without it, though to Europeans the taſte is as diſagreeable as that of a pickled olive generally is the firſt time it is eaten. The fruit itſelf is in ſeaſon eight months in the year, and the maize ſupplies the inhabitants during the other four.

To procure this principal article of their food (the bread-fruit), coſts theſe happy people no trouble or labour except climbing up a tree. The tree which produces it does not indeed grow ſpontaneouſly; but if a man plants ten of them in his life-time, which he may do in about an hour, he will as completely fulfil his duty to his own and future generations, as the native of our leſs temperate climate can do by ploughing in the cold of winter, and reaping in the ſummer's heat, as often as theſe ſeaſons return; even if, after he has procured bread for his preſent houſehold, he ſhould convert a ſurplus into money, and lay it up for his children.

There are two ſpecies of artocarpus, viz. the inciſus with gaſhed leaves; and the integrifolia, with entire leaves. There is alſo ſaid to be another diſtinction, into that which bears fruit with ſtones or ſeeds, and that in which the fruit has none. The parts of fructification of that tree which bears the fruit without ſtones are defective. The amentum, or catkin, which contains the male parts, never expands. The ſtyli, or female part of the fruit, are likewiſe deficient. From which it follows, that there can be no ſtones or ſeeds, and therefore that this tree can be propagated only by ſuckers or layers; although it is abundantly evident, that it muſt originally have proceeded from the ſeed-bearing bread-fruit tree. Inſtances of this kind we ſometimes find in European fruits; ſuch as the barberry, and the Corinthian grape from Zant commonly called *currants*, which can therefore be increaſed only by layers and cuttings. Dr. Solander was aſſured by the oldeſt inhabitants of Otaheite and the adjoining iſlands, that they well remember there was formerly plenty of the ſeed-bearing bread-fruit; but they had been neglected upon account of the preference given to the bread-fruit without ſeeds, which they propagate by ſuckers.

ARTOIS, a late province of the French Netherlands, now included in the department of the ſtraits of Calais. It is bounded to the ſouth and weſt by Picardy, to the eaſt by Hainault, and to the north by Flanders.

ARTOTYRITES, a Chriſtian ſect, in the primitive church, who celebrated the euchariſt with bread and cheeſe, ſaying, that the firſt oblations of men were not only of the fruits of the earth, but of their flocks. The word is derived from *αρτος bread*, and *τυρος cheeſe*. The Artotyrites admitted women to the prieſthood and epiſcopacy; and Epiphanius tells us, it was a common thing to ſee ſeven girls at once enter into their church, robed in white, and holding a torch in their hand; where they wept, and bewailed the wretchedneſs of human nature, and the miſeries of this life.

ARVALES FRATRES, in Roman antiquity, a college of 12 prieſts, inſtituted by Romulus, and choſen out of the moſt noble families, himſelf being one of that body: they aſſiſted in the ſacrifices of the ambervalia annually offered to Ceres and Baechus, for the proſperity of the fruits of the earth; when they wore on their heads crowns made of ears of corn. The origin of this inſtitution was as follows: Acca Laurentia, Romulus's nurſe, was accuſtomed once a-year to make a ſolemn ſacrifice for a bleſſing on the fields, her 12 ſons always aſſiſting her in the ſolemnity; but at laſt loſing one of her ſons, Romulus offered himſelf to ſupply his place, and gave this ſmall ſociety the name of *Arvales fratres*. This order was in great repute at Rome; they held the dignity for life, and never loſt it upon account of impriſonment, baniſhment, or any other accident.

ARUBA, a ſmall Dutch iſland on the coaſt of Terra Firma; W. long. 69. 30. N. lat. 12. 30.

ARVIL-SUPPER, a feaſt or entertainment made at funerals in the North of England. Arvil-bread is the bread delivered to the poor at funeral ſolemnities: and *arvil*, *arval*, *arſal*, are terms uſed for the burial or funeral rites.

ARUM, WAKEROBIN, or CUCKOW-PINT; a genus of the polyandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 2d order, *Piperitæ*. The ſpatha is monophyllous, and cowl-ſhaped; the ſpadix is naked above, female below, and ſtamened in the middle.—The *Species* are 22; of which the moſt remarkable are the following. 1. The *maculatum*, or common wakerobin, which grows naturally on ſhady banks in moſt parts of Britain. The leaves are halberd-ſhaped, very entire, and ſpotted; the berries numerous, growing in a naked cluſter. The flowers appear in April; and their wonderful ſtructure has given riſe to many diſputes among botaniſts. The receptacle is long, in the ſhape of a club, with the ſeed-buds ſurrounding its baſe. The chives are fixed to the receptacle amongſt the ſeed-buds, ſo that there is no occaſion for the tips to be ſupported upon threads, and therefore they have none; but they are fixed to the fruit-ſtalk, and placed between two rows of tendrils: the point in diſpute is what is the uſe of thoſe tendrils? 2. The *proboſcidium*. 3. The *ariſarium*. 4. The *tenuifolium*. Theſe three ſpecies have uſually been ſeparated from this genus, and diſtinguiſhed by the general name of *ariſarum* or *friar's cowl*, on account of the reſemblance of their flowers to a friar's cowl. 5. The *italicum*, a native of Italy, Spain, and Portugal. 6. The *dracunculus*, or common dragon, grows naturally in moſt of the ſouthern parts of Europe; and has a ſtraight ſtalk three or four feet high, ſpotted like the belly of a ſnake. At the top it is ſpread out into leaves, which are cut into ſeveral narrow ſegments almoſt to the bottom, and are ſpread open like a hand; at the top of the ſtalk the flower is produced, which is in ſhape like the common arum, having a long ſpatha of a dark purple colour, ſtanding erect, with a large piſtil of the ſame colour, ſo that when it is in flower it makes no unpleaſing appearance; but the flower ſmells ſo like *carrion*, that few people can endure it. 7. The *trilobatum*, or arum of Ceylon, is a native of that iſland and ſome other parts of India. It is a low plant; the flower riſes immediately from the root, ſtanding on a very ſhort footſtalk: the ſpatha is long, erect, and of a fine ſcarlet colour, as is alſo the piſtil. 8. The *colocaſia*. 9. The *divaricatum*, with ſpear-ſhaped leaves. 10. The *peregrinum*, or elder. 11. The *eſculentum*, or catable arum. 12. The *ſagittifolium*, or greateſt Ægyptian arum. All theſe ſpecies have mild roots, which are eaten by the inhabitants of the hot countries, where they grow naturally; as alſo the leaves of ſome of them, particularly thoſe of the eſculentum, which they call *Indian kale*. 13. The *arboreſcens*, or dumb cane, is a native of the ſugar iſlands and warm parts of America, where it grows chiefly on low grounds. All the parts of it abound with an acrid juice very ſtimulating to the tongue. The ſtalks of it are ſometimes applied to the mouths of the negroes by way of puniſhment.—All the ſpecies of this plant are hardy, except the trilobatum and the arboreſcens. The former muſt be kept conſtantly in a ſtove, and the laſt in a moderate hot-bed. The arboreſcens is propagated by cutting off the ſtalks into lengths of three or four joints, which muſt be left to dry ſix weeks or two months before they are planted.—The roots

of the maculatum and dracunculus are uſed in medicine. All the parts of the arum, particularly the root, have an extremely pungent, acrimonious taſte; but dried and kept for ſome time, it loſes much of this, and becomes almoſt inſipid.—This root was once reckoned a medicine of great efficacy in cachectic and chlorotic caſes, in weakneſs of the ſtomach and in the cure of rheumatic ſymptoms. It was given from 10 grains to a ſcruple of the freſh root twice or thrice a day, mixed with mucilage to cover its pungency, and prevent its making any painful impreſſion on the tongue. It generally excites a ſlight tingling ſenſation through the whole habit, and, when the patient is kept warm in bed, produces a copious ſweat.—The arum was formerly an ingredient in an officinal preparation, the compound powder; but in that form its virtues are very precarious. Some recommended a tincture of it drawn with wine; but neither wine, water, nor ſpirits, extract its virtues.

ARUNDEL, a borough-town in Suſſex, ſeated on the river Arun. W. long. 0. 25. N. lat. 50. 45.

ARUNDEL *Oil*, in the materia medica. At Bombay, Gambroon, and Surat, in the Eaſt Indies, there grows a tree which bears a nut incloſed in a rough huſk, which reſembles much the horſe-cheſnut; and the kernel of the nut yields an oil by expreſſion, which is of a purgative nature. It is much uſed in India for the cure of the dyſentery, and a tea-ſpoonful of it is reckoned a doſe. The tree goes by the name of the *Arundel tree* at Bombay, and its oil by that of *Arundel oil*. It has been conjectured, that this is the oil of the purging nuts mentioned in Dale's Pharmacologia, which are got from the tree called *Lignum Moluccenſe*, *Pavana dictum*, *fructu avellanæ*, J. B. 1. 342; and *pinus Indica*, *nucleo purgante*, C. B. 492; and the *palma Chriſti Indica*, Tournefort. Mat. Med.

ARUNDELIAN MARBLES, OXFORD MARBLES, or PARIAN CHRONICLE, are ancient ſtones (as has been ſuppoſed) whereon is inſcribed a chronicle of the city of Athens, engraven in capital letters in the iſland of Paros, one of the Cyclades, 264 years before Chriſt. They take their firſt name from Thomas Earl of Arundel, who procured them out of the Eaſt, or from Henry his grandſon, who preſented them to the univerſity of Oxford. The Arundelian marbles, in their perfect ſtate, contained a chronological detail of the principal events of Greece during a period of 1318 years, beginning with Cecrops, before Chriſt 1582 years, and ending with the archonſhip of Diognetus, before Chriſt 264. But the chronicle of the laſt 90 years is loſt; ſo that the part now remaining ends at the archonſhip of Diotimus, 354 years before the birth of Chriſt: and in this fragment the inſcription is at preſent ſo much corroded and effaced, that the ſenſe can only be diſcovered by very learned and induſtrious antiquaries; or, more properly ſpeaking, ſupplied by their conjectures. This chronicle, and many other reliques of antiquity, real or pretended, were purchaſed in Aſia Minor, in Greece, or in the iſlands of the Archipelago, by Mr. William Petty, who in the year 1624 was ſent by Thomas Earl of Arundel for the purpoſe of making ſuch collections for him in the Eaſt. They were brought into England about the beginning of the year 1627, and placed in the gardens belonging to Arundel-houſe in London. Though generally regarded as a curious monument of antiquity, they have been found in ſome inſtances inconſiſtent with the moſt authentic hiſtorical accounts; Sir Iſaac Newton and ſeveral other modern philoſophers paid little or no regard to them; and of late their abſolute authenticity has been ſeverely queſtioned in an expreſs diſſertation upon the ſubject, entitled *The Parian Chronicle*.

ARUNDO, the REED; a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx conſiſts of two valves, and the floſcules are thick and downy. The ſpecies are, 1. The *phragmitis*, or common marſh-reed, grows by the ſides of rivers and in ſtanding waters. 2. The *donax*, or manured reed, is a native of warm countries, but will bear the cold of our moderate winters in the open air. It dies to the ſurface in autumn, but appears again in the ſpring, and if kept ſupplied with water, will grow 10 or 12 feet high in one ſummer. The ſtalks of this are brought from Spain and Portugal; and are uſed by the weavers, as alſo for making fiſhing rods. 3. The *verſicolor*, or Indian variegated reed, ſuppoſed to be a variety of the ſecond. 4. The *bambos*, or bamboo, is a native of the Eaſt Indies and ſome parts of America; where it frequently attains the height of 60 feet. The main root is long, thick, jointed, ſpreads horizontally, and ſends out many cylindrical woody fibres, of a whitiſh colour, and many feet long. From the joints of the main root ſpring ſeveral round jointed ſtalks to a prodigious height, and at about 10 or 12 feet from the ground ſend out at their joints ſeveral ſtalks joined together at their baſe: theſe run up in the ſame manner as thoſe they ſhoot out from. If any of theſe be planted with a piece of the firſt ſtalk adhering to them, they will perpetuate their ſpecies. They are armed at their joints with one or two ſharp rigid ſpines, and furniſhed with oblong oval leaves, eight or nine inches long, ſeated on ſhort foot-ſtalks. The flowers are produced in large panicles from the joint of the ſtalks, placed three in a parcel cloſe to their receptacles. They reſemble thoſe of the common reed, and are ſucceeded by ſeeds of the ſame form ſurrounded with down. The young ſhoots are covered with a dark-green bark; and when tender are pickled in vinegar, along with ſalt, garlic, and the pods of capſicum. (See ACHIAR.) The ſtalks in their young ſtate are almoſt ſolid, and contain a milky juice of a ſweet nature; but as they advance in age, they become hollow, except at the joints, where they are ſtopped by a woody membrane, upon which this liquor lodges, and concretes into a ſubſtance called *Tabaxir*, or ſugar of *Mombu*, which was held in ſuch eſteem by the ancients as a medicine, that it was valued at its weight in ſilver. The old ſtalks grow to five or ſix inches diameter, are then of a ſhining yellow colour, and are ſo hard and durable that they are uſed in buildings, and for making all ſorts of houſehold furniture. Theſe, when bored through their joints, are converted into water-pipes. They ſerve alſo for the poles with which the ſlaves carry thoſe litters which are called *palanquins*, and which are ſo common in the Eaſt. 5. The *arborea*, with a tree-like ſtalk, differs from the former only in having narrower leaves. 6. The *orientalis* is the ſpecies of which the Turks make writing pens: it grows in a valley near mount Athos, and alſo on the banks of the river Jordan. None of theſe plants are at preſent to be found in Britain.—As all theſe plants grow naturally in low marſhy lands, they muſt in the culture be ſupplied with plenty of water. The ſecond kind requires little care; the third is more delicate, and requires to be kept in pots. The fourth, fifth, and ſixth ſorts muſt be preſerved in ſtoves. They are to be planted in tubs filled with rich earth, and plentifully ſupplied with water. When the tubs decay, they may be ſuffered to grow into the tan, which will encourage them to grow to a larger ſize.

ARUNDO *Saccharifera*, or *Sugar-cane*. See SACCHARUM.

ARUSPICES, or HARUSPICES, in Roman antiquity, an order of prieſts who pretended to foretel future events by inſpecting the entrails of victims killed in ſacrifice; they were alſo conſulted on occaſion of portents and prodigies. The haruſpices were always choſen from the beſt families; and as their employment was of the ſame nature as that of the augurs, they were as much honoured. Their college, as well as thoſe of the other religious orders, had its particular regiſters and records.

ARX, in the ancient military art, a town, fort, or caſtle, for defence of a place. The arx in ancient Rome was a diſ-

tinct edifice from the capitol, though ſome have confounded the two. According to Ryckius, the arx, properly ſpeaking, was a place on the higheſt part of the Capitoline Mount, ſtronger and better fortified than the reſt, with towers and pinnated walls: in which was alſo the temple of Jupiter Capitolinus.

ARX alſo denoted a conſecrated place on the Palatine Mount, where the augurs publicly performed their office. Some will have the arx to have been the augural temple; but Varro expreſsly diſtinguiſhes between the two.

ARX was particularly uſed for a public place in Rome, ſet apart for the operations of the augurs. In which ſenſe arx amounts to the ſame with what is otherwiſe called *auguraculum* and *auguratorium*, and in the camp *augurale*. Out of this arx it was that the *feciales*, or heralds, gathered the graſs uſed in the ceremony of making leagues and treaties.

ARX *Britannica*, a citadel of Batavia, whoſe foundation is ſeen at low water, near the old mouth of the middle Rhine: ſome imagine it the pharos or high tower of Caligula, as Suetonius calls it; a monument of Caligula's ſham conqueſt of Britain. Others, that it was built by Druſus, with an altar afterwards by Claudius, on his expedition into Britain.

ARYTENOIDES, in anatomy, the name of two cartilages which, together with others, conſtitute the head of the larynx. It is alſo applied to ſome muſcles of the larynx.

ARYTHMUS, in medicine, the want of a juſt modulation in the pulſe. It is oppoſed to *eurythmus*, a pulſe modulated agreeably to nature.

ARZILLA, a town of Africa, in the kingdom of Fez. W. long. 5. 30. N. lat. 35. 30.

AS, in antiquity, a particular weight, conſiſting of 12 ounces; being the ſame with *libra*, or the Roman pound. The word is derived from the Greek ας, which in the Doric dialect is uſed for εις *one*, q. d. an entire thing; though others will have it named *as* quaſi *æs*, becauſe made of braſs.

As was alſo the name of a Roman coin, which was of different weights and different matter in different ages of the commonwealth.—Under Numa Pompilius, according to Euſebius, the Roman money was either of wood, leather, or ſhells. In the time of Tullus Hoſtilius, it was of braſs; and called *as*, *libra*, *libella*, or *pondo*, becauſe actually weighing a pound or 12 ounces. Four hundred and twenty years after, the firſt Punic war having exhauſted the treaſury, they reduced the *as* to two ounces. In the ſecond Punic war, Hannibal preſſing very hard upon them, they reduced the *as* to half its weight, viz. to one ounce. And, laſtly, by the Papirian law, they took away half an ounce more, and conſequently reduced the *as* to the diminutive weight of half an ounce: and it is generally thought that it continued the ſame during the commonwealth, and even till the reign of Veſpaſian. The *as* therefore was of four different weights in the commonwealth. Its original ſtamp was that of a ſheep, ox, or ſow: but from the time of the emperors, it had on one ſide a Janus with two faces, and on the reverſe the roſtrum or prow of a ſhip.

As was alſo uſed to denote any integer or whole. Whence the Engliſh word *ace*.—Thus *as* ſignified the whole inheritance; whence *hæres ex aſſe*, the heir to the whole eſtate.

ASA, among naturaliſts. The writers of the later ages have formed this word *aſa* from the laſar of the ancients, and attributed it to a gum very different from that anciently known by the name they have thus corrupted.

The aſa of the ancients was an odoriferous and fragrant gum; and the aſa of the after-ages had ſo little title to this epithet, that they diſtinguiſhed it by one expreſſing its being of an offenſive or ſtinking ſmell. The Arabian writers, according to this diſtinction, deſcribed two kinds of aſa, the one ſtinking, the other aromatic; and the modern Greeks preſerved the name *aſa*, or *laſar*, to the ſtinking gum the Latins called by that name, but added a diſtinctive epithet to expreſs it ſmell, and called it *ſcardolaſarum*.

ASA, or ASSA, in the materia medica, a name given to two very different ſubſtances, called *aſa-dulcis* (Benzoin) and *aſa fœtida*; the latter being the concrete juice of a large umbelliferous plant which grows in ſeveral parts of Aſia. See the article FERULA.

ASAPH (St.), a city in Flintſhire, with a biſhop's ſee. This dioceſe does not contain any one whole county; but conſiſts partly of Denbigh, Flint (where its church is), Montgomery, and Merioneth ſhires, and a ſmall part of Shropſhire.

ASAPPES, or AZAPES, an inferior order of ſoldiers in the Turkiſh army, who are always expoſed to the firſt ſhock of the enemy; to the end that the enemy being thus fatigued, and their ſwords blunted, the ſpahis and janiſaries may fall on and find an eaſy conqueſt. The word is derived from the Turkiſh *ſaph* which ſignifies *rank*, from whence they have formed *aſphaph* to *range in battle*. The aſappes are ſaid to be held of ſo *little value*, that they frequently ſerve as bridges for the cavalry to paſs over in bad roads, and as faſcines to fill up the ditches of places beſieged. The greater part of them are natural Turks. They travel on foot, and have no pay but the plunder they can get from the enemy.

ASARINA. See CHELONE.

ASAROTA, ασαρωτα, from α and σαιρω *I ſweep*, a kind of painted pavements in uſe before the invention of moſaic work. The moſt celebrated was that at Pergamus, painted by Seſus, and exhibiting the appearance of crumbs, as if the floor had not been ſwept after dinner, whence, according to Pliny, the denomination. Perrault ſuppoſes them to have been a black kind of pavement of a ſpongy matter.

ASARUM, ASARABACCA; a genus of the monogynia order, belonging to the dodecandria claſs of plants. The calyx is trifid or quadrifid, and reſts on the germen; there is no corolla; the capſule is leathery and crowned.—The ſpecies are three; viz. the Europeum, the Canadenſe, and Virginicum. The firſt ſpecies grows naturally in ſome parts of England. It has thick fleſhy jointed roots; the leaves grow ſingly upon ſhort foot-ſtalks, which ariſe immediately from the root; the flowers grow upon very ſhort foot-ſtalks cloſe to the ground, ſo are hid under the leaves. They have a bell-ſhaped impalement, of a worn-out purple colour, which is cut in three at the top, where it turns backward. It delights in a moiſt ſhady place, and may be propagated by parting the roots in autumn. The two other ſpecies have no remarkable properties. Both the roots and leaves of this plant have a naufeous, bitter, acrimonious, hot taſte; and a ſtrong ſmell. Given in ſubſtance from half a dram to a dram, they evacuate powerfully both upwards and downwards: but the principal uſe of this plant has been that of a ſternutatory, for the root of aſarum is perhaps the ſtrongeſt of all the vegetable errhines, white hellebore itſelf not excepted. The leaves are conſiderably milder, and may be uſed to the quantity of three, four, or five grains. Geoffroy relates, that after ſnuffing up a doſe of this errhine at night, he has frequently obſerved the diſcharge from the noſe to continue for three days together; and that he has known a paralyſis of the mouth and tongue cured by one doſe. He recommends this medicine in ſtubborn diſorders of the head proceeding from viſcid tenacious matter, in palſies, and in ſoporific diſtempers. The leaves are the principal ingredient in the *pulvis aſari compoſitus* of the London pharmacopœia.

ASBESTOS, a ſort of native foſſil ſtone, which may be ſplit into threads and filaments, from one inch to ten inches in length, very fine, brittle, yet ſomewhat tractable, ſilky, and of a greyiſh colour, not unlike talc of Venice. It is almoſt inſipid to the taſte, indiſſoluble in water, and endued with the wonder-

ful property of remaining unconſumed in the fire, which only whitens it. There are ſome ſorts of aſbeſtos however whoſe filaments are rigid and brittle. The induſtry of mankind has found a method of working this untoward mineral, and employing it in divers manufactures, chiefly cloth and paper. Pliny calls the aſbeſtos *inventu rarum, textu difficillimum;* but however this be, Bapt. Porta aſſures us, that in his time the ſpinning of aſbeſtos was a thing known to every body at Venice; and Sig. Caſtagnatta, ſuperintendant of ſome mines in Italy, is ſaid to have carried the manufacture to ſuch perfection, that his aſbeſtos was ſoft and tractable, much reſembling lamb ſkin dreſſed white: he could thicken and thin it at pleaſure, and thus either make it into a very white ſkin, or a very white paper.

This kind of linen cloth was chiefly eſteemed by the ancients; though then better known and more common than among us, being held equally precious with the richeſt pearls: nor is it now of mean value, even in the country where it is moſt generally made, a China cover (*i. e.* a piece of 23 inches and three-quarters long) being worth 80 tale, *i. e.* 36l. 13s. 4d. Pliny ſays, he himſelf had ſeen napkins thereof, which, being taken foul from the table after a feaſt, were thrown into the fire, and by that means were better ſcoured than if they had been waſhed in water, &c. But its principal uſe, according to Pliny, was for the making of ſhrouds for royal funerals to wrap up the corpſe, ſo that the aſhes might be preſerved diſtinct from thoſe of the wood, &c. whereof the funeral pile was compoſed: and the princes of Tartary, according to the accounts in the Philoſophical Tranſactions, ſtill uſe it at this day in burning their dead. A handkerchief or pattern of this linen was long ſince preſented to the Royal Society, a foot long and half a foot broad. This gave two proofs of its reſiſting fire; though in both experiments it loſt above three drams in its weight. When taken out red hot, it did not burn a piece of white paper on which it was laid. Mr. Villette aſſerts that his large burning concave uſually vitrifies the aſbeſtos.

The method of preparing the incombuſtible paper and cloth is thus deſcribed by Ciampini: The ſtone is laid to ſoak in warm water; then opened and divided by the hands, that the earthy matter may be waſhed out. The ablution being ſeveral times repeated, the flax-like filaments are collected and dried; and they are moſt conveniently ſpun with an addition of flax. Two or three filaments of the aſbeſtos are eaſily twiſted along with the flaxen thread, if the operator's fingers are kept oiled. The cloth alſo, when woven, is beſt preſerved by oil from breaking or waſting. On expoſure to the fire, the flax and the oil burn out, and the cloth remains pure and white. Probably from the diſſipation of ſome extraneous matter of this kind proceeded the diminution of weight in the handkerchief juſt recited; for pure aſbeſtos leaves nothing. The ſhorter filaments which ſeparate in waſhing the ſtone may be made into paper in the common manner.

The aſbeſtos is found in Crete and Cyprus; in Tartary; at Namur in the Low Countries; in Thuringia among the mines; in the Old Noricum; in Egypt; in the mountains of Arcadia; at Puteoli; in the iſland of Corſica; in the iſland of Angleſey in Wales; in Aberdeenſhire in Scotland; at Montauban in France; and in the kingdom of Siberia.

ASCARIS, in zoology, a genus of inſects belonging to the order of vermes inteſtina. The body of the aſcaris is cylindrical, ſiliform, and taper at both ends. The ſpecies are two, *viz.* 1. The *vermicularis*, with faint annular rugæ, and the mouth tranſverſe, is about a quarter of an inch long, and thicker at one end than the other. It is found in boggy places, in the roots of putrid plants, and very frequently in the rectum of children and horſes. It emaciates children greatly, and is ſometimes vomited up. 2. The *lumbricoides* is about the ſame length with the lumbricus terreſtris, or common earth worm; but it wants the protuberant ring towards the middle of the body, the only mark by which they can properly be diſtinguiſhed. The body of the lumbricoides is cylindrical, and ſubulated at each extremity; but the tail is ſomewhat triangular. The lumbricoides is the worm which is moſt commonly found in the human inteſtines. It is viviparous, and produces vaſt numbers. See a repreſentation of both ſpecies in Pl. 29.

ASCENDANT, in aſtrology, denotes the horoſcope, or the degree of the ecliptic which riſes upon the horizon at the time of the birth of any one. This, it is pretended, has an influence on the perſon's life and fortune, by giving him a propenſity to one thing more than another.

ASCENDANTS, in law, are oppoſed to deſcendants in ſucceſſion, *i. e.* when a father ſucceeds his ſon, or an uncle his nephew, &c. heritage is ſaid to aſcend, or go to aſcendants.

ASCENDING, in aſtronomy, is ſaid of ſuch ſtars as are riſing above the horizon in any parallel of the equator.

ASCENDING *Latitude*, is the latitude of a planet when going towards the north pole.

ASCENDING *Node*, is that point of a planet's orbit, wherein it paſſes the ecliptic, to proceed northward. This is otherwiſe called the *northern node*, and repreſented by this character ☊.

ASCENDING *Veſſels*, in anatomy, thoſe which carry the blood upwards; as the aörta aſcendens.

ASCENSION, in aſtronomy, is either right or oblique. Right aſcenſion of the ſun, or a ſtar, is that degree of the equinoctial, counted from the beginning of Aries, which riſes with the ſun or ſtar in a right ſphere. Oblique aſcenſion is an arch of the equator intercepted between the firſt point of Aries and that point of the equator which riſes together with a ſtar in an oblique ſphere.

ASCENSION *Day*, a feſtival of the Chriſtian Church, held ten days before Whitſuntide, in memory of our Saviour's aſcenſion into heaven after his reſurrection.

ASCENSION *Iſland*, a barren iſland on the coaſt of Africa, lying in W. long. 17. 20. S. lat. 7. 5.

ASCENSIONAL DIFFERENCE, the difference between the right and oblique aſcenſion of the ſame point to the ſurface of the ſphere.

ASCENT, in a general ſenſe, implies the motion of a body upwards, or the continual receſs of a body from the earth. Whatever *aſcends*, does it in virtue of ſome external impulſe or extruſion. Thus it is that ſmoke and other rare bodies *aſcend* in the atmoſphere, and oil, light woods, &c. in water; not in conſequence of any external principle of levity as the Peripatetics believed, but by the ſuperior gravity or tendency downwards of the parts of the medium wherein they are placed. The *aſcent* of light bodies in heavy mediums is produced after the ſame manner as the *aſcent* of the lighter ſcale of a balance.

ASCESIS, properly denotes exerciſe of the body. It is formed from the verb ασκειν, uſed by the ancients in ſpeaking of the ſports and combats of the athletæ.

ASCESIS is alſo uſed by philoſophers, to denote an exerciſe conducive to virtue, or to the acquiring a greater degree of virtue. This is particularly denominated the *philoſophical aſceſis*, becauſe practiſed chiefly by philoſophers, who make a more peculiar profeſſion of improving themſelves in virtue; on the model whereof, the ancient Chriſtians introduced a religious Aſceſis.

ASCETERIUM, in eccleſiaſtical writers, is frequently uſed for a monaſtery, or place ſet apart for the exerciſes of virtue and religion. The word is formed from *aſceſis*, exerciſe; or *aſcetra*, one who performs exerciſe. Originally it ſignified a place where the athletæ or gladiators performed their exerciſes.

ASCETIC, an ancient appellation given to ſuch perſons

as, in the primitive times, devoted themſelves more immediately to the exerciſes of piety and virtue, in a retired life; and particularly to prayer, abſtinence, and mortification. The word is derived from *ασκεω I exerciſe*. In monkiſh times this title was beſtowed on that order of eccleſiaſtics; eſpecially upon ſuch of them as lived in ſolitude.

ASCETIC is alſo a title of ſeveral books of ſpiritual exerciſes; as the *Aſcetics*, or devout exerciſes of St. Baſil, archbiſhop of Cæſarea in Cappadocia.—We alſo ſay the *aſcetic* life, meaning the exerciſe of prayer, meditation, and mortification.

ASCHAFFENBURG, a town of Germany, ſeated on the river Maine, in the circle of the lower Rhine. E. long. 9. 35. N. lat. 50. 14.

ASCIDIA, a genus of animals belonging to the order of vermes molluſca. The body is cylindrical, and fixed to a ſhell, rock, &c. It has two apertures; one on the ſummit, the other lower, forming a ſheath. There are ſix ſpecies of this animal, viz. the papilloſum, gelatinoſum, inteſtinalis, quadridentata, ruſtica, and echinata: only one of which, viz. the ruſtica (ſee Pl. 30.), is found in the Britiſh ſeas. Animals of this genus have the faculty of ſquirting out the water they take in. The expanſion and contraction of their bodies occaſion their aſſuming various forms.

ASCII, among geographers, an appellation given to thoſe inhabitants of the earth who, at certain ſeaſons of the year, have no ſhadow; ſuch are all the inhabitants of the torrid zone, when the ſun is vertical to them.

ASCITÆ, from *ασκος* a *bag* or *bottle*, in antiquity, a ſect or branch of Montaniſts, who appeared in the ſecond century. They were ſo called, becauſe they introduced a kind of Bacchanals into their aſſemblies, who danced round a bag or ſkin blowed up; ſaying, they were thoſe new bottles filled with new wine whereof our Saviour makes mention, Matth. ix. 17.—They are ſometimes alſo called *Aſcodrogitæ*.

ASCITES, in medicine, the dropſy of the abdomen. See MEDICINE.

ASCLEPIA, a feſtival of Æſculapius the god of phyſic, obſerved particularly at Epidaurus, where it was attended with a conteſt between the poets and muſicians, whence it was likewiſe called *Ιερος Αγων*, *the ſacred contention*.

ASCLEPIAD, in ancient poetry, a verſe compoſed of four feet, the firſt of which is a ſpondee, the ſecond a choriambus, and the two laſt dactyls; or of four feet and a cæſura, the firſt a ſpondee, the ſecond a dactyl, after which comes the cæſura, then the two dactyls; as, *Mæcenas atavis edite regibus*.

ASCLEPIAS, SWALLOW-WORT; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. The generic character is taken from five oval, concave, horn-like nectaria which are found in the flower. The *Species* are 19, of which the following are the moſt remarkable. 1. The alba, or common ſwallow-wort, which has a root compoſed of many ſtrong fibres connected at top like thoſe of aſparagus; the leaves are placed oppoſite by pairs; and the flowers are white, growing in umbels near the top of the ſtalk, from whence are ſent out ſmaller umbels. After the flower is paſt, the two germens become long pointed pods, incloſing many compreſſed ſeeds lying imbricatim. It flowers in June, and the ſeeds ripen in September. It is a native of the ſouth of France, Spain, and Italy. 2. The Syriaca, or greater Syrian dogſbane, is a perennial plant, which ſends up ſeveral upright ſtalks in the ſpring, about two feet high, garniſhed with oval leaves growing oppoſite; at the top of the ſtalks the umbels of flowers are produced, which are of a bright purple. 3. The curraſſavica, or baſtard ipecacuanha, is a native of the warm parts of America, and riſes to the height of five or ſix feet, with upright ſtems, and ſmooth oblong leaves placed oppoſite. Towards the top of the branches the umbels of flowers come out, which ſtand erect: the petals of the flowers are of a ſcarlet colour, and the horny nectariums in the middle are of a bright ſaffron. The firſt two ſpecies are hardy; but the laſt one is tender, and therefore muſt be preſerved in a ſtove. The root of the firſt ſpecies has been uſed in medicine. It has a ſtrong ſmell, approaching to that of valerian, or nard; and the taſte, though at firſt ſweetiſh and aromatic, ſoon becomes bitteriſh, ſub-acrid, and nauſeous. This root is eſteemed ſudorific, diuretic, and emmenagogue; and is employed by the French and German phyſicians as a ſuccedaneum to contrayerva. Among us it is very rarely uſed. It appears from its ſenſible qualities to be a medicine of much the ſame kind with valerian, but inferior to it. The root of the third ſpecies has been ſometimes ſent over from America inſtead of that of ipecacuanha, and miſchievous effects have been produced by it. Thoſe who cultivate this plant ought to be careful that none of its milky juice mix with any thing which is taken inwardly, as that is poiſonous.

ASCODUTÆ, in antiquity, a ſect of hereties, in the ſecond century, who rejected all uſe of ſymbols and ſacraments, on this principle, That incorporeal things cannot be communicated by things corporeal, nor divine myſteries by any thing viſible.

ASCOLI, formerly *Aſculum Apulum*, a pretty large and populous town of Italy, in the marche of Ancona, and territory of the church. E. long. 15. 20. N. lat. 42. 47.

ASCOLI *de Satriano*, formerly *Aſculum Picenum*, an epiſcopal city of Italy. E. long. 15. 5. N. lat. 42. 8.

ASCOLIA, in Grecian antiquity, a feſtival celebrated by the Athenian huſbandmen in honour of Bacchus, to whom they ſacrifice a he-goat, becauſe it deſtroys the vines (*Ovid. Faſt.* 1. 357); and to ſhew the greater indignity to an animal hated by Bacchus, the peaſants, after having killed him, made a foot-ball of his ſkin. Virgil has beautifully deſcribed the occaſion of the ſacrifice, and manner of celebrating the feſtival, *Georg.* ii. 380.

ASCRIPTITII, or ADSCRIPTITII, were a kind of villeins, who, coming from abroad, ſettled in the lands of ſome new lord, whoſe ſubjects or ſervants they commenced; being ſo annexed to the lands, that they might be transferred and ſold with them. The term Aſcriptitii is ſometimes alſo uſed in ſpeaking of aliens or foreigners newly admitted to the freedom of a city or country; and alſo in the military laws, for the recruits appointed to ſupply the loſſes of the legions, called alſo *Accenſi*.

ASCYRUM, PETER'S-WORT; a genus of the polyandria order, belonging to the polydelphia claſs of plants; and in the natural method ranking under the 20th order, *Rotaceæ*. The calyx conſiſts of four leaves; the corolla has four petals; the filaments are numerous, and divided into four bundles. There are three ſpecies, the crux andreæ, the hypericoides, and the villoſum, all natives of the Weſt Indies, or America, but poſſeſſing no property worthy of notice.

ASEKI, or ASEKAI, the name which the Turks give to the favourite ſultaneſſes who have brought forth ſons. Theſe are greatly diſtinguiſhed above others in their apartments, attendants, penſions, and honours, and have even ſometimes ſhared the government. The ſultana who firſt preſents the emperor with a male child, is reckoned the chief favourite, is called *buyuk aſeki*, and ranks as a legitimate wife: though, from the time of Bajazet I. the ſultans are forbid to marry by a public law, which Solyman II. violated in favour of Roxalana.

ASELLUS, in zoology, the trivial name of a ſpecies of oniſcus. See ONISCUS.

ASH, in botany. See FRAXINUS.

ASH-*Hole*, among chemiſts, is the loweſt part of a furnace; and is intended to receive the aſhes falling from the fire, and

to give a paſſage to the air which is to be introduced into the furnace, to keep up the combuſtion.

ASH-*Wedneſday*, the firſt day of Lent; ſuppoſed to have been ſo called from a cuſtom in the church, of ſprinkling aſhes that day on the heads of penitents then admitted to penance. See LENT.

ASHBORN, a town in Derbyſhire, between the rivers Dove and Compton. W. long. 1. 35. N. lat. 53. 0.

ASHBURTON, a town in Devonſhire. W. long. 3. 10. N. lat. 50. 30.

ASHBY DE LA ZOUCH, a market-town in Leiceſterſhire, ſituated in W. long. 1. 20. N. lat. 52. 40.

ASHDOD, or AZOTUS. See AZOTUS.

ASHES, the earthy particles of combuſtible ſubſtances after they have been burnt. If the aſhes are produced from vegetable bodies, they contain a conſiderable quantity of fixed ſalt, blended with the terrene particles: and from theſe aſhes the fixed alkaline ſalts called *pot-aſh*, *pearl-aſh*, &c. are extracted. See POTASH, &c. The aſhes of all vegetables are vitrifiable, and found to contain iron. They alſo make an excellent manure for cold and wet grounds.

Several religious ceremonies depend upon the uſe of aſhes. St. Jerome relates, that the Jews in his time rolled themſelves in aſhes, as a ſign of mourning. To repent in ſackcloth and aſhes, is a frequent expreſſion in Scripture for mourning and being afflicted for our ſins. There was a ſort of ley and luſtral water made with the aſhes of an heifer ſacrificed upon the great day of expiation; the aſhes whereof were diſtributed to the people, and this water was uſed in purifications, as often as any touched a dead body, or was preſent at funerals, Numb. xix. 17. Tamar, after the injury received from her brother Amnon, covered her head with aſhes, 2 Sam. xiii. 19. The ancient Perſians had a ſort of puniſhment for ſome great criminals, which conſiſted in executing them in aſhes. The criminal was ſtifled by being thrown headlong from a tower 50 cubits high, which was filled with aſhes to a particular height, 2 Mac. xiii. 5, 6.

ASHFORD, a market-town of Kent, about 12 miles S. W. of Canterbury. E. long. 0. 45. N. lat. 51. 15.

ASHLAR, a term uſed among builders; by which they mean common or free ſtones, as they come out of the quarry, of different lengths and thickneſſes.

ASHLERING, among builders, ſignifies quartering, to lath to, in garrets, about two and a half, or three feet high, perpendicular to the floor, up to the under ſide of the rafters.

ASIA, one of the four great parts of the world, ſituated between 25° and 180° E. lon. and between the equator and 80° N. lat. It is 4,740 miles in length from the Dardanelles on the W. to the E. ſhore of Tartary; and 4,380 miles in breadth, from the moſt ſouthern part of Malacca to the moſt northern cape of Nova Zembla; being ſuperior in extent, as well as in many other reſpects, to Africa and Europe. It is bounded on the N. by the Frozen Ocean; on the W. by the Red Sea (which divides it from Africa), and by the Mediterranean, the Black Sea, the Don, and the Oby, which divide it from Europe. On the E. it is bounded by the Pacific Ocean, which divides it from America; and on the S. by the Indian Ocean. The principal countries in this continent are Siberia, Tartary, China, Thibet, Hindooſtan, Siam, Burmah, Perſia, part of Arabia, Syria, Paleſtine, Natolia, Diarbekar, Irac, Turcomania, Georgia, Curdiſtan, &c. The various particulars of government, religion, ſoil, climate, and productions, may be found under the names of the reſpective countries. It is here ſufficient to obſerve, that this quarter of the globe derives particular conſideration, from having been the ſcene of the moſt important tranſactions reſpecting the human race, as recorded in the holy ſcriptures; as the creation of man, the eſtabliſhment of the Hebrew nation and religion, the promulgation of Chriſtianity, &c.

Aſia Minor, or *Leſſer Aſia*; the ſame with NATOLIA.

ASIARCHÆ, termed by St. Paul, *Chiefs of Aſia*, Acts xix 31. were the Pagan pontiffs of Aſia, choſen to ſuperintend and have the care of the public games; which they did at their own expence: for which reaſon they were always the richeſt and moſt conſiderable men of the towns.

ASIDE, in the drama, ſomething ſaid by an actor, which ſome, or even all the other actors preſent, are ſuppoſed not to hear; a circumſtance juſtly condemned as being unnatural and improbable.

ASIITO, a town of Italy, in Perugia, and in the pope's territories. E. long. 23. 40. N. lat. 43. 0.

ASILUS, or HORNET-FLY, a genus of inſects belonging to the order of inſecta diptera. It has two wings; and a horny, ſtraight, two-valved beak. There are 17 ſpecies of this inſect. Many of them wound in a very painful manner, and are particularly troubleſome to cattle in low meadows; others of them are quite harmleſs. See Pl. 29.

ASINARA, an iſland of Italy, on the weſtern coaſt of Sardinia. E. long. 8. 30. N. lat. 41. 0.

ASISIO, or ASITIO, a city of the pope's territories in Italy, ſituated about 16 miles eaſt of Perugia. E. long. 13. 35. N. lat. 43.

ASKRIG, a town in the N. Riding of Yorkſhire. W. long. 0. 5. N. lat. 53. 50.

ASLANI, in commerce, a ſilver coin, worth from 115 to 120 aſpers. See ASPER.

ASNA, or ESNA, a town in Upper Egypt, ſeated upon the Nile. E. long. 31. 40. N. lat. 38. 15.

ASOLA, a town of the Breſſan in Italy, belonging to the republic of Venice. E. long. 14. 18. N. lat. 45. 15.

ASOLO, a town of Italy, in the Treviſan, 10 miles N. E. of Baſſano. E. long. 12. 2. N. lat. 45. 49.

ASOPH, a town of Coban Tartary, in Aſia, ſeated on the river Don. E. long. 41. 30. N. lat. 47. 18.

ASOW, once a celebrated and important fortreſs of Ruſſia, in the diſtrict of Bachmut.

ASP, in natural hiſtory, a ſmall poiſonous kind of ſerpent, whoſe bite gives a ſpeedy but eaſy death. It is ſaid to be thus denominated from the Greek *ασπις ſhield*, in regard to the manner of its lying convolved in a circle, in the centre of which is the head, which it exerts, or raiſes, like the umbo or umbilicus of a buckler. This ſpecies of ſerpent is very frequently mentioned by authors; but ſo careleſsly deſcribed, that it is not eaſy to determine which, if any of the ſpecies known at preſent, may properly be called by this name. It is ſaid to be common in Africa, and about the banks of the Nile; and Bellonius mentions a ſmall ſpecies of ſerpent which he had met with in Italy, and which had a ſort of callous excreſcence on the forehead, which he takes to have been the aſpis of the ancients. It is with the aſp that Cleopatra is ſaid to have diſpatched herſelf, and prevented the deſigns of Auguſtus, who intended to have carried her captive to adorn his triumphal entry into Rome. But the fact is conteſted; and Brown places it among his vulgar errors. Lord Bacon makes the aſp the leaſt painful of all the inſtruments of death. He ſuppoſes it to have an affinity to opium, but to be leſs diſagreeable in its operation; and his opinion ſeems to correſpond with the accounts of moſt writers, as well as with the effects deſcribed to have been produced upon Cleopatra; but later naturaliſts have expreſſed doubts on the ſubject. The ancients had a plaſter called ὁ Ασπιδων, made of this terrible animal, of great efficacy as a diſcutient of ſtrumæ and other indurations, and uſed likewiſe againſt pains of the gout. The fleſh and ſkin, or exuviæ, of the creature, had alſo their ſhare in the ancient materia medica.

ASPALATHUS, African broom; a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx conſiſts of five diviſions: the pod is oval, and contains two ſeeds. Of this genus there are 19 ſpecies; all of which are natives of warm climates, and muſt be preſerved in ſtoves by thoſe who would cultivate them here. The roſe-wood, whence the oleum rhodii is obtained, is one of the ſpecies, but of which we have yet had no particular deſcription. The wood is heavy, oleaginous, ſomewhat ſharp and bitter to the taſte, of a ſtrong ſmell and purple colour. It is called *roſe wood* or *lignum Rhodium*, either on account of its ſweet ſmell, or of its growth in the iſland of Rhodes. It was anciently in much repute as an aſtringent, but is now diſuſed. It affords an oil of an admirable ſcent, reputed one of the beſt of perfumes; and this is uſed in ſcenting pomatums, liniments, &c.

ASPARAGUS, sparagus, sperage, or sparrowgrass; a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The calyx is quinquepartite, and erect; the three inferior petals are bent outwards; the berry has three cells, and contains two ſeeds. The ſpecies are 10; but the only one cultivated in the gardens is that with an upright herbaceous ſtalk, briſtly leaves, and equal ſtipula, or the common aſparagus. The other ſpecies are kept only in the gardens of the curious for the ſake of variety.

The garden aſparagus is with great care cultivated for the uſe of the table. The propagation of this uſeful plant is from ſeed; and as much of the ſucceſs depends upon the goodneſs of the ſeed, it is much better to ſave it than to buy it at the ſhops. The manner of ſaving it is this: Mark with a ſtick ſome of the faireſt buds; and when they are run to berry, and the ſtalks begin to dry and wither, cut them up; rub off the berries into a tub, and pouring water upon them, rub them about with your hands; the huſks will break and let out the ſeed, and will ſwim away with the water in pouring it off; ſo that in repeating this two or three times, the ſeeds will be clean waſhed, and found at the bottom of the tub. Theſe muſt be ſpread on a mat to dry, and in the beginning of February muſt be ſown on a bed of rich earth. They muſt not be ſown too thick, and muſt be trod into the ground, and the earth raked over them ſmooth: the bed is to be kept clear of weeds all the ſummer; and in October, when the ſtalks are withered and dry, a little rotten dung muſt be ſpread half an inch thick over the whole ſurface of the bed. The ſpring following, the plants will be fit to plant out; the ground muſt therefore be prepared for them by trenching it well, and burying a large quantity of rotten dung in the trenches, ſo that it may lie at leaſt ſix inches below the ſurface of the ground: when this is done, level the whole plot exactly, taking out all the looſe ſtones. This is to be done juſt at the time when the aſparagus is to be planted out; which muſt be in the beginning of March, if the ſoil is dry and the ſeaſon forward; but in a wet ſoil, it is better to wait till the beginning of April, which is about the ſeaſon that the plants are beginning to ſhoot. The ſeaſon being now come, the roots muſt be carefully taken up with a narrow-pronged dung-fork, ſhaking them out of the earth, ſeparating them from each other, and obſerving to lay all their heads even, for the more convenient planting them; which muſt be done in this manner. Lines muſt be drawn at a foot diſtance each, ſtraight acroſs the bed; theſe muſt be dug into ſmall trenches of ſix inches deep, into which the roots muſt be laid, placing them againſt the ſides of the trench with their buds in a right poſition upwards, and ſo that, when the earth is raked over them, they may be two inches under the ſurface of the ground. Between every four rows a ſpace of two feet and a half ſhould be left for walking in, to cut the aſparagus. When the aſparagus is thus planted, a crop of onions may be ſown on the ground, which will not at all hurt it. A month after this, the aſparagus will come up, when the crop of onions muſt be thinned, and the weeds cleared away. About Auguſt the onions will be fit to pull up. In October following cut off the ſhoots of the aſparagus within two inches of the ground, clear well all weeds away, and throw up the earth upon the beds, ſo as to leave them five inches above the level of the alleys. A row of colworts may be planted in the middle of the alleys, but nothing muſt be now ſown on the beds. In the ſpring the weeds muſt be hoed up, and all the ſummer the beds kept clear of weeds. In October they muſt be turned up and earthed again, as on the preceding ſeaſon. The ſecond ſpring after planting, ſome of the young aſparagus may be cut for the table. The larger ſhoots ſhould only be taken, and theſe ſhould be cut at two inches under ground, and the beds every year managed as in the ſecond year. Aſparagus is remarkable for communicating, very ſoon after being eaten, a ſtrong ſmell to the urine; and for this reaſon it is ſuppoſed to be diuretic. Notwithſtanding this, it does not appear that aſparagus contributes much either to the exciting of the ſecretion when ſuppreſſed, or facilitating its diſcharge.

ASPASIA, among ancient phyſicians, a conſtrictive application for the *pudenda muliebria*. It conſiſted only of wool, moiſtened with an infuſion of unripe galls.

ASPASTICUM, from *ασπαζομαι I ſalute*, in eccleſiaſtical writers, a place, or apartment, adjoining to the ancient churches, wherein the biſhop and preſbyters ſat, to receive the ſalutations of the perſons who came to viſit them, deſire their bleſſing, or conſult them on buſineſs. This is alſo called *aſpaticum diaconicum*, *receptorium*, *metatorium*, or *meſatorium*, and *ſalutatorium*: in Engliſh, *greeting-houſe*.

ASPECT, in aſtronomy, denotes the ſituation of the planets and ſtars with reſpect to each other. There are five different aſpects. 1. Sextile aſpect is when the planets or ſtars are 60° diſtant, and marked thus *. 2. The quartile, or quadrate, when they are 90° diſtant, marked □. 3. Trine, when 120° diſtant, marked △. 4. Oppoſition, when 180° diſtant, marked ☍. And, 5. Conjunction, when both in the ſame degree, marked ☌. Kepler, who added eight new ones, defines aſpect to be the angle formed by the rays of two ſtars meeting on the earth, whereby their good or bad influence is meaſured; for it is to be obſerved, that theſe aſpects being firſt introduced by aſtrologers, were diſtinguiſhed into benign, malignant, and indifferent; the quartile and oppoſition being accounted malign; the trine and ſextile, benign or friendly; and the conjunction, indifferent.

ASPEN-tree, in botany. See Populus.

ASPER, in grammar, an accent peculiar to the Greek language, marked thus (῾); and importing, that the letters over which it is placed ought to be ſtrongly aſpirated, or pronounced as if an *h* were joined with them.

Asper, or *Aſpre*, in commerce; a Turkiſh coin, three of which make a Medine.

ASPERA arteria, in anatomy, the ſame with the trachea or windpipe.

ASPERIFOLIATE, or asperifolious, among botaniſts, ſuch plants as are rough-leaved, having their leaves placed alternately on their ſtalks, and a monopetalous flower divided into five parts. They conſtitute an order of plants in the *Fragmenta methodi naturalis* of Linnæus, in which are theſe genera, viz. tournefortia, cerinthe, ſymphytum, pulmonaria, anchuſa, lithoſpermum, myoſotis, heliotropium, cynogloſſum, aſperugo, lycopſis, echium, borrago: *magis minuſve oleraceæ, mucilaginoſæ, & glutinoſæ ſunt*. Lin. In the preſent ſyſtem, theſe are among the pentandria monogynia.

ASPERIFOLIÆ PLANTAE, rough-leaved plants. The name of a class in Boerhaave and Ray's methods, consisting of plants which have four naked seeds, and whose leaves are rough to the touch. In Tournefort's System, these plants constitute the third section or order of the second class; and in Linnæus's Sexual method, they make a part of the pentandria monogynia.

ASPEROSA, a town of Turkey, in Europe, situated on the coast of the Archipelago. E. long. 25. 20. N. lat. 40. 58.

ASPERUGO, SMALL WILD BUGLOSS, in botany; a genus of the pentandria monogynia class; and in the natural method ranking under the 49th order, *Asperifoliæ*. The calyx of the fruit is compressed, with folds flatly parallel, and sinuous. There are two species, viz. the procumbens, or wild bugloss, a native of Britain; and the Egyptiaca, a native of Egypt. Horses, goats, sheep, and swine eat the first species; cows are not fond of it.

ASPERULA, WOODROOF; a genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is infundibuliform; and the capsule contains two globular seeds. There are two species, the cynanchica, and the odorata. Both of them grow wild in Britain, so are seldom admitted into gardens. The first is found on chalky hills. The latter is a low umbelliferous plant, growing wild in woods and copses, and flowering in May. It has a pleasant smell, which is improved by moderate exsiccation; the taste is subsaline, and somewhat austere. It imparts its flavour to vinous liquors, was once used in medicine, in hepatic obstructions, and by some in epilepsies and palsies; modern practice has nevertheless rejected it. The smell of it is said to drive away ticks and other insects. The roots of the first are used in Sweden to dye red.

ASPHALTITES, so called from the great quantity of bitumen it produces; called also the *Dead Sea;* and from its situation, the *East Sea*, the *Salt Sea*, the *Sea of Sodom*, the *Sea of the Desert*, and the *Sea of the Plain*, by the sacred writings: a lake of Judea. Many things have been said and written of this famous, or, if they were indeed true, rather infamous lake; such as that it arose from the submersion of the vale of Siddim, where once stood, as is commonly reported, the three cities which perished in the miraculous conflagration, with those of Sodom and Gomorrah, for their unnatural and detestable wickedness: on which account this lake has been looked upon as a lasting monument of the just judgment of God, to deter mankind from such abominations. Hence it is added, that the waters of the lake are so impregnated with salt, sulphur, and other bituminous stuff, that nothing will sink or live in it; and that it casts such stench and smoke, that the very birds die in attempting to fly over it.

ASPHALTUM, or ASPHALTOS, BITUMEN JUDAICUM, or JEWS PITCH, is a light solid bitumen, of a dusky colour on the outside, and a deep shining black within; of very little taste; and having scarcely any smell, unless heated, when it emits a strong pitchy one. It is found in a soft or liquid state on the surface of the Dead Sea, and by age grows dry and hard. The same kind of bitumen is met with likewise in the earth, in other parts of the world, in China, America, and in some places in Europe, as the Carpathian hills, France, Neufchatel, &c. There are several kinds of Jews pitch in the shops; but as they are a medley of we know not what ingredients, their medicinal use begins to be deservedly laid aside, notwithstanding the many virtues attributed to this bitumen by the ancients. The true asphaltum was formerly used in embalming the bodies of the dead. The thick and solid asphalta are at present employed in Egypt, Arabia, and Persia, as pitch for ships; as the fluid ones, for burning in lamps, and for varnishes. Some writers relate, that the walls of Babylon, and the temple of Jerusalem, were cemented with bitumen instead of mortar. The watch and clock makers use a composition of asphaltum, fine lamp black, and oil of turpentine, for drawing the black figures on dial plates: the engravers also employ it in the composition of their etching ground. These compositions are prepared chiefly at Augsburg and Nuremberg, from whence they are imported.

ASPHODELUS, ASPHODEL, or KING'S SPEAR: a genus of the monogynia order, belonging to the hexandria class of plants. The calyx is divided into six parts; and the nectarium consists of six valves, covering the nectarium. The *species* are five. 1. The luteus, or common yellow asphodel, which has roots composed of many thick fleshy fibres, yellow, and joined into a head at the top; from whence arise strong round single stalks near three feet high, garnished on the upper part with yellow star-shaped flowers. 2. The ramosus, or branching asphodel, hath roots composed of fleshy fibres, to each of which is fastened an oblong bulb as large as a small potatoe; the leaves are long and flexible, having sharp edges, and between these come out the flower-stalks, which arise more than three feet high, sending forth many lateral branches. The upper part of these are adorned with many white star-shaped flowers, which grow in long spikes flowering gradually upward. They come out in the beginning of June, and the seeds ripen in autumn. 3. The ramosus, or unbranched asphodel, has roots like the second, but the leaves are longer and narrower; the stalks are single, never putting out any side branches. The flowers appear at the same time with the former, are of a purer white, and grow in longer spikes. 4. The albus, with keel-shaped leaves, has roots composed of smaller fibres than the two last, nor are the knobs at bottom half so large; the leaves are long, almost triangular, and hollow like the keel of a boat. 5. The stulosus, or annual branching spiderwort, has roots composed of many yellow fleshy fibres; the leaves are spread out from the crown of the root, close to the ground, in a large cluster; these are convex on their under side, but plain above. The flower-stalks rise immediately from the root, and grow about two feet high, dividing into three or four branches upward, which are adorned with white starry flowers, with purple lines on the outside. These flower in July and August, and their seeds ripen in October. The way to increase these plants is by parting their roots in August, before they shoot up their fresh green leaves. They may also be raised from seeds sown in August; but they must not be planted among tender flowers, as they will draw away all the nourishment. The Lancashire asphodel is thought to be very noxious to sheep, whenever, through poverty of pasture, they are necessitated to eat it; although they are said to improve much in their flesh at first, they afterwards die with symptoms of a diseased liver. This is the plant of which such wonderful tales have been told by Pauli, Bartholine, and others, of its softening the bones of such animals as swallow it; and which they thence called *gramen ossifragum*. Horned cattle eat it without any ill effect.

ASPHURELATA, in natural history, are semi-metallic fossils, fusible by fire, and not malleable in their native state, being then mixed with sulphur and other adventitious matter. Of this series of fossils there are only five bodies, each of which makes a distinct genus; viz. antimony, bismuth, cobalt, zinc, or quicksilver.

ASPIRATE, in grammar, denotes words marked with the spiritus asper. See ASPER.

ASPIRATION, among grammarians, is used to denote the pronouncing a syllable with some vehemence.

ASPLENIUM, CETERACH; a genus of the order of filices, belonging to the cryptogamia class of plants. The parts of fructification are situated in the small sparse line under the

diſk of the leaves. There are 24 ſpecies. Two of theſe are natives of Britain, and grow upon old walls or moiſt rocks; one is called *ſcolopendrium*, or *hart's tongue*; the other is properly *ceterach*, alſo called *ſpleenwort*. It has an herbaceous, ſomewhat mucilaginous, roughiſh taſte: it is recommended as a pectoral, and for promoting urine in nephritic caſes.

ASS, in zoology, a ſpecies of the equus or horſe. See EQUUS.

Coronation of the Aſs, in antiquity, was a part of the ceremony of the feaſt of Veſta, wherein the bakers put bread crowns on the heads of theſe quadrupeds; *Ecce coronatis panis dependet aſellis*. Hence, in an ancient calendar, the ides of June are thus denoted; *Feſtum eſt Veſtæ. Aſinus coronatur!*—This honour, it ſeems, was done the beaſt, becauſe, by its braying, it had ſaved Veſta from being raviſhed by the Lampſacan god. Hence the formula, *Veſtæ delicium eſt aſinus*.

ASSAI, in muſic, ſignifies quick; and, according to others, that the motion of the piece be kept in a middle degree of quickneſs or ſlowneſs; as, *aſſai allegro*, *aſſai preſto*.

ASSANCALA, a ſtrong town in Armenia, near the river Arras. E. long. 41. 30. N. lat. 39. 46.

ASSANCHIF, a town of Aſia, in Diarbekir, ſeated on the river Tigris. E. long. 42. 30. N. lat. 37. 20.

ASSANS. See ASSENS.

ASSARIUM, in antiquity, denotes a ſmall copper coin, being a part or diminutive of the *as*. The word ασσαριον is uſed by Suidas indifferently with οβολος and νομισμα, to denote a ſmall piece of money; in which he is followed by Cujacius, who defines ασσαριον by *Minimus æris nummus*. We find mention of the aſſarion in the goſpel of St. Matthew, chap. x. verſe 29.

ASSARON, or OMER, a meaſure of capacity, in uſe among the Hebrews, containing five pints. It was the meaſure of manna which God appointed for every Iſraelite.

ASSASIN, or ASSASSIN, a perſon who kills another with the advantage either of an inequality in the weapons, or by means of the ſituation of the place, or by attacking him unawares.

The word *aſſaſſin* is ſaid by ſome to have been brought from the Levant, where it took its riſe from a certain prince of the family of the *Arſacidæ*, popularly called *Aſſaſſins*, living in a caſtle between Antioch and Damaſco, and bringing up a number of young men, ready to pay a blind obedience to his commands; whom he employed in murdering the princes with whom he was at enmity. But according to Mr. Volney, the word *Haſſaſſin* (from the root *haſs*, to kill, to aſſaſſinate, to liſten, to ſurpriſe,) in the vulgar Arabic ſignifies *robbers of the night*, perſons who *lie in ambuſh to kill*; and is very univerſally underſtood in this ſenſe at Cairo and in Syria. Hence it was applied to the *Batenians*, who flew by ſurpriſe. There was a certain law of nations, an opinion received in all the republics of Greece and Italy, whereby he that aſſaſſinated an uſurper of the ſupreme power was declared a virtuous man. At Rome eſpecially, after the expulſion of the kings, the law was formal and ſolemn, and inſtances of it admitted. The commonwealth armed the hand of any citizen, and created him magiſtrate for that moment.

ASSASSINS, a tribe or clan in Syria, called alſo *Iſmaelians* and *Bataniſts* or *Batenians*. Theſe people probably owed their origin to the Karmatians, a famous heretical ſect among the Mahometans, who ſettled in Perſia about the year 1090; whence, in proceſs of time, they ſent a colony into Syria, where they became poſſeſſed of a conſiderable tract of land among the mountains of Lebanon, extending itſelf from the neighbourhood of Antioch to Damaſcus. The firſt chief and legiſlator of this remarkable tribe appears to have been Haſſan Sabah, a ſubtile impoſtor, who by his artifices made fanatical and implicit ſlaves of his ſubjects. Their religion was compounded of that of the Magi, the Jews, the Chriſtians, and the Mahometans; but the capital article of their creed was to believe that the Holy Ghoſt reſided in their chief; that his orders proceeded from God himſelf, and were real declarations of his divine pleaſure. To this monarch the orientals gave the name of *Scheik*; but he is better known in Europe by the name of the *Old Man of the Mountain*.

This people once feigned to have an intention of embracing the Chriſtian religion. They reigned a long time in Perſia and on mount Lebanon. Hulaku, a khan of the Mogul Tartars, in the year 655 of the Hegira, or 1254 of the Chriſtian era, entered their country, and diſpoſſeſſed them of ſeveral places; but it was not till the year 1272 that they were totally conquered. This achievement was owing to the conduct and intrepidity of the Egyptian forces ſent againſt them by the ſultan Bibaris. It has, however, been thought, that the Druſes, who ſtill reſide among the eminences of mount Lebanon, and whoſe religion and cuſtoms are ſo little known, are a remnant of thoſe barbarians.

ASSAULT, in law, is an attempt to offer to beat another, without touching him: as if one lifts up his cane or his fiſt in a threatening manner at another; or ſtrikes at him, but miſſes him; this is an aſſault, *inſultus*, which Finch deſcribes to be "an unlawful ſetting upon one's perſon." This is alſo an inchoate violence, amounting conſiderably higher than bare threats; and therefore, though no actual ſuffering is proved, yet the party injured may have redreſs by action of *treſpaſs vi et armis*, wherein he ſhall recover damages as a compenſation for the injury.

ASSAULT, in the military art, a furious effort made to carry a fortified poſt, camp, or fortreſs, wherein the aſſailants do not ſcreen themſelves by any works. While the aſſault continues, the fire from the batteries of the aſſailants ceaſes, for fear of killing their own men.

ASSAY, ESSAY, or SAY, in metallurgy, the proof or trial of the goodneſs, purity, value, &c. of metals and metalline ſubſtances. (See ESSAY.) In ancient ſtatutes this is called *Touch*; and thoſe who had the care of it, *Keepers of the touch*. Under Henry VI. divers cities were appointed to have touch for wrought ſilver-plate, 2 Hen. VI. c. 14. By this, one might imagine they had no better method of aſſaying than the ſimple one by the touch-ſtone; but the caſe is far otherwiſe. In the time of Henry II. the biſhop of Saliſbury, then treaſurer, conſidering that though the money paid into the king's exchequer for his crown-rents might anſwer *numero et pondere*, it might nevertheleſs be mixed with copper or braſs: wherefore a conſtitution was made, called the *trial by combuſtion*; which differs little or nothing from the preſent method of aſſaying ſilver. See a deſcription of it in the Black Book in the Exchequer, written by Gervaſe of Tilbury, c. xxi. This trial is alſo there called *eſſaium*, and the officer who made it is named *fuſor*. The method ſtill in uſe of aſſaying gold and ſilver was firſt eſtabliſhed by an act of the Engliſh parliament in 1354.

Aſſaying is more particularly uſed by moneyers and goldſmiths, for the making a proof or trial by the cuppel, or teſt, of the fineneſs or purity of the gold and ſilver to be uſed in the coining of money, and manufacture of plate, &c. or that have been already uſed therein. There are two kinds of aſſaying; the one before metals are melted, in order to bring them to their proper fineneſs; the other after they are ſtruck, to ſee that the ſpecies be ſtandard. For the firſt aſſay, the aſſayers uſe to take 14 or 15 grains of gold, and half a dram of ſilver, if it be for money; and 18 grains of the one, and a dram of the other, if for other occaſions. As to the ſecond aſſay, it is made of one of the pieces of money already coined, which they cut in four parts. The quantity of gold for an aſſay among

us is six grains; in France it was nearly the same; and in Germany, about three times as much.

ASSAYING, *ars docimastica*, in its extent, comprehends particular manners of examining every ore, or mixed metal, according to its nature, with the best-adapted fluxes; so as to discover, not only what metals, and what proportions of metal, are contained in ores; but likewise how much sulphur, vitriol, alum, arsenic, smelt, &c. may be obtained from every one respectively. See BLOW-PIPE, METALLURGY, and MINERALOGY.

ASSAY-*Master*, or *Essay-Master*, an officer under certain corporations, entrusted with the care of making true touch, or assay, of the gold and silver brought to him; and giving a just report of its goodness or badness. Such is the assay-master of the Mint in the Tower, called also *assayer of the king*.

The assay-master of the goldsmiths company is a sort of assistant-warden, called also a *touch warden*, appointed to survey, assay, and mark all the silver work, &c. committed to him. There are also assay-masters appointed by statute at York, Exeter, Bristol, Chester, Norwich, Newcastle, and Birmingham, for assaying wrought plate. The assay-master is to retain eight grains of every pound Troy of silver brought to him; four whereof are to be put in the pix, or box of deal, to be reassayed the next year, and the other four to be allowed him for his waste and spillings.

Note. The number of penny-weights set down in the assay-master's report, is to be accounted as per pound, or so much in every pound of 12 ounces Troy. For every 20 pennyweights, or ounce Troy, the silver is found by the assay to be worse than standard, or sterling, sixpence is to be deducted; because every ounce will cost so much to reduce it to standard goodness, or to change it for sterling. In gold, for every carat it is set down to be worse than standard, you must account that in the ounce Troy it is worse by so many times 3s. 8d.; and for every grain it is set down worse, you must account it worse by so many times 11d. in the ounce Troy; and for every half grain 5½d.: for so much it will cost to make it of standard goodness, &c.

ASSEMBLY, in the beau-monde, an appointed meeting of fashionable persons of both sexes, for the sake of play, dancing, gallantry, conversation, &c.

ASSEMBLY, in the military art, the second beating of a drum before a march; at which the soldiers strike their tents, roll them up, and stand to arms.

ASSEMBLIES of the clergy are called *convocations*, *synods*, *councils*. The annual meeting of the Church of Scotland is called a *General Assembly*. Assemblies of the Roman people were called *comitia*.

Under the Gothic governments, the supreme legislative power was lodged in an assembly of the states of the kingdom, held annually for the like purposes as our parliament. Some feeble remains of this usage subsisted before the French revolution in the annual assemblies of the states of Languedoc, Bretagne, and a few other provinces of France; but they were no more than shadows of the ancient assemblies. It is only in free countries, that such assemblies retain their ancient powers and privileges.

ASSENS, a sea-port town of Denmark, situated upon the Little Belt. E. long. 10. 30. N. lat. 55. 15.

ASSENT, in a general sense, implies an agreement to something proposed or affirmed by another. The *royal assent* is the approbation given by the king to a bill in parliament, after which it becomes a law.

ASSERTION, in the language of the schools, a proposition advanced by the assertor, who avows the truth of it, and is ready to defend it.

ASSESSOR, an inferior officer of justice, appointed chiefly to assist the ordinary judge with his opinion and advice.

ASSESSOR is also one who assesses, or settles taxes and other public duties.

ASSETS, in law, signifies goods enough to discharge that burden which is cast upon the executor or heir, in satisfying the debts and legacies of the testator or ancestor. Assets are real or personal: where a man hath lands in fee simple, and dies seised thereof, the lands which come to his heir are assets real; and where he dies possessed of any personal estate, the goods which come to the executors are assets personal. Assets are also divided into *assets per descent*, and *assets inter maines*. Assets by descent is where a person is bound in an obligation, and dies seised of lands which descend to the heir; the land shall be assets, and the heir shall be charged as far as the lands to him descended shall extend. *Assets inter maines* is when a man indebted makes executors, and leaves them sufficient to pay his debts and legacies; or where some commodity or profit ariseth to them in right of the testator, which are called *assets in their hands*.

ASSIDEANS, or HASIDEANS, from the Hebrew חסידים *merciful, pious*; a sect among the Jews who held works of supererogation necessary. They were the fathers and predecessors of the Pharisees; and from them likewise rose the Esseni.

ASSIDENT SIGNS, in medicine, are symptoms which usually attend a disease, but not always; hence differing from *pathognomic* signs, which are inseparable from the disease: *e. g.* In the pleurisy, a pungent pain in the side; in an acute fever, difficulty of breathing, &c. collectively taken, are pathognomic signs; but that the pain extends to the hypochondrium or clavicle, or that the patient lies with more ease on one side than on the other, are *assident* signs.

ASSIDUUS, or ADSIDUUS, among the Romans, denoted a rich or wealthy person. The word in this sense is derived from *as assis*, q. d. a monied man. Hence we meet with *assiduous* sureties, *assidui fidejussores*; answering to what the French now call city sureties or securities, *cautions bourgeois*. When Servius Tullius divided the Roman people into five classes, according as they were assessed or taxed to the public, the richer sort who contributed asses were denominated *assidui*; and as these were the chief people of business who attended all the public concerns, those who were diligent in attendances came to be denominated *assidui*.

ASSIENTO, a Spanish word signifying a *farm*, in commerce, is used for a bargain between the king of Spain and other powers, for importing negroes into the Spanish dominions in America, and particularly to Buenos Ayres. The first assiento was made with the French Guinea-company; and, by the treaty of Utrecht, transferred to the English, who were to furnish 4800 negroes annually.

ASSIGN, in common law, a person to whom a thing is assigned or made over.

ASSIGNEE, in law, a person to whom a thing is appointed, or *assigned*, to be occupied, paid, or done. An *assignee* differs from a *deputy* in this, that the *assignee* possesses or enjoys the things in his own right; and a *deputy* in the right of another. An *assignee* may be so either by *deed*, or by *law*.

ASSIGNEE *by deed* is, when a lessee of a term sells and assigns the same to another: the other is his *assignee by deed*.

ASSIGNEE *by law*, is he whom the law so makes, without any appointment of the person. Thus, an executor is *assignee by law* to the testator, who dies possessed of a lease made to him and his *assigns*.

ASSIGNING, in a general sense, implies the making over the right of one person to another. In a particular sense, it signifies the pointing out of something; as, an error, false judgment, &c.

ASSIGNMENT, the transferring the interest one has in a lease, or other thing, to another person.

ASSIMILATION, ASSIMILATIO, in *Physics*, is proper-

ly a motion whereby bodies convert other duly diſpoſed bodies into a nature like, or homogeneous to their own. Inſtances of this *aſſimilation* we ſee in flame, which converts the oily or other particles of fuel into its own fiery and luminous nature. The like alſo appears in the œconomy of vegetables, where the watery juices imbibed from the earth, being prepared and digeſted in the veſſels of the plant, become of a vegetable nature, and augment the wood, leaves, fruit, &c. So alſo, in animal bodies, we ſee the food *aſſimilated* or changed into an animal ſubſtance, by digeſtion, chilification, and the other operations neceſſary to nutrition.

ASSISE, in old Engliſh law-books, is defined to be an aſſembly of knights, and other ſubſtantial men, together with a juſtice, in a certain place, and at a certain time: but the word in its preſent acceptation, implies a court, place, or time, when and where the writs and proceſſes, whether civil or criminal, are decided by judge and jury.

All the counties of England are included in ſix circuits; and two judges are aſſigned by the king's commiſſion, who hold their aſſiſes twice a-year in every county (except London and Middleſex, where courts of *niſi prius* are holden in and after every term, before the chief or other judge of the ſeveral ſuperior courts; and except the four northern counties, where the aſſiſes are taken only once a-year) to try by a jury of the reſpective counties the truth of ſuch matters of fact as are then under diſpute in the courts in Weſtminſter-hall. Theſe judges of aſſiſe came into uſe in the room of the ancient juſtices in eyre, *juſticiarii in itinere*; who were regularly eſtabliſhed, if not firſt appointed, by the parliament of Northampton, A. D. 1176, 22 Henry II. with a delegated power from the king's great court or *aula regia*, being looked upon as members thereof: and they afterwards made their circuit round the kingdom once in ſeven years for the purpoſe of trying cauſes. They were afterwards directed by *magna charta*, c. 12. to be ſent into every county once a-year to take or try certain actions then called *recognitions* or *aſſiſes*; the moſt difficult of which they are directed to adjourn into the court of common pleas to be there determined. The itinerant juſtices were ſometimes mere juſtices of aſſiſe, or of dower, or of gaol-delivery, and the like; and they had ſometimes a more general commiſſion, to determine all manner of cauſes, *juſticiarii ad omnia placita*: but the preſent juſtices of aſſiſe and *niſi prius* are more immediately derived from the ſtatute Weſt. 2. 13. Edw. I. c. 30. explained by ſeveral other acts, particularly the ſtatute 14 Edw. III. c. 16. and muſt be two of the king's juſtices of the one bench or the other, or the chief baron of the exchequer, or the king's ſerjeants ſworn. The judges uſually make their circuits in their reſpective vacations after Hilary and Trinity terms; and they now ſit by virtue of five ſeveral authorities. 1. The commiſſion of the *peace*, in every county of the circuits: and all juſtices of the peace of the county are bound to be preſent at the aſſiſes; and ſheriffs are alſo to give their attendance on the judges, or they ſhall be fined. 2. A commiſſion of *oyer* and *terminer*, directed to them and many other gentlemen of the county, by which they are empowered to try treaſons, felonies, &c. and this is the largeſt commiſſion they have. 3. A commiſſion of general *gaol delivery*, directed to the judges and the clerk of aſſiſe aſſociate, which gives them power to try every priſoner in the gaol committed for any offence whatſoever, but none but priſoners in the gaol; ſo that one way or other they rid the gaol of all the priſoners in it.

4. A commiſſion of *aſſiſe*, directed to the judges and clerk of aſſiſe, to take aſſiſes; that is, to take the verdict of a peculiar ſpecies of jury called *an aſſiſe*, and ſummoned for the trial of *landed* diſputes. The other authority is, 5. That of *niſi prius*, which is a conſequence of the commiſſion of *aſſiſe*, being annexed to the office of thoſe juſtices by the ſtatute of Weſtm. 2. 13 Edw. I. c. 30. And it empowers them to try all queſtions of fact iſſuing out of the courts of Weſtminſter, that are then ripe for trial by jury. The original of the name is this: all cauſes commenced in the courts of Weſtminſter-hall are by the courſe of the courts appointed to be there tried, on a day fixed in ſome Eaſter or Michaelmas term, by a jury returned from the county wherein the cauſe of action ariſes; but with this proviſo, *niſi prius juſticiarii ad aſſiſas capiendas venerint; unleſs before* the day prefixed, the judges of aſſiſe come into the county in queſtion. This they are ſure to do in the vacations preceding each Eaſter and Michaelmas term, and there diſpoſe of the cauſe; which ſaves much expence and trouble, both to the parties, the jury, and the witneſſes.

The word *aſſiſe*, from the French *aſſis*, ſeated, ſettled, or eſtabliſhed, and formed of the Latin verb *aſſideo*, I ſit by, is uſed in ſeveral different ſenſes. It is ſometimes taken for the ſittings of a court; ſometimes for its regulations or ordinances, eſpecially thoſe that fix the ſtandard of weights and meaſures; and ſometimes it ſignifies a jury, either becauſe juries conſiſted of a fixed determinate number, or becauſe they continued ſitting till they pronounced their verdict.

ASSISIO, an epiſcopal town of Italy, in the duchy of Spoleto. E. long. 13. 35. N. lat. 43. 4.

ASSITHMENT, a wiregeld, or compenſation, by a pecuniary mulct; from the prepoſition *ad*, and the Sax. *ſithe, vicè; quod vicè ſupplicii ad expiandum delictum ſolvitur.*

ASSOCIATION *of Ideas*, is where two or more ideas conſtantly and immediately follow or ſucceed one another in the mind, ſo that one ſhall almoſt infallibly produce the other, whether there be any natural relation between them or not.

Where there is a real affinity or connection in ideas, it is the excellency of the mind, to be able to collect, compare, and range them in order, in its inquiries: but where there is none, nor any cauſe to be aſſigned for their accompanying each other, but what is owing to mere accident or habit, this unnatural aſſociation becomes a greater imperfection, and is, generally ſpeaking, a main cauſe of error, or wrong deductions in reaſoning. Thus the ideas of goblins and ſprights, it has been obſerved, have really no more affinity with darkneſs than with light; and yet let a fooliſh maid inculcate theſe ideas often on the mind of a child, and raiſe them there together, it is poſſible he ſhall never be able to ſeparate them again ſo long as he lives, but darkneſs ſhall ever bring with it thoſe frightful ideas. With regard to this inſtance, however, it muſt at the ſame time be obſerved, that the connection alluded to appears far from being either unnatural or abſurd.

Such wrong combinations of ideas, Mr. Locke ſhews, are a great cauſe of the irreconcileable oppoſition between the different ſects of philoſophy and religion: for we cannot imagine, that all who hold tenets different from and ſometimes even contradictory to, one another, ſhould wilfully and knowingly impoſe upon themſelves, and refuſe truth offered by plain reaſon: but ſome looſe and independent ideas are, by education, cuſtom, and the conſtant din of their party, ſo coupled in their minds, that they always appear there together: theſe they can no more ſeparate in their thoughts, than if they were but one idea, and they operate as if they were ſo. This gives ſenſe to jargon, demonſtration to abſurdities, conſiſtency to nonſenſe, and is the foundation of the greateſt, and almoſt of all the errors in the world.

Aſſociation forms a principal part of Dr. Hartley's mechanical theory of the mind. He diſtinguiſhes it into ſynchronous and ſucceſſive; and aſcribes our ſimple and complex ideas to the influence of this principle or habit. Particular ſenſations reſult from previous vibrations conveyed through the nerves to the medullary ſubſtance of the brain; and theſe are ſo intimately aſſociated together, that any one of them, when

impreſſed alone, ſhall be able to excite in the mind the ideas of all the reſt. Thus we derive the ideas of natural bodies from the aſſociation of the ſeveral ſenſible qualities with the names that expreſs them, and with each other. The ſight of part of a large building ſuggeſts the idea of the reſt inſtantaneouſly, by a ſynchronous aſſociation of the parts; and the ſound of the words, which begin a familiar ſentence, brings to remembrance the remaining parts, in order, by ſucceſſive aſſociation. Dr. Hartley maintains, that ſimple ideas run into complex ones by aſſociation; and apprehends, that by purſuing and perfecting this doctrine, we may ſome time or other be enabled to analyſe thoſe complex ideas, that are commonly called the *ideas of reflection*, or *intellectual ideas*, into their ſeveral component parts, i. e. into the ſimple ideas of ſenſation of which they conſiſt; and that this doctrine may be of conſiderable uſe in the art of logic, and in explaining the various phenomena of the human mind.

ASSOCIATION *of Parliament*. In the reign of king William III. the parliament entered into a ſolemn aſſociation to defend his majeſty's perſon and government againſt all plots and conſpiracies; and all perſons bearing offices civil or military, were enjoined to ſubſcribe the aſſociation to ſtand by king William, on pain of forfeitures and penalties, &c. by ſtat. 7 and 8 W. III. c. 27.

ASSOILE, in old law, to free from excommunication.

ASSONANCE, in rhetorick and poetry, a term uſed where the words of a phraſe or a verſe have the ſame ſound or termination, and yet make no proper rhyme. Theſe are uſually accounted vicious in Engliſh; though the Romans ſometimes uſed them with elegance: as, *Militem comparavit, exercitum ordinavit, aciem inſtravit.*

ASSONANT RHYMES, is a term particularly applied to a kind of verſes common among the Spaniards, where a reſemblance of ſound ſerves inſtead of a natural rhyme. Thus, *ligera, cubierta, tierra, meſa*, may anſwer each other in a kind of *aſſonant* rhyme, having each an *e* in the penult ſyllable, and an *a* in the laſt.

ASSUMPSIT, in the law of England, a voluntary or verbal promiſe, whereby a perſon aſſumes, or takes upon him to perform or pay any thing to another. A promiſe is in the nature of a verbal covenant, and wants nothing but the ſolemnity of writing and ſealing to make it abſolutely the ſame. If therefore it be to do any explicit act, it is an expreſs contract, as much as any covenant; and the breach of it is an equal injury. The remedy indeed is not exactly the ſame: ſince, inſtead of an action of covenant, there only lies an action upon the caſe, for what is called an *aſſumpſit* or undertaking of the defendant; the failure of performing which is the wrong or injury done to the plaintiff, the damages whereof a jury are to eſtimate and ſettle. As, if a builder promiſes, undertakes, or aſſumes to Caius, that he will build and cover his houſe within a time limited, and fails to do it; Caius has an action on the caſe againſt the builder for this breach of his expreſs promiſe, undertaking, or aſſumpſit; and ſhall recover a pecuniary ſatisfaction for the injury ſuſtained by ſuch delay. So alſo in the caſe of a debt by ſimple contract, if the debtor promiſes to pay it and does not, this breach of promiſe entitles the creditor to his action on the caſe, inſtead of being driven to an action of debt. Thus likewiſe a promiſſory note, or note of hand not under ſeal, to pay money at a day certain, is an expreſs aſſumpſit; and the payee at common law, or by cuſtom and act of parliament the indorſee, may recover the value of the note in damages, if it remains unpaid. Some agreements indeed, though never ſo expreſsly made, are deemed of ſo important a nature, that they ought not to reſt in verbal promiſe only, which cannot be proved but by the memory (which ſometimes will induce the perjury) of witneſſes. To prevent this, the ſtatute of frauds and perjuries, 29 Car. II. c. 3. enacts, that in the five following caſes no verbal promiſe ſhall be ſufficient to ground an action upon, but at the leaſt ſome note or memorandum of it ſhall be made in writing, and ſigned by the party to be charged therewith: 1. Where an executor or adminiſtrator promiſes to anſwer damages out of his own eſtate. 2. Where a man undertakes to anſwer for the debt, default, or miſcarriage, of another. 3. Where any agreement is made upon conſideration of marriage. 4. Where any contract or ſale is made of lands, tenements, or hereditaments, or any intereſt therein. 5. and laſtly, Where there is any agreement that is not to be performed within a year from the making thereof. In all theſe caſes, a mere verbal aſſumpſit is void.

From theſe expreſs contracts the tranſition is eaſy to thoſe that are only implied by law; which are ſuch as reaſon and juſtice dictate, and which therefore the law preſumes that every man has contracted to perform; and, upon this preſumption, makes him anſwerable to ſuch perſons as ſuffer by his non-performance. Thus, 1. If I employ a perſon to tranſact any buſineſs for me, or perform any work, the law implies that I undertook, or aſſumed, to pay him ſo much as his labour deſerved: and if I neglect to make him amends, he has a remedy for his injury by bringing his action on the caſe upon this implied aſſumpſit; wherein he is at liberty to ſuggeſt that I promiſed to pay him ſo much as he reaſonably deſerved, and then to aver that his trouble was really worth ſuch a particular ſum, which the defendant has omitted to pay. But this valuation of his trouble is ſubmitted to the determination of a jury; who will aſſeſs ſuch a ſum in damages as they think he really merited. This is called an *aſſumpſit* on a *quantum meruit*. 2. There is alſo an implied aſſumpſit on a *quantum valebat*, which is very ſimilar to the former; being only where one takes up goods or wares of a tradeſman, without expreſsly agreeing for the price. There the law concludes, that both parties did intentionally agree that the real value of the goods ſhould be paid; and an action on the caſe may be brought accordingly, if the vendee refuſes to pay that value. 3. A third ſpecies of implied aſſumpſit is when one has had and received money belonging to another without any valuable conſideration given on the receiver's part: for the law conſtrues this to be money had and received for the uſe of the owner only; and implies that the perſon ſo receiving, promiſed and undertook to account for it to the true proprietor. And, if he unjuſtly detains it, an action on the caſe lies againſt him for the breach of ſuch implied promiſe and undertaking; and he will be made to repair the owner in damages, equivalent to what he has detained in ſuch violation of his promiſe. This is a very extenſive and beneficial remedy, applicable to almoſt every caſe where the defendant has received money which *ex æquo et bono* he ought to refund. It lies for money paid by miſtake, or on a conſideration which happens to fail, or through impoſition, extortion, or oppreſſion, or where undue advantage is taken of the plaintiff's ſituation. 4. Where a perſon has laid out and expended his own money for the uſe of another at his requeſt, the law implies a promiſe of repayment, and an action will lie on this aſſumpſit. 5. Likewiſe, fifthly, upon a ſtated account between two merchants, or other perſons, the law implies that he againſt whom the balance appears has engaged to pay it to the other: though there be not any actual promiſe. And from this implication it is frequent for actions on the caſe to be brought, declaring that the plaintiff and defendant had ſettled their accounts together, *inſimul computaſſent* (which gives name to this ſpecies of aſſumpſit); and that the defendant engaged to pay the plaintiff the balance, but has ſince neglected to do it. But if no account has been made up, then the legal remedy is by bringing a writ of *account de computo*; commanding the defendant to render a juſt account to the plain-

tiff, or ſhow the court good cauſe to the contrary. In this action, if the plaintiff ſucceeds, there are two judgments; the firſt is, that the defendant do account *(quod computet)* before auditors appointed by the court; and when ſuch account is finiſhed, then the ſecond judgment is, that he do pay the plaintiff ſo much as he is found in arrear. 6. The laſt claſs of contracts, implied by reaſon and conſtruction of law, ariſes upon this ſuppoſition, that every one who undertakes any office, employment, truſt, or duty, contracts with thoſe who employ or entruſt him, to perform it with integrity, diligence, and ſkill: and if by his want of either of thoſe qualities any injury accrues to individuals, they have therefore their remedy in damages, by a ſpecial action on the caſe. A few inſtances will fully illuſtrate this matter. If an officer of the public is guilty of neglect of duty, or a palpable breach of it, of non-feaſance, or of miſ-feaſance; as, if the ſheriff does not execute a writ ſent to him, or if he wilfully makes a falſe return thereof; in both theſe caſes, the party aggrieved ſhall have an action *on the caſe* for damages to be aſſeſſed by a jury. If a ſheriff or gaoler ſuffers a priſoner who is taken upon meſne proceſs (that is, during the pendency of a ſuit) to eſcape, he is liable to an action *on the caſe*. But, if, after judgment, a gaoler or a ſheriff permits a debtor to eſcape, who is charged in execution for a certain ſum; the debt immediately becomes his own, and he is compellable by action of *debt*, being for a ſum liquidated and aſcertained, to ſatisfy the creditor in his whole demand. Advocate or attorney that betray the cauſe of their client, or, being retained, neglect to appear at the trial, by which the cauſe miſcarries, are liable to an action on the caſe, for a reparation to their injured client. There is alſo in law always an implied contract with a common innkeeper, to ſecure his gueſt's goods in his inn: with a common carrier or barge-maſter, to be anſwerable for the goods he carries; with a common farrier, that he ſhoes a horſe well, without laming him; with a common taylor, or other workman, that he performs his buſineſs in a workmanlike manner: in which if they fail, an action on the caſe lies to recover damages for ſuch breach of their general undertaking. Alſo, if an innkeeper, or other victualler, hangs out a ſign and opens his houſe for travellers, it is an implied engagement to entertain all perſons who travel that way; and upon this univerſal aſſumpſit an action on the caſe will lie againſt him for damages, if he without good reaſon refuſes to admit a traveller. In contracts likewiſe for ſales, if the ſeller doth upon the ſale warrant it to be good, the law annexes a tacit contract to this warranty, that, if it be not ſo, he ſhall make compenſation to the buyer: elſe it is an injury to good faith, for which an action on the caſe will lie to recover damages.

ASSUMPTION, a feſtival in the Romiſh church, in honour of the miraculous aſcent of the Virgin Mary into heaven: the Greek church, who alſo obſerve this feſtival, celebrate it on the 15th of Auguſt with great ceremony.

Assumption, in logic, is the minor or ſecond propoſition in a categorical ſyllogiſm.

Assumption is alſo uſed for a conſequence drawn from the propoſition whereof an argument is compoſed.

Assumption, an iſland in North America, in the gulph of St. Laurence. W. long. 60. 40. N. lat. 49. 30.

Assumption, a large and handſome town of Proper Paraguay. W. long. 60. 40. S. lat. 34. 10.

ASSUMPTIVE arms, in heraldry, are ſuch as a perſon has a right to aſſume, with the approbation of his ſovereign, and of the heralds: thus, if a perſon, who has no right by blood, and has no coat of arms, ſhall captivate in any lawful war any gentleman, nobleman, or prince, he is, in that caſe, entitled to bear the ſhield of that priſoner, and enjoy it to him and his heirs for ever.

ASSURANCE, in commerce. See Insurance.

ASSUROR, a merchant, or other perſon, who makes out a policy of aſſurance, and thereby inſures a ſhip, houſe, or the like.

ASSYRIA, a country celebrated in ancient hiſtory, and which comprehended the provinces in Aſia, now called Diarbeck, Curdiſtan, and Irac.

ASSYTHMENT. See Assithment.

ASTABAT, a town of Armenia, in Aſia, ſituated near the river Aras, 12 miles ſouth of Nakſhivan. E. long. 46. 30. N. lat. 39. 0.

ASTANDA, in antiquity, a royal courier or meſſenger, the ſame with angarus. King Darius of Perſia is ſaid by Plutarch, in his book on the fortune of Alexander, to have formerly been an *aſtanda*.

ASTAROTH, or Ashtaroth, in antiquity, a goddeſs of the Sidonians. The word is Syriac, and ſignifies *ſheep*, eſpecially when their udders are turgid with milk. From the fecundity of theſe animals, which in Syria continue to breed a long time, they formed the notion of a deity, whom they called *Aſtaroth*, or *Aſtarte*.

ASTARTE, the ſingular of Aſtaroth, in Pagan mythology, a Phœnician goddeſs, called in Scripture the *queen of heaven*, and the *goddeſs of the Sidonians*. Solomon, in compliment to one of his queens, erected an altar to her. In the reign of Ahab, Jezebel cauſed her worſhip to be performed with much pomp and ceremony: ſhe had 400 prieſts; the women were employed in weaving hangings or tabernacles for her; and Jeremiah obſerves, that "the children gathered the "wood, the fathers kindled the fire, and the women kneaded "the dough, to make cakes for the queen of heaven."

ASTEISM, in rhetoric, a genteel irony, or handſome way of deriding another. Such, *e. g.* is that of Virgil: *Qui Bavium non odit, amet tua carmina, Mævi*, &c. Diomed places the characteriſtic of this figure, or ſpecies of irony, in that it is not groſs and ruſtic, but ingenious and polite.

ASTER, starwort; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The receptacle is naked; the pappus is ſimple; the rays of the corolla are 10; and the calyx is imbricated. There are above 30 ſpecies. All of them may be raiſed from ſeed ſown either in autumn or ſpring: but the greateſt part of them being perennial plants, and increaſing greatly at the roots, are generally propagated by parting their roots early in the ſpring, and they will grow in almoſt any ſoil or ſituation; and the larger ſorts increaſe ſo faſt, that, if not prevented, they will in a little time run over a large ſpace of ground. Some few ſorts, which are natives of warm climates, will require artificial heat to raiſe them, if not to preſerve them.

Aster, or *Stella Marina*, in zoology. See Asterias.

ASTERABAD, a province in the N. E. part of Perſia, having Tabriſtan on the E. part of the Caſpian Sea and part of Jorjan on the N. Koraſan on the W. and Koumas on the S. —E. long 54. 35. N. lat. 36. 50.

ASTERIA, in zoology, a name by which ſome authors have called the *falco palumbarius*, or *goſhawk*. See Falco.

Asteria is alſo the name of a gem, uſually called the *cat's eye*, approaching to the nature of the opal, in having a bright included colour, which ſhifts about as it is moved. It has, however, only two colours, a pale brown and a white; the brown ſeeming the ground, and the white playing about in it, as the fire colour in the opal. It is hard, and will take a fine poliſh, but is uſually worn with its native ſhape and ſmoothneſs. It is found in the Eaſt and Weſt Indies, and in Europe. The iſland of Borneo affords ſome very fine ones, but they are uſually ſmall. They are very common in the ſands of rivers in

New Spain; and in Bohemia they are not unfrequently found immerſed in the ſame maſſes of jaſper with the opal.

ASTERIA is alſo the name of an extraneous foſſil, called in Engliſh the *ſtar-ſtone*. Theſe foſſils are ſmall, ſhort, angular, or ſulcated columns, between one and two inches long, and ſeldom above a third of an inch in diameter: being compoſed of regular joints, when ſeparated, each reſembles a radiated ſtar. They are, not without reaſon, ſuppoſed to be a part of ſome ſea-fiſh petrified; probably the aſterias or ſea-ſtar. The aſteria is alſo called *aſtrites*, *aſtroites*, and *aſteriſcus*. They may be reduced to two kinds: thoſe whoſe whole bodies make the form of a ſtar; and thoſe which in the whole are irregular, but are adorned as it were with conſtellations in the parts. Dr. Liſter, for diſtinction's ſake, only gives the name *aſteria* to the former ſort, diſtinguiſhing the latter by the appellation of *aſtroites*; other naturaliſts generally uſe the two indiſcriminately. The aſteria of the ancients appears to be of this latter kind. The quality of moving in vinegar, as if animated, is ſcarce perceivable in the aſtroites, but is ſignal in the aſteria. The former muſt be broken in ſmall pieces before it will move; but the latter will move, not only in a whole joint, but in two or three knit together. Theſe ſtones are found in many parts of England; but at Cleydon in Oxfordſhire, rather larger than common, though of a ſofter ſubſtance. See Pl. 30.

ASTERIAS, STAR-FISH, or SEA-STAR, in zoology, a genus of inſects of the order of vermes molluſca. It has a depreſſed body, covered with a coriaceous coat, is compoſed of five or more ſegments, running out from a central part, and furniſhed with numerous tentacula. It has the mouth in the centre, armed with ſharp teeth, which ſerve to convey the food into the body. From this mouth there goes a ſeparate canal through all or many of the rays. The tentacula reſemble the horns of ſnails, but ſerve the animal to walk with. They are capable of being contracted or ſhortened: and it is only on the creature's moving that they are ſeen of their full length. See a repreſentation of ſome of the ſpecies in Pl. 30.

Moſt of the ſpecies of aſterias are found in the Britiſh ſeas. 1. The glacialis, with five rays, depreſſed, broad at the baſe, yellow, and having a round ſtriated operculum on the back, is the moſt common; it feeds on oyſters, and is very deſtructive to the beds. 2. The clathatra, or cancellated ſea-ſtar, with five ſhort thick rays, hirſute beneath, cancellated above, is found with the former, but more rare. 3. The oculata, with five ſmooth rays, dotted or punctured, is of a fine purple colour, and is found about Angleſea. 4. The hiſpida, with five rays, broad, angulated at top, and rough with ſhort briſtles, is of a brown colour, and likewiſe found about Angleſea. 5. The placenta, with five very broad and membranaceous rays, extremely thin and flat, is found about Weymouth. 6. The ſpherulata, with a pentagonal indented body; a ſmall globular bead between the baſe of each ray; the rays ſlender, jointed, taper, and hirſute on their ſides; found off Angleſea. 7. The caput meduſæ, or arboreſcent ſea-ſtar, with five rays iſſuing from an angular body; the rays dividing into innumerable branches, growing ſlender as they recede from the baſe. Theſe the animal, in ſwimming, ſpreads like a net to their full length; and when he perceives any prey within them, draws them in again, thus catching it with all the dexterity of a fiſherman. It is an inhabitant of every ſea: and is called by ſome the *Magellanic ſtar-fiſh* and *baſket-fiſh*. When it extends its rays fully, it forms a circle of near three feet in diameter. There are ſeveral other ſpecies mentioned by authors; ſome of them of 10, 12, 13, or even 14 rays.

ASTERIAS, the ancient name of the bittern. See ARDEA.

ASTERISK, a ſtar (*), placed over a word or ſentence, to refer the reader to the margin for a note or quotation.

ASTERN, a ſea-phraſe, uſed to ſignify any thing at ſome diſtance behind the ſhip; being the oppoſite of AHEAD, which ſignifies the ſpace before her.

ASTEROPODIUM, a kind of extraneous foſſil, of the ſame ſubſtance with the aſteriæ or ſtar-ſtones, to which they ſerve as a baſe.

ASTHMA. See MEDICINE.

ASTI, a city of Montferrat in Italy, ſeated on the Tanaro. E. long. 8. 15. N. lat. 54. 50.

ASTOMI, in anthropology, a people feigned without mouths. Pliny ſpeaks of a nation of Aſtomi in India, who lived only by the ſmell or effluvia of bodies taken in by the noſe.

ASTORGA, a very ancient city of Spain, in the kingdom of Leon, about 150 miles N. W. of Madrid. W. long. 6. 20. N. lat. 42. 20.

ASTRACAN, a province of Ruſſia, and the moſt eaſterly part of Europe; bounded on the N. by Bulgaria and Baſkiria; on the S. by the Caſpian Sea: on the W. by the Volga, which divides it from the Nagayan Tartars and Don Coſſacks; and on the E. by the great ridge of mountains which part it from Great Tartary. This province extends from the 46th to the 52d degree of latitude.

ASTRÆA, in aſtronomy, a name which ſome give to the ſign Virgo, by others called *Erigone*, and ſometimes *Iſis*.

ASTRAGAL, in architecture, a little round moulding, which in the orders ſurrounds the top of the ſhaft or body of the column. It is alſo called the *talon* and *tondino*; it is uſed at the bottoms as well as tops of columns, and on other occaſions. It properly repreſents a ring, on whatever part of a column it is placed; and the original idea of it was that of a circle of iron put round the trunk of a tree uſed to ſupport an edifice, to prevent its ſplitting. See Plate 25. The aſtragal is often cut into beads and berries, and is uſed in the ornamented entablatures to ſeparate the ſeveral faces of the architrave.

ASTRAGAL, in gunnery, a round moulding encompaſſing a cannon, about half a foot from its mouth.

ASTRAGALOMANCY, a ſpecies of divination performed by throwing ſmall pieces, with marks correſponding to the letters of the alphabet; the accidental diſpoſition of which formed the anſwer required. This kind of divination was practiſed in a temple of Hercules, in Achaia. The word is derived from ἀστράγαλος, and μαντικ *divination*.

ASTRAGALUS, MILK-VETCH, or LIQUORICE VETCH; a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The pod is gibbous and bilocular. Of this genus there are 39 ſpecies. The common ſort grows wild upon dry uncultivated places, and is recommended as proper food for cattle. The other ſpecies deſerving notice is the tragacantha, a thorny buſh growing in Crete, Aſia, and Greece, which yields the gum tragacanth. This is of ſo ſtrong a body, that a dram of it will give a pint of water the conſiſtence of a ſyrup, which a whole ounce of gum Arabic is ſcarce ſufficient to do.

ASTRAGALUS, in anatomy. See ANATOMY.

ASTRANTIA, MASTERWORT; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The involucrum is lanceolated, open, equal, and coloured. The ſpecies are two, the major and minor, both natives of the Alps, and poſſeſſing no remarkable properties.

ASTRICTION, among phyſicians, denotes the operation of aſtringent medicines.

ASTRINGENTS, in the materia medica, ſubſtances diſtinguiſhed by a rough auſtere taſte, and changing ſolutions of iron, eſpecially thoſe made in the vitriolic acid, into a dark purple or black colour; ſuch are galls, tormentil root, biſtort, logwood, &c.

ASTROGNOSIA, the ſcience of the fixed ſtars, or the knowledge of their names, conſtellations, magnitudes, &c. See ASTRONOMY.

ASTROITES, or STAR-STONE, in natural hiſtory. See ASTERIA and STAR-STONE.

ASTROLABE, the name for a ſtereographic projection of the ſphere, either upon the plane of the equator, the eye being ſuppoſed to be in the pole of the world; or upon the plane of the meridian, when the eye is ſuppoſed in the point of the interſection of the equinoctial and horizon.

ASTROLABE is alſo the name of an inſtrument formerly uſed for taking the altitude of the ſun or ſtars at ſea.

ASTROLABE, among the ancients, was the ſame as our armillary ſphere.

ASTROLOGY, the art of foretelling future events, from the poſitions, aſpects, and influences of the heavenly bodies. The word is compounded of αστρ, *ſtar*, and λογος *diſcourſe*; whence, in the literal ſenſe of the term, aſtrology ſhould ſignify no more than the *doctrine* or *ſcience of the ſtars*. This indeed was its original acceptation, and conſtituted the ancient aſtrology; which conſiſted formerly of both the branches now called aſtronomy and aſtrology, under the name of the latter only: and for the ſake of making judiciary predictions it was, that aſtronomical obſervations, properly ſo called, were chiefly made by the ancients. And though the two branches are now perfectly ſeparated, and that of aſtrology almoſt univerſally rejected by men of real learning, this has but lately been the caſe, as their union ſubſiſted, in ſome degree, from Ptolemy till Kepler, who had a ſtrong bias towards the ancient aſtrology.

Aſtrology may be divided into two branches, *natural* and *judiciary*. To the former belongs the predicting of natural effects; ſuch as the changes of weather, hurricanes, floods, earthquakes, &c. But this art properly belongs to *phyſiology*, or *natural philoſophy*; and is only to be deduced, *à poſteriori*, from phenomena and obſervations. *Judiciary* or *Judicial* ASTROLOGY, which is what is commonly and properly called *Aſtrology*, is that which profeſſes to foretel moral events, or ſuch as have a dependence on the free will and agency of man; as if they were produced or directed by the ſtars. This ſpecies of impoſture, it is commonly ſaid, was invented in Chaldea, and from thence tranſmitted to the Egyptians, Greeks, and Romans; though ſome inſiſt that it was of Egyptian origin, and aſcribe the invention to Cham. But it is to the Arabs that we owe it. At Rome the people were ſo infatuated with it, that the aſtrologers, or, as they were then called, the mathematicians, maintained their ground in ſpite of all the edicts of the emperors to expel them out of the city.

ASTRONIUM, in botany; a genus of the pentandria order, belonging to the dicœcia claſs of plants. The male calyx conſiſts of five leaves, and the corolla is quinquepetalous. Of the female the calyx and corolla are the ſame as in the male; the ſtyli are three, and the ſeed is ſingle. There is but one ſpecies, the graveolens, a native of Jamaica.

ASTRONOMICAL *Calendar*, an inſtrument engraved on copper plates, printed on paper, and paſted on a board, with a braſs ſlider carrying a hair. It ſhows the ſun's meridian altitude, right aſcenſion, declination, riſing, ſetting, amplitude, &c. to a greater degree of exactneſs than the common globes.

ASTRONOMICAL *Sector*, a very uſeful mathematical inſtrument, made by the late ingenious Mr. Graham; a deſcription of which is given in the courſe of the following article.

ASTRONOMY.

THE doctrine of the heavens and their phænomena. Aſtronomy is properly a mixed mathematical ſcience, by which we become acquainted with the celeſtial bodies, their motions, periods, eclipſes, magnitudes, diſtances, and other phænomena. Some, however, underſtand the term aſtronomy in a more extenſive ſenſe, as compriſing in it the theory of the univerſe, with the primary laws of nature; in which ſenſe it ſeems to be rather a branch of phyſics than of mathematics.

HISTORY OF ASTRONOMY.

THE invention of aſtronomy has been aſcribed to ſeveral perſons, ſeveral nations, and ſeveral ages. Indeed it is probable that mankind never exiſted without ſome knowledge of aſtronomy amongſt them; and we find traces of it, in different degrees of improvement, among all nations.

Adam, in his ſtate of innocence, it is ſuppoſed by ſome of the Jewiſh rabbins, was endowed with a knowledge of the nature, influence, and uſes of the heavenly bodies; and Joſephus aſcribes to Seth and his poſterity a conſiderable knowledge of aſtronomy: he ſpeaks of two pillars, the one of ſtone and the other of brick, called the pillars of Seth, upon which they engraved the principles of the ſcience; and he ſays that the former was ſtill entire in his time. But be this as it may, it is evident that the great length of the antediluvian lives would afford ſuch excellent opportunities for obſerving the heavenly bodies, that we cannot but ſuppoſe that the ſcience of aſtronomy was conſiderably advanced before the flood. Indeed Joſephus ſays that longevity was beſtowed upon them for the very purpoſe of cultivating the ſciences of geometry and aſtromy; obſerving that the latter could not be learned in leſs than 600 years; "for that period, he adds, is the *grand year*." An expreſſion remarkable enough; and by which it may be ſuppoſed is meant the period in which the ſun and moon come again into the ſame ſituation in which they were at the beginning of it, with regard to the nodes, apogee of the moon, &c. "This period, ſays Caſſini, of which we find no intimation in any monument of any other nation, is the fineſt period that ever was invented; for it brings out the ſolar year more exactly than that of Hipparchus and Ptolemy; and the lunar month within about one ſecond of what is determined by modern aſtronomers." If the Antediluvians had ſuch a period of 600 years, they muſt have known the motions of the ſun and moon more exactly than their deſcendants knew them ſome ages after the flood.

On the building of the Tower of Babel, it is ſuppoſed that Noah retired with his children, born after the flood, to the north-eaſtern part of Aſia, where his deſcendants peopled the vaſt empire of China. It is ſaid alſo that the Jeſuit miſſionaries have found traditional accounts among the Chineſe, of their having been taught this ſcience by their firſt emperor Fo-hi, who is ſuppoſed to be the ſame with Noah; and Kempfer aſſerts that Fo-hi diſcovered the motions of the heavens, divided

ime into years and months, and invented the 12 ſigns into which they divide the zodiac, and which they diſtinguiſh by theſe names following; 1, the mouſe; 2, the ox or cow; 3, the tiger; 4, the hare; 5, the dragon; 6, the ſerpent; 7, the horſe; 8, the ſheep; 9, the monkey; 10, the cock or hen; 11, the dog; and, 12, the boar. They divide the heavens into 28 conſtellations, or claſſes of ſtars, allotting 4 to each of the 7 planets; ſo that the year always begins with the ſame planet; and their conſtellations anſwer to the 28 lunar manſions uſed by the Arabian aſtronomers. Theſe conſtellations however they do not mark with the figures of animals, like moſt other nations, but by connecting the ſtars by ſtraight lines, and denoting the ſtars themſelves by ſmall circles: ſo, for inſtance, the great bear would be marked thus,



The Chineſe themſelves have many records and traditions of the high antiquity of their aſtronomy; though not without ſuſpicion of great miſtakes. But, on more certain authority, it is aſſerted by Gaubil, that at leaſt 120 years before Chriſt, the Chineſe had determined by obſervation the number and extent of their conſtellations as they now ſtand; the ſituation of the fixed ſtars with reſpect to the equinoctial and ſolſtitial points; and the obliquity of the ecliptic; with the theory of eclipſes: and that they were, long before that, acquainted with the true length of the ſolar year, the method of obſerving meridian altitudes of the ſun by the ſhadow of a gnomon, and of deducing from thence his declination, and the height of the pole. The ſame miſſionary alſo ſays, that the Chineſe have yet remaining ſome books of aſtronomy, which were written about 200 years before Chriſt; from which it appears, that the Chineſe knew the daily motion of the ſun and moon, and the times of the revolutions of the planets, many years before that period.

Du Halde informs us, that Tcheou-cong, the moſt ſkilful aſtronomer that ever China produced, lived more than a thouſand years before Chriſt; that he paſſed whole nights in obſerving the celeſtial bodies, and arranging them into conſtellations, &c. At preſent, however, the ſtate of aſtronomy is but very low in that country, although it is cultivated at Peking, by public authority, in like manner as in moſt of the capital cities of Europe.

The inhabitants of Japan, of Siam, and of the Mogul's empire, have alſo been acquainted with aſtronomy from time immemorial; and the celebrated obſervatory at Benares is a monument both of the ingenuity of the Hindoos and of their ſkill in that ſcience.

According to Porphyry, aſtronomy muſt have been of very ancient ſtanding in the Eaſt. He informs us that, when Babylon was taken by Alexander, there were brought from thence celeſtial obſervations for the ſpace of 1903 years; which therefore muſt have commenced within 115 years after the flood, or within 15 years after the building of Babel.—Epigenes, according to Pliny, affirmed that the Babylonians had obſervations of 720 years engraven on bricks.—Again, Achilles Tatius aſcribes the invention of aſtronomy to the Egyptians; and adds, that their knowledge of that ſcience was engraven on pillars, and by that mean tranſmitted to poſterity.

Bailly, in his elaborate Hiſtory of ancient and modern aſtronomy, endeavours to trace the origin of this ſcience among the Chaldeans, Egyptians, Perſians, Indians, and Chineſe to a very early period. And thence he maintains, that it was cultivated in Egypt and Chaldea 2800 years before Chriſt; in Perſia, 3209; in India, 3101; and in China, 2952 years before that æra. He alſo apprehends, that aſtronomy had been ſtudied even long before this diſtant period, and that we are only to date its revival from thence.

In inveſtigating the antiquity and progreſs of aſtronomy among the Indians, Bailly examines and compares four different ſets of aſtronomical tables of the Indian philoſophers, from which it appears that the fundamental epoch of the Indian aſtronomy is a conjunction of the ſun and moon which took place 3102 years before Chriſt. Eclipſes are calculated by the mean motions of the ſun and moon, commencing at a period 5000 years diſtant. The cycle of 19 years is alſo uſed by the Indians, and their aſtronomy agrees with modern diſcoveries as to the obliquity of the ecliptic, an acceleration of the motion of the equinoctial points, and many other reſpects. From the reſearches made into the knowledge of the Indians on theſe points, by Playfair, in the ſecond volume of the Edinburgh Tranſactions, and ſeveral writers in the Aſiatic Reſearches, it may be inferred that the fabulous accounts of the antiquity of the world, believed by the vulgar among the Hindoos, refer only to various periods aſſigned by their aſtronomers for the commencement of different calculations.

Aſtronomy, it ſeems, too, was not unknown to the Americans; though in their diviſion of time, they made uſe only of the ſolar, and not of the lunar motions. The Mexicans, in particular, had a ſtrange predilection for the number 13: their ſhorteſt periods conſiſted of 13 days; their cycle of 13 months, each containing 20 days; and their century of 4 periods of 13 years each: this exceſſive veneration for the number 13, aroſe, according to Siguenza, from its being the number of their greater gods. Clavigero alſo aſſerts it as a fact, that, having diſcovered the exceſs of a few hours in the ſolar above the lunar year, they made uſe of intercalary days, to bring them to an equality, as eſtabliſhed by Julius Cæſar in the Roman calendar; but with this difference, that inſtead of one day every 4 years, they interpoſed 13 days every 52 years.

Moſt authors however fix the origin of aſtronomy and aſtrology, either in Chaldea or in Egypt; and accordingly among the ancients we find the word Chaldean often uſed for aſtronomer, or aſtrologer. Indeed both of theſe nations pretended to a very high antiquity, and claimed the honour of producing the firſt cultivators of this ſcience. The Chaldeans boaſted of their temple or tower of Belus, and of Zoroaſter, whom they placed 5000 years before the deſtruction of Troy; while the Egyptians boaſted of their colleges of prieſts, where aſtronomy was taught, and of the monument of Oſymandyas, in which, it is ſaid, there was a golden circle of 365 cubits in circumference, and one cubit thick, divided into 365 equal parts according to the days of the year, &c.

It is indeed evident that both Chaldea and Egypt were countries very proper for aſtronomical obſervations, on account of the extended flatneſs of the country, and the purity and ſerenity of the air. The tower of Belus, or of Babel itſelf, was probably an aſtronomical obſervatory; and the pyramids of Egypt, whatever they were originally deſigned for, might perhaps anſwer the ſame purpoſe; at leaſt they ſhew the ſkill of this people in practical aſtronomy, as they are all placed with their four fronts exactly facing the cardinal points of the compaſs. The Chaldeans began to make obſervations ſoon after the confuſion of languages, as appears from the obſervations found there on the taking of Babylon by Alexander; and it is probable they began much earlier. They determined, with tolerable exactneſs, the length both of a periodical and ſynodical month. They diſcovered, that the motion of the moon was not uniform; and they even attempted to aſſign thoſe parts of the orbit in which the motion is quicker or ſlower. We are alſo aſſured by Ptolemy that they were not

unacquainted with the motion of the moon's apogee and nodes, the latter of which they ſuppoſed made a complete revolution in 6585⅓ days, or a little more than 18 years, and contained 223 complete lunations, which period is called the Chaldean *Saros*. From Hipparchus, the ſame author alſo gives us ſeveral obſervations of lunar eclipſes made at Babylon above 720 years before Chriſt; and Ariſtotle informs us, that they had many occultations of the planets and fixed ſtars by the moon; a circumſtance which led them to conceive that eclipſes of the ſun were to be attributed to the ſame cauſe. They had alſo no inconſiderable ſhare in arranging the ſtars into conſtellations, and the comets did not eſcape their obſervation. Dialling was alſo practiſed among them long before the Greeks were acquainted with that ſcience.

The Egyptians, it appears from various circumſtances, were much of the ſame ſtanding in Aſtronomy as the Chaldeans. Herodotus aſcribes their knowledge in the ſcience to Seſoſtris; probably not the ſame whom Newton makes cotemporary with Solomon, as they were acquainted with aſtronomy at leaſt many hundred years before that æra. We learn, from the teſtimony of ſome ancient authors, that they believed the figure of the earth was ſpherical; that the moon was eclipſed by paſſing through the earth's ſhadow, though it does not certainly appear that they had any knowledge of the true ſyſtem of the univerſe; that they attempted to meaſure the magnitude of the earth and ſun, though their methods of aſcertaining the latter were very erroneous; and that they even pretended to foretel the appearance of comets, as well as earthquakes and inundations.

This ſcience however fell into great decay with the Egyptians, and in the time of the emperor Auguſtus it was entirely extinct among them.

From Chaldea and Egypt the ſcience of aſtronomy paſſed into Phenicia, which this people applied to the purpoſes of navigation, ſteering their courſe by the north polar ſtar; and hence they became maſters of the ſea, and of almoſt all the commerce in the world.

The Greeks, it is probable, derived their aſtronomical knowledge chiefly from the Egyptians and Phenicians, by means of ſeveral of their countrymen who viſited theſe nations, for the purpoſe of learning the different ſciences. Newton ſuppoſes that the diviſion into conſtellations was made about the time of the Argonautic expedition; but it is more probable that they were, at leaſt moſt part of them, of a much older date, and derived from other nations, though clothed in fables of their own invention or application. Several of the conſtellations are mentioned by Heſiod and Homer, who lived about 870 years before Chriſt. Their knowledge in this ſcience however was greatly improved by Thales the Mileſian, and other Greeks, who travelled into Egypt, and brought from thence the chief principles of the ſcience. Thales was born about 640 years before Chriſt; and he, firſt of all among the Greeks, obſerved the ſtars, the ſolſtices, and predicted the eclipſes of the ſun and moon. The ſcience was farther cultivated and extended by his ſucceſſors Anaximander, Anaximanes, and Anaxagoras; but moſt eſpecially by Pythagoras, 577 years before Chriſt, who brought from Egypt the learning of theſe people, taught the ſame in Greece and Italy, and founded the ſect of the Pythagoreans. He taught that the ſun was in the centre of the univerſe; that the earth was round, and people had antipodes; that the moon reflected the rays of the ſun, and was inhabited like the earth; that comets were a kind of wandering ſtars, diſappearing in the further parts of their orbits; that the white colour of the milky-way was owing to the united brightneſs of a great multitude of ſmall ſtars; and he ſuppoſed that the diſtances of the moon and planets from the earth, were in certain harmonic proportions to one another.

Philolaus, a Pythagorean, who flouriſhed about 450 years before Chriſt, aſſerted the annual motion of the earth about the ſun; and not long after, the diurnal motion of the earth on her own axis, was taught by Hicetas, a Syracuſan. About the ſame time flouriſhed at Athens, Meton and Euctemon, where they obſerved the ſummer ſolſtice 432 years before Chriſt, and obſerved the riſings and ſettings of the ſtars, and what ſeaſons they anſwered to. Meton alſo invented the cycle of 19 years, which ſtill bears his name.

Eudoxus the Cnidian lived about 370 years before Chriſt, was accounted one of the moſt ſkilful aſtronomers and geometricians of antiquity, and the inventor of many of the propoſitions in Euclid's Elements. He introduced geometry into the ſcience of aſtronomy, and travelled into Aſia, Africa, Sicily, and Italy, to improve it: and we are informed by Pliny that he determined the annual year to contain 365 days 6 hours; that he determined alſo the periodical times of the planets, and made other important obſervations and diſcoveries.

Calippus flouriſhed ſoon after Eudoxus, and his celeſtial ſphere is mentioned by Ariſtotle; but he is better known by a period of 76 years which he invented, containing 4 corrected Metonic periods, and which commenced at the ſummer ſolſtice in the year 330 before Chriſt. About his time the knowledge of the Pythagorean ſyſtem was carried into Italy, Gaul, and Egypt, by certain colonies of Greeks.

However, the introduction of Aſtronomy into Greece is repreſented by Vitruvius in a manner ſomewhat different. He maintains, that Beroſus, a Babylonian, brought it immediately from Babylon itſelf, and opened an aſtronomical ſchool in the iſle of Cos. And Pliny ſays, that in conſideration of his wonderful predictions, the Athenians erected him a ſtatue in the gymnaſium, with a gilded tongue. But if this Beroſus be the ſame with the author of the Chaldaic hiſtories, he muſt have lived before Alexander.

After the death of this conqueror, the ſciences flouriſhed chiefly in Egypt, under the auſpices of Ptolemy Philadelphus and his ſucceſſors. He founded a ſchool there, which continued till the invaſion of the Saracens in the year of Chriſt 650. From the founding of that ſchool, the ſcience of aſtronomy advanced conſiderably. Ariſtarchus, about 270 years before Chriſt, ſtrenuouſly aſſerted the Pythagorean ſyſtem, and gave a method of determining the ſun's diſtance by the dichotomy of the moon.—Eratoſthenes, who was born at Cyrene in the year 271 before Chriſt, meaſured the circumference of the earth by means of a gnomon; and being invited to Alexandria, from Athens, by Ptolemy Euergetes, and made keeper of the royal library there, he ſet up for that prince thoſe armillary ſpheres, which Hipparchus and Ptolemy the aſtronomer afterwards employed ſo ſucceſsfully in obſerving the heavens. He alſo determined the diſtance between the tropics to be $\frac{11}{83}$ of the whole meridian circle, which makes the obliquity of the ecliptic in his time to be 23° 51′ ⅓.—The celebrated Archimedes, too, cultivated aſtronomy, as well as geometry and mechanics; determined the diſtances of the planets from one another; and conſtructed a kind of planetarium or orrery to repreſent the phenomena and motions of the heavenly bodies.

To paſs by ſeveral others of the ancients, who cultivated aſtronomy, more or leſs, we find that Hipparchus, who flouriſhed about 140 years before Chriſt, was the firſt who applied himſelf to the ſtudy of every part of aſtronomy, and, as we are informed by Ptolemy, made great improvements in it: he diſcovered that the orbits of the planets are eccentric, that the moon moved ſlower in the apogee than in her perigee, and that there was a motion of anticipation of the moon's nodes: he conſtructed tables of the motions of the ſun and moon, collected accounts of ſuch eclipſes, &c. as had been made by the

Egyptians and Chaldeans, and calculated all that were to happen for 600 years to come: he difcovered that the fixed ftars changed their places, having a flow motion of their own from weft to eaft: he corrected the Calippic period, and pointed out fome errors in the method of Eratofthenes for meafuring the circumference of the earth; he computed the fun's diftance more accurately than any of his predeceffors: but his chief work is a catalogue which he made of the fixed ftars, to the number of 1022, with their longitudes, latitudes, and apparent magnitudes; which, with moft of his other obfervations, are preferved by Ptolemy in his Almageft.

There was but little progrefs made in aftronomy from the time of Hipparchus to that of Ptolemy, who was born at Peluſium in Egypt, in the firft century of chriftianity, and made the greateft part of his obfervations at the celebrated fchool of Alexandria in that country. Profiting by thofe of Hipparchus and other ancient aftronomers, he formed a fyftem of his own, which, though erroneous, was followed for many ages by all nations. He compiled a great work, called the Almageft, which contained the obfervations and collections of Hipparchus and others his predeceffors in aftronomy. This work was preferved from the conflagration of the Alexandrine library by the Saracens, and tranflated into Arabic in the year 827, and from thence into Latin in 1230. The Greek original was not known in Europe till the beginning of the 15th century, when it was brought from Conftantinople, then taken by the Turks, by George, a monk of Trapezond, by whom it was tranflated into Latin; and various other editions have been fince made.

During the long period from the year 800 till the beginning of the 14th century, the weftern parts of Europe were immerfed in grofs ignorance and barbarity; while the Arabians, profiting by the books they had preferved from the wreck of the Alexandrine library, cultivated and improved all the fciences, and particularly that of aftronomy, in which they had many able profeffors and authors. The caliph Al Manfur firft introduced a tafte for the fciences into his empire. His grandfon Al Mamun, who afcended the throne in 814, was a great encourager and improver of the fciences, and efpecially of aftronomy. Having conftructed proper inftruments, he made many obfervations; determined the obliquity of the ecliptic to be 23° 35′; and under his auſpices a degree of the circle of the earth was meafured a fecond time in the plain of Singar, on the border of the Red Sea. About the fame time Alferganus wrote elements of aftronomy; and Albategnius, who flourifhed about the year 880, greatly reformed it, by comparing his own obfervations with thofe of Ptolemy. Hence he computed the motion of the fun's apogee from Ptolemy's time to his own; fettled the preceffion of the equinoxes at one degree in 70 years; and fixed the obliquity of the ecliptic at 23° 35′. The tables which he compofed, for the meridian of Aracta, were long efteemed by the Arabians. After his time, though the Saracens had many eminent aftronomers, feveral centuries elapfed without producing any very valuable obfervations, excepting thofe of fome eclipfes obferved by Ebn Younis, aftronomer to the caliph of Egypt, by means of which the quantity of the moon's acceleration fince that time may be determined.

Other eminent Arabic aftronomers were, Arzachel, a Moor of Spain, who obferved the obliquity of the ecliptic, and improved Trigonometry by conftructing tables of fines, inftead of chords of arches, dividing the diameter into 300 equal parts. Alhazen, his contemporary, wrote upon the twilight, the height of the clouds, the phænomenon of the horizontal moon, and firft fhewed the importance of the theory of refractions in aftronomy.

Ulug Beg, grandfon of the celebrated Tartar prince Tamerlane, a great proficient in practical aftronomy, had very large inftruments, particularly a quadrant of about 180 feet high, with which he made good obfervations. From thefe he determined the latitude of Samercand, his capital, to be 39° 37′ 23″; and compofed aftronomical tables for the meridian of the fame fo exact, that they differ very little from thofe conftructed afterwards by Tycho Brahe. His principal work was his catalogue of the fixed ftars, made from his own obfervations in the year 1437.

During this period, almoft all Europe was immerfed in dark ignorance; which began to be diſpelled by the fettlement of the Moors in Spain. The emperor Frederick II, about 1230, alfo began to encourage learning; reftoring fome decayed univerfities, founding a new one in Vienna; and caufing the works of Ariftotle, and Ptolemy's Almageft, to be tranflated into Latin. Two years after this, John de Sacro Bofco, that is, of Halifax, compiled from Ptolemy, Albategnius, Alferganus, and other Arabic aftronomers, his work *De Sphæra*, which was held in the greateft eſtimation for 300 years after, and was honoured with commentaries by Clavius and other learned men. In 1240, Alphonfo, King of Caſtile, not only cultivated aftronomy himfelf, but greatly encouraged others; and by the aſſiſtance of feveral learned men corrected the tables of Ptolemy, and compofed thofe which were denominated from him the Alphonfine Tables. About the fame time alfo, Roger Bacon, an Engliſh monk, wrote feveral tracts relative to aftronomy, particularly of the lunar afpects, the folar rays, and the places of the fixed ftars; and about the year 1270, Vitello, a Polander, compofed a treatife on optics, in which he fhewed the ufe of refractions in aftronomy.

Little other improvement was made in aftronomy till the time of Purbach, who was born in 1423. He compofed new tables of fines for every 10 minutes, making the radius 60, with four ciphers annexed. He conftructed fpheres and globes, and wrote feveral aftrononical tracts; as, a commentary on Ptolemy's Almageft; fome treatifes on Arithmetic and Dialling, with tables for various climates; new tables of the fixed ftars reduced to the middle of that century; and he corrected the tables of the planets, making new equations to them where the Alphonfine tables were erroneous. In his folar tables, he placed the fun's apogee in the beginning of Cancer; but retained the obliquity of the ecliptic 23° 33½′, as determined by the lateft obfervations. He alfo obferved fome eclipfes, made new tables for computing them, and had juft finifhed a theory of the planets, when he died in 1462, being only 39 years of age.

Purbach was fucceeded in thefe labours by his pupil and friend, John Muller, commonly called Regiomontanus, from Koeningſberg, a town of Franconia, where he was born. He completed the epitome of Ptolemy's Almageft, which Purbach had begun; and after the death of his friend was invited to Rome, where he made many aftronomical obfervations. Being returned to Nuremberg in 1471, by the encouragement of a wealthy citizen named Bernard Walther, he made feveral inſtruments for aftronomical obfervations, among which was an armillary aſtrolabe, like that uſed at Alexandria by Hipparchus and Ptolemy, with which and a good clock then but a late invention he made many obfervations. He made ephemerides for 30 years to come, fhewing the lunations, eclipfes, &c.; printed the works of many of the moft celebrated ancient aftronomers, and wrote the Theory of the Planets and Comets, and a treatiſe on Triangles, ſtill in repute for feveral good theorems; computing the table of fines for every ſingle minute, to the radius 1000000, and introducing the uſe of tangents alſo into trigonometry. After his death, which happened at Rome in 1476, being only 40 years of age, Walther collected his papers, and continued the aſtronomical obſervations till his own death alſo. The obſervations of both were collected by order of the ſenate

of Nuremberg, and published there in 1544 by John Schoner: they were also afterwards published in 1618 by Snellius, at the end of the observations made by the Landgrave of Hesse; and lastly with those of Tycho Brahe in 1666.

Walther was succeeded, as astronomer at Nuremberg, by John Werner, a clergyman, who observed the motion of the comet in 1500; and wrote several tracts on geometry, astronomy, and geography, in a masterly manner; the most remarkable of which are those concerning the motion of the 8th sphere, or of the fixed stars: in this tract, by comparing his own observations, made in 1514, with those of Ptolemy, Alphonsus, and others, he shewed that the motion of the fixed stars, since called the precession of the equinoxes, is 1° 10′ in 100 years. He made also the first star of Aries 26° distant from the equinoctial point, and the obliquity of the ecliptic only 23° 28′; constructed a planetarium, representing the celestial motions according to the Ptolemaic hypothesis; and published a translation of Ptolemy's Geography, with a commentary, in which he first proposed the method of finding the longitude at sea by observing the moon's distance from the fixed stars. Werner died in 1528, at 60 years of age.

Nicolaus Copernicus was the next who made any considerable figure in astronomy. About the year 1507 he conceived doubts of the Ptolemaic system, and entertained notions about the true one, which he gradually improved by a series of astronomical observations, and the contemplation of former authors. By these he formed new tables, and completed his work in the year 1530, containing these, and a renovation of the true system of the universe, in which all the planets are considered as revolving about the sun, placed in the centre. The work was printed in 1543, under the care of Schoner and Osiander, by the title of *Revolutiones Orbium Cælestium*; and the author received a copy of it a few hours before his death, on the 23d of May 1543, he being then 70 years of age.

After the death of Copernicus, the science and practice of astronomy were greatly improved by Schoner, Nonius, Appian, Gemma Frisius, Rothman, Byrgius, the Landgrave of Hesse, &c.—Schoner reformed and explained the calendar, improved the methods of making celestial observations, and published a treatise on cosmography; he died 4 years after Copernicus.—Nonius wrote several works on mathematics, astronomy and navigation, and invented some useful and more accurate instruments than formerly: one of these was the astronomical quadrant, on which he divided the degrees into minutes by a number of concentric circles: the first was divided into 90 equal parts or degrees, the second into 89, the third into 88, and so on, to 46; so that, the index of the quadrant always falling upon or near one of the divisions, the minutes are known by an easy computation. The chief work of Appian, *The Cæsarean Astronomy*, was published at Ingoldstadt in 1540; in which he shews, how to observe the places of the stars and planets by the astrolabe; to resolve astronomical problems by certain instruments; to predict eclipses, and to describe the figures of them; and the method of dividing and using an astronomical quadrant: at the end are added observations of 5 comets, one of which has been supposed the same with that observed by Hevelius, and if so, it ought to have returned again in the year 1789;—but astronomers were disappointed in their expectations. Gemma Frisius wrote a commentary on Appian's Cosmography, accompanied with many observations of eclipses: he also invented the astronomical ring, and several other instruments, useful in taking observations at sea; and was the first who recommended a time-keeper for determining the longitude. Rheticus began a very extensive work, being a table of sines, tangents and secants, to a very large radius, and to every 10 seconds, or $\frac{1}{6}$ of a minute; which was completed by his pupil Valentine Otho, and published in 1594.

About the year 1561, William IV, Landgrave of Hesse Cassel, applied himself to the study of astronomy, and with the best instruments which could then be procured made a great number of observations, published by Snellius in 1618, and preferred by Hevelius to those of Tycho Brahe. From these observations he formed a catalogue of 400 stars, with their latitudes and longitudes, adapted to the beginning of the year 1593.

Tycho Brahe, a noble Dane, began his observations about the same time with the Landgrave of Hesse, and observed the great conjunction of Jupiter and Saturn: but finding the usual instruments very inaccurate, he constructed many others much larger and exacter. In 1571 he discovered a new star in the chair of Cassiopeia; which induced him, like Hipparchus on a similar occasion, to make a new catalogue of the stars; which he composed to the number of 777, and adapted their places to the year 1600. In the year 1576, by favour of the king of Denmark, he built his new observatory, called Uraniburg, on the small island Huenna, opposite to Copenhagen, which he very amply furnished with many large instruments, some of them so divided as to shew single minutes, and in others the arch might be read off to 10 seconds. One quadrant was divided according to the method invented by Nonius, that is, by 47 concentric circles; but most of them were divided by diagonals; a method of division invented by Richard Chanceler, an Englishman. Tycho employed his time at Uraniburg to the best advantage, till the death of the king, when, falling into discredit, he was obliged to remove to Holstein: he afterwards found means of introducing himself to the Emperor Rodolph, with whom he continued at Prague till the time of his death in 1601.—It is well known that Tycho was the inventor of a system of astronomy, a kind of Semi-Ptolemaic, which he vainly endeavoured to establish instead of the Copernican or true system. His numerous works, however, shew that he was a man of great abilities; and his discoveries, together with those of Purbach and Regiomontanus, were collected and published together in 1621, by Longomontanus, the favourite disciple of Tycho.

While Tycho resided at Prague with the emperor, he prevailed on Kepler to leave the university of Glatz, and to come to him; and Tycho dying in 1601, Kepler enjoyed all his life the title of mathematician to the Emperor, who ordered him to finish the tables of Tycho Brahe, which he published in 1627, under the title of Rodolphine. He died about the year 1630 at Ratisbon, where he was soliciting the arrears of his pension. From his own observations, and those of Tycho, Kepler discovered several of the true laws of nature, by which the motions of the celestial bodies are regulated. He discovered that all the planets revolve about the sun, not in circular, but in elliptical orbits, having the sun in one of the foci of the ellipse; that their motions are not equable, but varying, quicker or slower as they are near to the sun or farther from him; that the areas described by the variable line drawn from the planet to the sun, are equal in equal times, and always proportional to the times of describing them. He also discovered, by trials, that the cubes of the distances of the planets from the sun, were in the same proportion as the squares of their periodical times of revolution. By observations also on comets, he concluded that they are freely carried about among the orbits of the planets, in paths that are nearly rectilinear, but which he could not then determine.

In Kepler's time there were many other good proficients in astronomy; as Wright, Napier, Bayer, &c. Wright made several good meridional observations of the sun, with a quadrant of 6 feet radius, in the years 1594, 1595, and 1596; from which he greatly improved the theory of the sun's motion, and computed more accurately his declination, than any person had done before. In 1599 he published also an excellent work entitled, "Certain Errors in Navigation discovered

and detected," containing a method which has commonly, though erroneouſly, been aſcribed to Mercator. To Napier we owe ſome excellent theorems and improvements in ſpherics, beſides the ever memorable invention of logarithms. Bayer, a German, publiſhed his *Uranometria*, or the figures of all the conſtellations viſible in Europe, with the ſtars marked on them, and accompanied by names, or the letters of the Greek alphabet; a contrivance by which they may eaſily be referred to with diſtinctneſs and preciſion. About the ſame time too, aſtronomy was cultivated abroad by Mercator, Maurolycus, Maginus, Homelius, Schultet, Stevin, Galileo, &c. and in England by Thomas and Leonard Digges, John Dee, Robert Flood, Harriot, &c.

The beginning of the 17th century was particularly diſtinguiſhed by the invention of teleſcopes, and the application of them to aſtronomical obſervations. The more diſtinguiſhed early obſervations with the teleſcope, were made by Galileo, Harriot, Huygens, Hook, Caſſini, &c. It is ſaid that, from report only, Galileo made for himſelf teleſcopes, by which he diſcovered inequalities in the moon's ſurface, Jupiter's ſatellites, and the ring of Saturn; alſo ſpots on the ſun, by which he found out the revolution of that luminary on its axis; and he diſcovered that the nebulæ and milky way were full of ſmall ſtars. Harriot alſo, hitherto known only as an algebraiſt, made much the ſame diſcoveries as Galileo, and as early, if not more ſo, as appears by his papers not yet printed, in the poſſeſſion of the earl of Egremont.

Horrox, a young aſtronomer of great talents, found out in 1633, that the planet Venus would paſs over the ſun's diſc on the 24th of November, 1639; an event which he announced only to his friend Crabtree; and theſe two were the only perſons in the world that obſerved this tranſit. Horrox made alſo many other uſeful obſervations, and had even formed a new theory of the moon, taken notice of by Newton; but his early death, in the beginning of the year 1640, put a ſtop to his uſeful and valuable labours.

About the ſame time flouriſhed Hevelius, Burgomaſter of Dantzic, who obſerved the ſpots and phaſes of the moon, from which obſervations he compiled his *Selenographia*; and an account of his apparatus is contained in his work entitled *Machina Cœleſtis*, a book now very ſcarce, as moſt of the copies were accidentally burnt, with the whole houſe and apparatus, in 1679. Hevelius died in 1688, aged 76.

Hook, a contemporary of Hevelius, invented inſtruments with teleſcopic ſights, and cenſured the others. This occaſioned a ſharp diſpute between them; to ſettle which, Halley was ſent over to Hevelius to examine his inſtruments. The two aſtronomers made ſeveral obſervations together, very much to their ſatisfaction; and amongſt them was one of an occultation of Jupiter by the moon, when they determined the diameter of the latter to be 30′ 33″.

Before the middle of the 17th century, the conſtruction of teleſcopes was greatly improved, particularly by Huygens and Fontana. The former conſtructed one of 123 feet, with which he obſerved the moon and planets, and diſcovered that Saturn was encompaſſed with a ring. With teleſcopes too, of 200 and 300 feet focus, Caſſini ſaw five ſatellites of Saturn, with his zones or belts, and the ſhadows of Jupiter's ſatellites paſſing over his body. In 1666 Azout applied a micrometer to teleſcopes, to meaſure the diameters of the planets, and other ſmall diſtances in the heavens: but an inſtrument of this kind had been invented before, by Gaſcoigne, though it was but little known abroad.

To obviate the difficulties of the great lengths of refracting teleſcopes and the aberration of the rays, it is ſaid that Merſennus firſt ſtarted the idea of making teleſcopes of reflectors, inſtead of lenſes, in a letter to Deſcartes; and in 1663 James Gregory of Aberdeen ſhewed how ſuch a teleſcope might be conſtructed. After ſome time ſpent alſo on the conſtruction of both ſorts of teleſcopes, Newton found out the great inconvenience which ariſes to refractors from the different refrangibility of the rays of light; for which not finding a remedy, and purſuing the other kind, in the year 1672 he preſented to the Royal Society two reflectors, conſtructed with ſpherical ſpeculums. The inconvenience however ariſing from the different refrangibility of the rays of light, has ſince been fully obviated by Dollond. Towards the latter part of the 17th, and beginning of the 18th century, practical aſtronomy it ſeems rather languiſhed. But at the ſame time the ſpeculative part was carried to the higheſt perfection by Newton in his Principia, by David Gregory, Keil, Whiſton and others.

Soon after this, great improvements of aſtronomical inſtruments began to take place, particularly in Britain. Graham not only improved clocks and watch work, but alſo carried the accuracy of aſtronomical inſtruments to a ſurpriſing degree. He conſtructed the old 8 feet mural arch at the Royal Obſervatory, Greenwich, and a ſmall equatorial ſector for making obſervations out of the meridian; but he is chiefly remarkable for contriving the zenith ſector of 24 feet radius, and afterwards one of $12\frac{1}{2}$ feet, with which Bradley diſcovered the aberration of the fixed ſtars. The reflecting teleſcope of Gregory and Newton was greatly improved by Hadley, who preſented a very powerful inſtrument of that kind to the Royal Society in 1719. He invented alſo the reflecting quadrant or ſector, now called by his name, preſented to the ſociety in 1731, and now ſo univerſally uſeful at ſea, eſpecially where nice obſervations are required. It appears however that an inſtrument ſimilar to this in its principles had been invented by Newton; and a deſcription with a drawing of it was given by him to Halley, when he was preparing for his voyage in 1701, to diſcover the variation of the needle: it has alſo been aſſerted that Godfrey of Philadelphia, in America, made the ſame diſcovery, and the firſt inſtrument of this kind. About the middle of this century, the conſtructing and dividing of large aſtronomical inſtruments were carried to great perfection by Bird; and reflecting teleſcopes were not leſs improved by Short, who firſt executed the divided object-glaſs micrometer, which had been propoſed and deſcribed by Louville and others. Dollond alſo improved refracting teleſcopes, by means of his achromatic glaſſes; and the diſcoveries of Herſchel are owing to the amazing powers of reflectors of his own conſtruction.

Thus the aſtronomical improvements in the preſent century have been chiefly owing to the inventions and improvements in the inſtruments, and to the eſtabliſhment of regular obſervatories in England, France, and other parts of Europe. Roemer, a celebrated Daniſh aſtronomer, firſt made uſe of a meridional teleſcope; and, by obſerving the eclipſes of Jupiter's ſatellites, firſt diſcovered the progreſſive motion of light, concerning which he read a diſſertation before the Academy of Sciences at Paris in 1675. Flamſteed, appointed the firſt Aſtronomer Royal at Greenwich in 1675, obſerved, for 44 years, and gave a catalogue of 3000 ſtars with their places, to the year 1689; alſo new ſolar tables, and a theory of the moon according to Horrox; likewiſe, in Moore's Syſtem of Mathematics, he gave a curious tract on the doctrine of the ſphere, ſhewing how geometrically to conſtruct eclipſes of the ſun and moon, as well as occultations of the fixed ſtars by the moon. Upon his tables were conſtructed, both Halley's tables, and Newton's theory of the moon. Caſſini, the firſt French Aſtronomer Royal, made many obſervations on the ſun, moon, planets and comets, greatly improved the elements of their motions, erected the gnomon, and drew the celebrated meridian line in the church of Petronia at Bologna.

In 1719 Flamſteed was ſucceeded by Halley, as Aſtronomer

Royal at Greenwich, who had been ſent at the early age of 21 to the iſland of St. Helena, to obſerve the ſouthern ſtars, and make the catalogue of them, publiſhed in 1679. In 1705 he publiſhed his *Synopſis Aſtronomiæ Cometicæ*, in which he ventured to predict the return of a comet in 1758 or 1759. He firſt diſcovered the acceleration of the moon, and gave a very ingenious method for finding her parallax by three obſerved phaſes of a ſolar eclipſe; publiſhed in the Philoſophical Tranſactions many learned papers, and amongſt them ſome concerning the uſe that might be made of the next tranſit of Venus in determining the diſtance of the ſun from the earth; compoſed tables of the ſun, moon, and all the planets, which are ſtill in great repute; and recommended the method of determining the longitude by the moon's diſtances from the ſun and certain fixed ſtars; a method which had before been noticed, and which has ſince been carried into execution.

About this time a diſpute aroſe concerning the figure of the earth. Newton had determined, from a conſideration of the laws of gravity, and the diurnal motion of the earth, that the figure of it was an oblate ſpheroid, and flatted at the poles: but Caſſini, from the meaſures of Picart, ſuppoſed it to be an oblong ſpheroid, or lengthened at the poles. To ſettle this diſpute, it was reſolved, under Lewis XV. to meaſure two degrees of the meridian; one near the equator, and the other as near the pole as poſſible. For this purpoſe, the Royal Academy of Sciences ſent to Lapland, Maupertuis, Clairault, Camus, and Le Monier; who were accompanied by Outhier, and Celſus, profeſſor of anatomy at Upſal. On the ſouthern expedition were ſent Godin, Condamine, and Bouguer, to whom the king of Spain joined George Juan and Antonio de Ulloa. Theſe ſet out in 1735, and returned at different times in 1744, 1745, and 1746; but the former party, who ſet out only in 1736, returned the year following; having both fulfilled their commiſſions. Picart's meaſure was reviſed by Caſſini and De la Caille, which, after his errors were corrected, was found to agree very well with the other two; and the reſult of the whole ſerved to confirm the determination of the figure before laid down by Newton. On the ſouthern expedition, the attraction of the great mountains of Peru was found to have a ſenſible effect on the plumb-line of one of their largeſt inſtruments, deflecting it 7 or 8 ſeconds from the true perpendicular.

On the death of Halley, in 1742, he was ſucceeded by Bradley, as Aſtronomer Royal at Greenwich. The accuracy of his obſervations enabled him to detect the ſmaller inequalities in the motions of the planets and fixed ſtars. The conſequence of this accuracy was, the diſcovery of the aberration of light, the nutation of the earth's axis, and a much greater degree of perfection in the lunar tables. He obſerved the places, and computed the elements of the comets which appeared in the years 1723, 1736, 1743, and 1757; made new and accurate tables of the motions of Jupiter's ſatellites; and from a multitude of obſervations of the luminaries, conſtructed the moſt accurate table of refractions yet extant. Alſo, with a very large tranſit inſtrument, and a new mural quadrant of 8 feet radius, conſtructed by Bird in 1750, he made an immenſe number of obſervations for ſettling the places of all the ſtars in the Britiſh catalogue, together with near 1500 places of the moon, the greater part of which he compared with Mayer's tables. Bradley died in 1762.

In the mean time the aſtronomers elſewhere were aſſiduous in their endeavours to promote this ſcience. The theory of the moon was particularly conſidered by Clairault, D'Alembert, Euler, Mayer, Simpſon, and Walmſly, and eſpecially Clairault, Euler, and Mayer, who computed complete ſets of lunar tables: thoſe of the laſt of theſe authors, for their ſuperior accuracy, were rewarded with a premium of 3000 pounds; and brought into uſe in the computation of the Nautical Ephemeris, publiſhed by the Board of Longitude. The moſt accurate tables of the ſatellites of Jupiter were compoſed, from obſervations by Wargentin, an excellent Swediſh aſtronomer. Among the many French aſtronomers who contributed to the advancement of the ſcience, it was particularly indebted to De la Caille for an excellent ſet of ſolar tables; who, in 1750, went to the Cape of Good Hope to make obſervations in concert with the moſt celebrated aſtronomers in Europe, for determining the parallax of Mars and the moon, and thence, that of the ſun, which it was concluded did not much exceed 10 ſeconds. Here he re-examined and adjuſted, with great accuracy, the ſtars about the ſouthern pole; and alſo meaſured a degree of the meridian. In Italy the ſcience was aſſiduouſly cultivated by Bianchini, Boſcovich, Friſi, Manfredi, Zanotti, and many others; in Sweden by Wargentin already mentioned, Blingenſtern, Mallet, and Planman; and in Germany by Euler, Mayer, Lambert, Griſchow, and others.

In the year 1760, all the learned Societies in Europe made preparations for obſerving the tranſit of Venus over the ſun, which had been predicted by Halley more than 80 years before, with the uſe that might be made of it in determining the ſun's parallax, and the diſtances of the planets from the ſun. The ſame exertions were repeated, to obſerve the tranſit in 1769, by ſending obſervers to different parts of the world: and from the whole, Short computed that the ſun's parallax was nearly 8¾ ſeconds, and conſequently the diſtance of the ſun from the earth about 24114 of the earth's diameters, or 96 millions of miles.

Bradley was ſucceeded, in 1762, in his office of Aſtronomer Royal, by Bliſs, Savilian profeſſor of aſtronomy; who being in a declining ſtate of health, did not long enjoy it. In 1765, he was ſucceeded by Nevil Maſkelyne, the preſent Aſtronomer Royal, who, in January 1761, was ſent by the Royal Society, at a very early age, to the Iſland of St. Helena, to obſerve the tranſit of Venus over the ſun, and the parallax of the ſtar Sirius. The firſt of theſe objects partly failed, by clouds preventing the ſight of the 2d internal contact; and the 2d alſo, owing to Short having ſuſpended the plumb-line by a *loop* from the neck of the central pin. However, our aſtronomer indemnified himſelf by many other valuable obſervations: Thus, he obſerved at St. Helena, the tides; the horary parallaxes of the moon; and the going of a clock, to find, by compariſon with its previous going which had been obſerved in England, the difference of gravity at the two places: alſo, in going out and returning, he practiſed the method of finding the longitude by the lunar diſtances taken with Hadley's Quadrant, making out rules for the uſe of ſeamen, and teaching the method to the officers on board the ſhip; which was explained in the Philoſophical Tranſactions, for the year 1762, and more fully afterwards, in the Britiſh Mariner's Guide, publiſhed in the year 1763. In September 1763, he ſailed for the iſland of Barbadoes, to ſettle the longitude of the place, to examine Harriſon's watch, and to try Irwin's marine chair. While at Barbadoes, he made many other obſervations, and amongſt them, many relating to the moon's horary parallaxes, not yet publiſhed. Returning to England in the latter part of the year 1764, he was appointed in 1765 to ſucceed Bliſs as Aſtronomer Royal, and immediately recommended to the Board of Longitude the lunar method of finding the longitude, and propoſed to it the project of a Nautical Almanac, to be calculated and publiſhed to facilitate that method; this it agreed to, and the firſt volume was publiſhed for 1767, and has continued ever ſince under his direction, to the great benefit of navigation.

In conſequence of a propoſal, made by this aſtronomer to the Royal Society, the project was formed of meaſuring accu-

rately the effect of some mountain on the plumb line, in deflecting it from the perpendicular; and Schehallien, in Scotland, having been found the most convenient in this island for the purpose, he went into Scotland to conduct the business; by which experiment he shewed, that the sum of the deflections on the two opposite sides was about 11⅗ seconds of a degree; and proved, to the satisfaction of the whole world, the universal attraction of matter. From the data resulting from these measures, Hutton has computed the mean density of the whole matter in the earth, to be about 4½ times that of common water.

Finally, the discoveries of Herschel form a new æra in astronomy. In 1781, he began with observations on the periodical star *in Collo Ceti*, and a new method of measuring the lunar mountains, none of which he made more than half a mile in height: and, having constructed telescopes far more powerful than any former ones, proceeded to other observations; as, on the rotation of the planets round their axes; on the parallax of the fixed stars; catalogues of double, triple, &c. stars; on the proper motion of the sun and solar system; on the remarkable appearances of the solar regions of the planet Mars, &c. Above all, his discovery of a new primary planet, on the 13th of March 1781, called by him the *Georgian Planet*, but named the *Planet Herschel* by foreign astronomers; and of its two satellites, discovered since that time, has greatly enlarged the bounds of the solar system, this new planet being more than twice as far from the sun as the planet Saturn.

Lists and historical accounts of the principal writings and authors on astronomy are contained in Weidler's and Bailly's History of Astronomy. For this purpose, consult also Adam, Vossius, Bayle, Chauffepié, Niceron, Perraut, the chronological table of Riccioli, and that of Sherburn, at the end of his edition of Manilius; also the first volume of De la Lande's astronomy. The more modern and popular books on astronomy are very numerous, and well known: as those of Ferguson, Long, Emerson, Vince, De la Lande, Leadbetter, Brent, Keil, Whiston, Wing, Street, Bonnycastle, &c. &c.

Sect. I. *Of the apparent Motions, Magnitudes, and Changes, in the Celestial Bodies, as seen by the naked Eye.*

The first and most obvious phænomenon is the daily rising of the sun in the east, and his setting in the west; after which the moon and stars appear, and keep the same westerly course. This cannot be long taken notice of, before we must perceive that neither the sun nor moon always rises exactly in the same point of the heavens. If we observe the sun, from the beginning of March, we find that he seems to rise almost every day sensibly more to the northward than he did the day before, to continue longer above the horizon, and to be more elevated at mid-day, till towards the end of June, when he is observed to move backward in the same manner: this retrograde motion continues beyond the middle of December, when he begins again to move forwards, and so on.

When the moon first becomes visible, she appears in the western part of the heavens, at no great distance from the sun; every night increases in size, and removes to a greater distance from the sun; till at last she appears in the eastern part of the horizon, just at the time the sun disappears in the western. After this she gradually moves farther and farther eastward, rising every night later and later, till at last she seems to approach the sun as nearly in the east as she did in the west, and rises only a little before him in the morning, as in the first part of her course she set in the west not long after him. All these different appearances are completed in the space of a month; after which they begin in the same order as before.

Some of the stars neither rise in the east nor set in the west; but seem to turn round an immoveable point, near which is placed a single star called the *pole*, or *pole-star*. This point is more or less elevated according to the different parts of the earth from which we take our view. The inhabitants of Lapland, for instance, see it much more elevated above the horizon than we do; we see it more elevated than it appears to the inhabitants of France and Spain; and they, again, see it more elevated than the inhabitants of Barbary. By continually travelling south, this star at last seems depressed in the horizon, and another point appears directly opposite to it, round which the stars in the southern part of the horizon seem to turn. In this part of the heavens, however, there is no star so near the pole as there is in the northern part; nor is the number of stars in the southern part of the heavens so great as in the northern. Supposing us still to travel southward, the north-pole entirely disappears, and the whole hemisphere appears to turn round a single point in the south, as the northern hemisphere appears to us to turn round the pole-star. The general appearance of the heavens, therefore, is that of a vast concave sphere, turning round two points fixed in the north and south parts of it, once in 24 hours.

The greater part of the stars keep their places with respect to one another; that is, if we observe two stars having a certain apparent distance from each other one night, they seem to have the same every succeeding night. But all the stars in the heavens do not appear to be of this fixed kind: some of them change their places, with regard to the fixed stars, and to one another. Of these, five were only observed formerly; but Herschel has now discovered a sixth. They are distinguished by the appellation of *planets*, from *plano*, to *err* or *wander*; and called by the names of *Mercury*, *Venus*, *Mars*, *Jupiter*, *Saturn*, and *Herschel*. The fixed stars are likewise distinguished from the planets by continually exhibiting that appearance which is called the *scintillation* or *twinkling of the stars*. This is said to arise from the exceeding minuteness of their apparent diameter; so that the interposition of any little substance, of which there are many floating in the atmosphere, continually deprives us of the sight of them; but the interposing body soon changing its place, we again see the star, and thus the twinkling is produced.

Mercury is a small star, emitting a very bright white light: though, by always keeping near the sun, he is seldom to be seen; and when he does make his appearance, his motion towards the sun is so swift, that he can only be discerned for a short time, a little after sunset, and again a little before sunrise.

Venus, the most beautiful star in the heavens, known by the names of the *morning* and *evening star*, keeps near the sun, though at almost double the distance of Mercury. She is never seen in the eastern quarter of the heavens when the sun is in the western; but seems to attend him in the evening, or to give notice of his approach in the morning.

Mars is of a red fiery colour, and gives a much duller light than Venus, though sometimes he equals her in size. He is not subject to the same limitation in his motions as Mercury or Venus; but appears sometimes very near the sun, and sometimes at a great distance from him; sometimes rising when the sun sets, or setting when he rises. Of this planet it is remarkable, that when he approaches any of the fixed stars, they change their colour, grow dim, and often become totally invisible, though at some little distance from the body of the planet: but Herschel thinks this has been exaggerated by former astronomers.

Jupiter and Saturn often appear at great distances from the sun. The former shines with a bright white light, and the latter with a pale faint one; and the motion of Saturn ar-

the fixed ſtars is ſo ſlow, that, unleſs carefully obſerved, he will not be thought to move at all. Herſchel's motion is ſtill ſlower, and he is ſeldom to be ſeen without a teleſcope. The apparent magnitudes of theſe bodies are very different at different times. Every perſon muſt have obſerved that Venus is not always equally big; and this apparent difference of magnitude is ſo remarkable, that ſhe appears no leſs than 32 times larger at ſome ſeaſons than at others. This increaſe of magnitude is likewiſe very remarkable in Mars and Jupiter, but leſs ſo in Saturn, Mercury, and Herſchel.

Theſe planets by no means appear to us to move regularly in the heavens, but, on the contrary, ſometimes go forward, ſometimes backward, and ſometimes ſeem to be ſtationary.

Beſides the above-mentioned bodies, there are others which appear at uncertain intervals, and with a very different aſpect from the planets. Theſe are very numerous, and no fewer than 450 are ſuppoſed to belong to our ſolar ſyſtem. They are called *Comets*, from having a long tail, ſomewhat reſembling the appearance of hair. This, however, is not always the caſe; for ſome comets have appeared as well defined and as round as planets: but in general they have a luminous matter diffuſed around them, or projecting out from them, which to appearance very much reſembles the Aurora Borealis. They appear to come in a direct line towards the ſun, as if they were going to fall into his body; and after having diſappeared for ſome time in conſequence of their proximity to that luminary, fly off again on the other ſide as faſt as they came, projecting a tail much greater and brighter in their receſs; but, getting daily at a farther diſtance from us in the heavens, they continually loſe ſome of their ſplendour, and at laſt totally diſappear. Their apparent magnitude is very different: ſometimes they appear only of the bigneſs of the fixed ſtars; at other times they equal the diameter of Venus, and ſometimes even of the ſun or moon. In 1652, Hevelius obſerved a comet which ſeemed not inferior to the moon in ſize, though it was not ſo bright, but appeared with a pale and dim light. Theſe bodies alſo ſometimes loſe their ſplendour ſuddenly, while their apparent bulk remains unaltered. With reſpect to their apparent motions, they have all the inequalities of the planets; ſometimes ſeeming to go forwards, ſometimes backwards, and ſometimes to be ſtationary.

The fixed ſtars are liable to changes: ſeveral obſerved by the ancients are now no more to be ſeen; and new ones have appeared, which were unknown to the ancients. Some of them have alſo diſappeared for ſome time, and again become viſible. At times ſome have been obſerved to diſtinguiſh themſelves by ſuperlative luſtre; but afterwards decreaſing, to vaniſh by degrees, and to be no more ſeen. One of theſe ſtars being firſt ſeen and obſerved by Hipparchus, ſet him upon compoſing a catalogue of the fixed ſtars, that by it poſterity might learn whether any of the ſtars periſh, and others are produced afreſh: and after ſeveral ages, another new ſtar appeared to Tycho Brahe, which put him on the ſame deſign. Of theſe changes accounts have been given by Halley, and by Montanere and Pigot in the Philoſophical Tranſactions. The milky way, or galaxy, is a remarkable appearance in the heavens, being a broad ring of a whitiſh colour, ſurrounding the whole celeſtial concave, whoſe light is now known to proceed from vaſt cluſters of ſtars diſcoverable only by the teleſcope.

Beſides the appearances already mentioned, which are very obſervable by the unaſſiſted eye, are the obſcurations of the ſun and moon, commonly called *eclipſes*. Theſe are too well known, and attract the attention too much, to need any particular deſcription. We have, however, accounts very well authenticated, of obſcurations of the ſun continuing for a much longer time than a common eclipſe poſſibly can do, and likewiſe of the darkneſs being much greater than it uſually is on ſuch occaſions.

Sect. II. *Of the Appearances of the Celeſtial Bodies as ſeen through Teleſcopes.*

The ſun, though to human eyes ſo extremely bright and ſplendid, is yet frequently obſerved, even through a teleſcope of but very ſmall powers, to have dark ſpots on his ſurface, which are ſaid to have been firſt diſcovered in the year 1611; and the honour of the diſcovery is diſputed betwixt Galileo and Scheiner, a German Jeſuit at Ingolſtadt. But whatever merit Scheiner might have in the priority of the diſcovery, it is certain that Galileo far exceeded him in accuracy, though the work of Scheiner has conſiderable merit, as containing obſervations ſelected from above 3000 made by himſelf.

There is great variety in the magnitudes of the ſolar ſpots; the difference is chiefly in ſuperficial extent of length and breadth; their depth or thickneſs is very ſmall: ſome have been ſo large, as by computation to be capable of covering the continents of Aſia and Africa; nay, the whole ſurface of the earth, or even five times its ſurface. The diameter of a ſpot, when near the middle of the diſk, is meaſured by comparing the time it takes in paſſing over a croſs hair in a teleſcope, with the time wherein the whole diſk of the ſun paſſes over the ſame hair; it may alſo be meaſured by the micrometer; and by either of theſe methods we may judge how many times the diameter of the ſpot is contained in the diameter of the ſun. Spots are ſubject to increaſe and diminution of magnitude, and ſeldom continue long in the ſame ſtate. They are of various ſhapes; moſt of them having a deep black nucleus ſurrounded by a duſky cloud, whereof the inner parts near the black are a little brighter than the outſkirts. They change their ſhapes, ſomething in the manner that our clouds do; though not often ſo ſuddenly: thus, what is of a certain figure to-day, ſhall, to-morrow, or perhaps in a few hours, be of a different one; what is now but one ſpot, ſhall in a little time be broken into two or three; and ſometimes two or three ſpots ſhall coaleſce, and be united into one.

The number of ſpots on the ſun is very uncertain; ſometimes there are a great many, ſometimes very few; and ſometimes none at all. Scheiner made obſervations on the ſun from 1611 to 1629; and ſays he never found his diſk quite free of ſpots, excepting a few days in December 1624. At other times he frequently ſaw 20, 30, and in the year 1625 he was able to count 50 ſpots on the ſun at a time. In an interval afterwards of 20 years, from 1650 to 1670, ſcarcely any ſpots were to be ſeen, and ſince that time ſome years have furniſhed a great number of ſpots, and others none at all; but ſince the beginning of the laſt century, not a year paſſed wherein ſome were not ſeen.

From theſe phænomena it is evident, that the ſpots are not endowed with any permanency, nor are they at all regular in their ſhape, magnitude, number, or in the time of their appearance or continuance. Hevelius obſerved one that aroſe and vaniſhed in 16 or 17 hours; and no one has been obſerved to continue longer than 70 days: thoſe ſpots that are formed gradually, are gradually diſſolved; while thoſe that ariſe ſuddenly, are for the moſt part ſuddenly diſſolved. When a ſpot diſappears, that part where it was generally becomes brighter than the reſt of the ſun, and continues ſo for ſeveral days; on the other hand, thoſe bright parts called *faculæ* (as the others are called *maculæ*) ſometimes turn to ſpots.

The ſolar ſpots appear to have a motion which carries them acroſs the ſun's diſk. Every ſpot, if it continues long enough without being diſſolved, appears to enter the ſun's diſk on the

eaſt ſide, to go from thence with the velocity continually increaſing till it has gone half its way; and then to move ſlower and ſlower, till it goes off at the weſt ſide; after which it diſappears for about the ſame ſpace of time that it ſpent in croſſing the diſk, and then enters upon the eaſt ſide again, nearly in the ſame place, and croſſes it in the ſame track, and with the ſame unequal motion as before.

The motion of the ſpots is in the order of the ſigns (the ſame way that all motions in the ſolar ſyſtem, thoſe of the comets alone excepted, are performed); and therefore, as the earth revolves round the ſun the ſame way with the ſolar ſpots, one of theſe will appear to remain longer on the diſk than it would otherwiſe do if the earth remained at reſt.

The face of the ſun, when clear of ſpots, ſeen by the naked eye through a ſmoked or coloured glaſs, or through a thin cloud, or the vapours near the horizon, appears all over equally luminous: but when viewed through the teleſcope, the glaſſes being ſmoked or coloured, the middle of the diſk appears brighter than the outſkirts; becauſe the light is darted more directly towards us from the middle than from any other part, and the faculæ appear more diſtinctly near the ſides, as being on a darker ground than in the middle.

The phænomena of the ſolar ſpots, as delivered by Scheiner and Hevelius, may be ſummed up in the following particulars. 1. Every ſpot which hath a nucleus, or conſiderably dark part, hath alſo an umbra, or fainter ſhade, ſurrounding it. 2. The boundary betwixt the nucleus and umbra is always diſtinct and well defined. 3. The increaſe of a ſpot is gradual, the breadth of the nucleus and umbra dilating at the ſame time. 4. In like manner, the decreaſe of a ſpot is gradual; the breadth of the nucleus and umbra contracting at the ſame time. 5. The exterior boundary of the umbra never conſiſts of ſharp angles; but is always curvilinear, how irregular ſoever the outline of the nucleus may be. 6. The nucleus of a ſpot, whilſt on the decreaſe, often changes its figure by the umbra encroaching irregularly upon it, inſomuch that in a ſmall ſpace of time new encroachments are diſcernible, whereby the boundary betwixt the nucleus and umbra is perpetually varying. 7. It often happens, by theſe encroachments, that the nucleus of a ſpot is divided into two or more nuclei. 8. The nuclei of the ſpots vaniſh ſooner than the umbra. 9. Small umbræ are often ſeen without nuclei. 10. An umbra of any conſiderable ſize is ſeldom ſeen without a nucleus in the middle of it. 11. When a ſpot which conſiſted of a nucleus and umbra is about to diſappear, if it is not ſucceeded by a *facula*, or ſpot brighter than the reſt of the diſk, the place where it was is ſoon after not diſtinguiſhable from the reſt.

In the Philoſophical Tranſactions, vol. lxiv. the following appearances are mentioned by Wilſon. 1. When the ſpot is about to diſappear on the weſtern edge of the ſun's limb, the eaſtern part of the umbra firſt contracts, then vaniſhes, the nucleus and weſtern part of the umbra remaining; then the nucleus gradually contracts and vaniſhes, while the weſtern part of the umbra remains. At laſt this diſappears alſo; and if the ſpot remains long enough to become again viſible, the eaſtern part of the umbra firſt becomes viſible, then the nucleus; and when the ſpot approaches the middle of the diſk, the nucleus appears environed by the umbra on all ſides, as already mentioned. 2. When two ſpots lie very near to one another, the umbra is deficient on that ſide which lies next the other ſpot; and this will be the caſe, though a large ſpot ſhould be contiguous to one much ſmaller; the umbra of the large ſpot will be totally wanting on that ſide next the ſmall one. If there are little ſpots on each ſide of the large one, the umbra does not totally vaniſh; but appears flattened or preſſed in towards the nucleus on each ſide. When the little ſpots diſappear, the umbra of the large one extends itſelf as uſual. This circumſtance, he obſerves, may ſometimes prevent the diſappearance of the umbra in the manner above mentioned; ſo that the weſtern umbra may diſappear before the nucleus, if a ſmall ſpot happens to break out on that ſide.

In the ſame volume, p. 337, Wollaſton obſerves, that the appearances mentioned by Wilſon are not conſtant: and as much depends on the accuracy of obſervers and the ſituation of the ſpots on the ſun's orb, it is probable that their obſervations will continue to differ in minute particulars, till a conſiſtent theory is formed, by which the cauſe of theſe phænomena may be explained.

The ſpots are by no means confined to one part of the ſun's diſk; though we have not heard of any being obſerved about his polar regions. The paths they deſcribe in their courſe over the diſk are exceedingly different; ſometimes being ſtraight lines, ſometimes curves, ſometimes deſcending from the northern to the ſouthern part of the diſk, ſometimes aſcending from the ſouthern to the northern, &c.

Beſides theſe ſpots, there are others which ſometimes appear very round and black, travelling over the diſk of the ſun in a few hours, totally unlike the others, and proceeding from an interpoſition of the planets Mercury and Venus between the earth and the ſun. Excepting the two kinds of ſpots above mentioned, however, no kind of object is diſcoverable on the ſurface of the ſun, but he appears like an immenſe ocean of elementary fire or light.

With the moon the caſe is very different. Many darkiſh ſpots appear in her to the naked eye; and through a teleſcope their number is prodigiouſly increaſed: ſhe alſo appears very plainly to be more protuberant in the middle than at the edges, or to have the figure of a globe, and not a flat circle. When the moon is horned or gibbous, the one ſide appears very ragged and uneven, but the other always exactly defined and circular. The ſpots in the moon always keep their places exactly; never vaniſhing, or going from one ſide to the other, as thoſe of the ſun do. We ſometimes ſee more or leſs of the northern and ſouthern, and eaſtern and weſtern part of the diſk or face; which is owing to what is called her libration.

On plate 1. is a tolerably exact repreſentation of the full moon in her mean libration, with the numbers to the principal ſpots according to Riccioli, Caſſini, Mayer, underneath which the figure of part of the moon's ſurface is more accurately delineated. The names are as follow:

* Herſchel's Volcano.
1 Grimaldus.
2 Galileus.
3 Ariſtarchus.
4 Keplerus.
5 Gaſſendus.
6 Shikardus.
7 Harpalus.
8 Heraclides.
9 Lanſbergius.
10 Reinoldus.
11 Copernicus.
12 Helicon.
13 Capuanus.
14 Bullialdus.
15 Eratoſthenes.
16 Timocharis.
17 Plato.
18 Archimedes.
19 Inſula Sinus Medii.
20 Pitatus.
21 Tycho.
22 Eudoxus.
23 Ariſtoteles.
24 Manilius.
25 Menelaus.
26 Hermes.
27 Poſſidonius.
28 Dionyſius.
29 Plinius.
30 Caſharina Cyrillus. Theophilus.
31 Procaſtorius.
32 Promontorium acutum. Cenſorinus.
33 Meſſala.
34 Promontorium Somnii.
35 Proclus.
36 Cleomedes.
37 Snellius et Furnerius.
38 Petavius.
39 Langrenus.
40 Taruntius.
A Mare Humorum.
B Mare Nubium.
C Mare Imbrium.
D Mare Nectaris.
E Mare Tranquillitatis.
F Mare Serenitatis.
G Mare Fœcunditatis.
H Mare Criſium.

Mercury, when looked at through telescopes magnifying about 200 or 300 times, appears equally luminous throughout his whole surface, without the least dark spot. He appears to have the same phases with the moon, being sometimes horned, sometimes gibbous, and sometimes shining almost with a round face, though not entirely full, because his enlightened side is never turned directly towards us; but at all times perfectly well defined without any ragged edge, and perfectly bright.

Venus, when seen through a telescope, represents the same phases as the moon, and is diversified with spots; but Cassini seems to have been mistaken in giving her a satellite, for it has not been seen by subsequent astronomers, and the observations of Herschel render the assertions of some foreign astronomers on the immense heights of its mountains and the existence of its atmosphere equally problematical.

Much larger and more remarkable spots have been perceived on the disk of Mars than on that of any other primary planet. By very accurate observations Herschel has determined the proportion between the polar and equatorial diameters and the length of the day in this planet. He has also given some good conjectures on its seasons and its atmosphere: the latter it is now ascertained to have; but though considerable, the atmosphere is not of so great an extent as the conjectures on former observations led astronomers to imagine.

Jupiter has the same general appearance with Mars, only that the belts on his surface are much larger and more permanent. Their number is very variable, as sometimes only one, and at others no fewer than eight, may be perceived. They are generally parallel to one another, but not always so; and their breadth is likewise variable, one belt having been observed to grow narrow, while another in its neighbourhood has increased in breadth, as if the one had flowed into the other. The time of their continuance is very uncertain, sometimes remaining unchanged for three months; at others, new belts have been formed in an hour or two. In some of these belts large black spots have appeared, which moved swiftly over the disk from east to west, and returned in a short time to the same place; from whence the rotation of this planet about its axis has been determined. The figure of Jupiter is evidently an oblate spheroid, the longest diameter of his disk being to the shortest as 13 to 12. His rotation is from west to east, like that of the sun, and the plane of his equator is very nearly coincident with that of his orbit; so that there can scarce be any difference of seasons in that planet. His rotation has been observed to be somewhat quicker in his aphelion than his perihelion.

The most remarkable circumstance attending this planet is his having four moons, which constantly revolve round him at different distances. These are all supposed to move in ellipses; though the eccentricities of all of them are too small to be measured, excepting that of the fourth; and even this amounts to no more than 0.007 of its mean distance from the primary. The first of these satellites revolves at the distance of 5.697 of Jupiter's semidiameters, or 1′ 51″ as measured by proper instruments; its periodical time is 1 d. 18 h. 27′ 34″. The next satellite revolves at the distance of 9.017 semidiameters, or 2′ 56″, in 3 d. 13 h. 13′ 43″; the third at the distance of 14.384 semidiameters, or 4′ 42″, in 7 d. 3 h. 42′ 36″; and the fourth at the distance of 25.266, or 8′ 16″, in 16 d. 16 h. 32′ 09″.

Their nodes are not in the same place. All of them, by reason of their immense distance, seem to keep near their primary, and their apparent motion is a kind of oscillation like that of a pendulum, going alternately from their greatest distance on one side to the greatest distance on the other, sometimes in a straight line, and sometimes in an elliptic curve. When a satellite is in its superior semicircle, or that half of its orbit which is more distant from the earth than Jupiter is, its motion appears to us direct, according to the order of the signs; but in its inferior semicircle, when it is nearer to us than Jupiter, its motion appears retrograde; and both these motions seem quicker the nearer the satellites are to the centre of the primary, slower the more distant they are, and at the greatest distance of all they appear for a short time to be stationary.

From this account of the system of Jupiter and his satellites, it is evident, that occultations of them must frequently happen by their going behind their primary, or by coming in betwixt us and it. The former takes place when they proceed towards the middle of their upper semicircle; the latter, when they pass through the same part of their inferior semicircle. Occultations of the former kind happen to the first and second satellite; at every revolution, the third very rarely escapes an occultation, but the fourth more frequently by reason of its greater distance. It is seldom that a satellite can be discovered upon the disk of Jupiter, even by the best telescopes, excepting at its first entrance, when, by reason of its being more directly illuminated by the rays of the sun than the planet itself, it appears like a lucid spot upon it. Sometimes, however, a satellite, in passing over the disk, appears like a dark spot, and is easily to be distinguished. This is supposed to be owing to spots on the body of these secondary planets; and it is remarkable, that the same satellite has been known to pass over the disk at one time as a dark spot, and at another so luminous that it could not be distinguished from Jupiter himself, except at its coming on and going off. To account for this, we must say that either the spots are subject to change; or, if they be permanent like those of our moon, that the satellites at different times turn different parts of their globes towards us. Possibly both these causes may contribute to produce the phænomena just mentioned. For these reasons also both the light and apparent magnitude of the satellites are variable: for the fewer spots there are upon that side which is turned towards us, the brighter it will appear; and as the bright side only can be seen, a satellite must appear larger the more of its bright side it turns towards the earth, and the less so the more it happens to be covered with spots. The fourth satellite, though generally the smallest, sometimes appears bigger than any of the rest: the third sometimes seems least, though usually the largest; nay, a satellite may be so covered with spots as to appear less than its shadow passing over the disk of the primary, though we are certain that the shadow must be smaller than the body which casts it. To a spectator placed on the surface of Jupiter, each of these satellites would put on the phases of the moon; but they appear to us always round, having constantly their enlightened half turned towards the earth.

When the satellites pass through their inferior semicircles, they may cast a shadow upon their primary, and thus cause an eclipse of the sun to his inhabitants; and in some situations this shadow may be observed going before or following the satellite. On the other hand, in passing through their superior semicircles, the satellites may be eclipsed in the same manner as our moon by passing through the shadow of Jupiter: and this is actually the case with the first, second, and third of these bodies; but the fourth, by reason of the largeness of its orbit, passes sometimes above or below the shadow, as is the case with our moon. The beginnings and endings of these eclipses are easily seen by a telescope when the earth is in a proper situation with regard to Jupiter and the sun; but when this or any other planet is in conjunction with the sun, the superior brightness of that luminary renders both it and the satellites invisible. From the time of its first appearing after a conjunction until near the opposition, only the immersions of the satellites into his shadow, or the beginnings of the eclipses,

are visible; at the apposition, only the occultations of the satellites, by going behind or coming before their primary, are observable; and from the apposition to the conjunction, only the immersions, or end of the eclipses, are to be seen. This is exactly true in the first satellite, of which we can never see an immersion with its immediately subsequent emersion: and it is but rarely that they can be both seen in the second; as in order to their being so, that satellite must be near one of its limits, at the same time that the planet is near his perihelion and quadrature with the sun. With regard to the third, when Jupiter is more than 46 degrees from conjunction with, or apposition to, the sun, both its immersions and immediately subsequent emersions are visible; as they likewise are in the fourth, when the distance of Jupiter from conjunction or apposition is 24 degrees.

When Jupiter is in quadrature with the sun, the earth is farthest out of the line that passes through the centres of the sun and Jupiter, and therefore the shadow of the planet is then most exposed to our view: but even then the body of the planet will hide from us one side of that part of the shadow which is nearest to it, through which the first satellite passes; which is the reason that, though we see the entrance of that satellite into the shadow, or its coming out from thence, as the earth is situated on the east or west side thereof, we cannot see them both; whereas the other satellites going through the shadow at a greater distance from Jupiter, their ingress and egress are both visible.

Saturn, when viewed through a good telescope, makes a more remarkable appearance than any of the other planets. Galileo first discovered his uncommon shape, and from the discoveries made by him and other astronomers, it appears that this planet is surrounded by a broad thin ring, the edge of which reflects little or none of the sun's light to us, but the planes of the ring reflect the light in the same manner that the planet itself does; and if we suppose the diameter of Saturn to be divided into three equal parts, the diameter of the ring is about seven of these parts. The ring is detached from the body of Saturn in such a manner, that the distance between the innermost part of the ring and the body is equal to its breadth. If we had a view of the planet and his ring, with our eyes, perpendicular to one of the planes of the latter, we should see them as in Pl. 2. fig. A.; but our eye is never so much elevated above either plane as to have the visual ray stand at right angles to it, nor indeed is it ever elevated more than about 30 degrees above it; so that the ring, being commonly viewed at an oblique angle, appears of an oval form, and through very good telescopes double, as represented Pl. 1. fig. 3. and Pl. 2. fig. B. Both the outward and inward rim is projected into an ellipsis, more or less oblong according to the different degrees of obliquity with which it is viewed. Sometimes our eye is in the plane of the ring, and then it becomes invisible; either because the outward edge is not fitted to reflect the sun's light, or more probably because it is too thin to be seen at such a distance. As the plane of this ring keeps always parallel to itself, that is, its situation in one part of the orbit is always parallel to that in any other part, it disappears twice in every revolution of the planet, that is about once in 15 years; and he sometimes appears quite round for nine months together. At other times, the distance betwixt the body of the planet and the ring is very perceptible; and Whiston tells us, that Clarke's father saw a star through the opening. When Saturn appears round, if our eye be in the plane of the ring, it will appear as a dark line across the middle of the planet's disk; and if our eye be elevated above the plane of the ring, a shadowy belt will be visible, caused by the shadow of the ring as well as by the interposition of part of it betwixt the eye and the planet. The shadow of the ring is broadest when the sun is most elevated, but its obscure parts appear broadest when our eye is most elevated above the plane of it. When it appears double, the ring next the body of the planet appears brightest; when the ring appears of an elliptical form, the parts about the ends of the largest axis are called the *ansæ*. These, a little before and after the disappearing of the ring, are of unequal magnitude: the largest ansa is longer visible before the planet's round phase, and appears again sooner than the other.

In the diagram, fig. 2. are delineated the phases of the ring from its full appearance in the year 1782 to its disappearance in 1789, and its full re-appearance 1796.

Saturn has (see fig. 3.) besides the ring above-mentioned, five moons continually circulating round him. The first, at the distance of 2.097 semidiameters of his ring, and 4.893 of the planet itself, performs its revolution in 1 d. 21 h. 18′ 27″; the second, at 2.686 semidiameters of the ring, and 6.268 of Saturn, revolves in 2 d. 17 h. 41′ 22″; the third, at the distance of 8.754 semidiameters of Saturn, and 3.752 of the ring, in 4 d. 12 h. 25′ 12″; the fourth called the *Huygenian satellite*, at 8.698 semidiameters of the ring, and 20.295 of Saturn, revolves in 15 d. 22 h. 41′ 12″; while the fifth, placed at the vast distance of 59.154 semidiameters of Saturn, or 25.348 of his ring, does not perform its revolution in less than 79 d. 7 h. 47′ 00″. The orbits of all these satellites, except the fifth, are nearly in the same plane, which makes an angle with the plane of Saturn's orbit of about 31°; and by reason of their being inclined at such large angles, they cannot pass either across their primary or behind it with respect to the earth, except when very near their nodes; so that eclipses of them happen much seldomer than of the satellites of Jupiter.

The planet Herschel is less known than Saturn. Its apparent magnitude is so small, that it can seldom be seen with the naked eye; and even with the telescope it appears but of a few seconds diameter. It is attended by two satellites; the innermost is supposed to perform its revolution in about eight days and three-quarters, the other in thirteen days and a half.

The comets, viewed through a telescope, have a very different appearance from any of the planets. The nucleus, or star, seems much dimmer. They are to appearance surrounded with atmospheres of a prodigious size, often rising ten times higher than the nucleus, and have often likewise different phases, like the moon.

The head of a comet, seen through a good telescope, appears to consist of a solid globe, and an atmosphere that surrounds it. The solid part is frequently called the *nucleus*; which through a telescope is easily distinguished from the atmosphere or hairy appearance.

A comet is generally attended with a blaze or tail, whereby it is distinguished from a star or planet; as it is also by its motion. Sometimes the tail only of a comet has been visible at a place where the head has been all the while under the horizon; such an appearance is called a *beam*.

As the tail of a comet is owing to the heat of the sun, it grows larger as the comet approaches near to, and shortens as it recedes from, that luminary. If the tail of a comet were to continue of the same length, it would appear longer or shorter according to the different views of the spectator; for if his eye be in a line drawn through the middle of the tail lengthwise, or nearly so, the tail will not be distinguished from the rest of the atmosphere, but the whole will appear round; if the eye be a little out of that line, the tail will appear short (see Pl. 11. fig. C.); and it is called a *bearded comet*, when the tail hangs down towards the horizon, as in that figure. If the tail of a comet be viewed sidewise, the whole length of it is seen. It is obvious to remark, that the nearer the eye is to the tail, the greater will be its apparent length.

* The ingenious Dr Herschell has discovered two additional moons belonging to

The tails of comets often appear bent (ſee Pl. 12. fig. 78. 79.), owing to the reſiſtance of the æther; which, though extremely ſmall, may have a ſenſible effect on ſo thin a vapour as the tail conſiſts of. This bending is ſeen only when the earth is not in the plane of the orbit of the comet continued. When that plane paſſes through the eye of the ſpectator, the tail appears ſtraight. (ſee Pl. 8. fig. D. E.)

The fixed ſtars, when viewed through the beſt teleſcopes, appear not at all magnified, but rather diminiſhed in bulk; by reaſon, as is thought by ſome, that the teleſcope takes off that twinkling appearance they make to the naked eye; but by others more probably, that the teleſcope tube excludes a quantity of the rays of light, which are not only emitted from the particular ſtars themſelves, but by many thouſands more, which falling upon our eye-lids and the aërial particles about us, are reflected into our eyes ſo ſtrongly as to excite vibrations, not only on thoſe points of the retina where the images of the ſtars are formed, but alſo in other points at the ſame diſtance round about. This without the teleſcope makes us imagine the ſtars to be much bigger than when we ſee them only by a few rays coming directly from them, ſo as to enter our eye without being intermixed with others. The number of ſtars appears increaſed prodigiouſly through the teleſcope; 70 ſtars have been counted in the conſtellation called *Pleiades*, and no fewer than 2000 in that of Orion. The late improvements of Herſchel, however, have ſhown the number of ſtars to be exceedingly beyond even what the diſcoveries of former aſtronomers would induce us to ſuppoſe. He has alſo ſhown, that many which to the eye, or through ordinary glaſſes, appear ſingle, do in fact conſiſt of two or more ſtars; and that the galaxy or milky way owes its light entirely to multitudes of ſmall ſtars placed ſo cloſe, that the naked eye, or even ordinary teleſcopes, cannot diſcover them.

The nebulæ, or ſmall whitiſh ſpecks, diſcoverable by teleſcopes in various parts of the heavens, are owing to the ſame cauſe. Former aſtronomers could only reckon 103; but Herſchel has diſcovered upwards of 1250. He has alſo diſcovered a ſpecies of them, which he calls *planetary nebulæ*, on account of their brightneſs and ſhining with a well-defined diſk.

Sect. III. *Concluſions from the foregoing Appearances.*

Many have been the conjectures formed on the nature of the celeſtial bodies.

Anaximander and Anaximenes held, that there was a circle of fire all along the heavens, which they called *the circle of the ſun;* between the earth and this fiery circle was placed another circle of ſome opaque matter, in which there was a hole like the mouth of a German flute. Through this hole the light was tranſmitted, and appeared to the inhabitants of this earth as a round and diſtinct body of fire, and the eclipſes of the ſun were ſuppoſed to be occaſioned by ſtopping this hole.

Anaxagoras held the ſun to be a fiery globe of ſome ſolid ſubſtance, bigger than Peloponneſus; and many of the moderns have adopted this notion, only increaſing the magnitude of the globe prodigiouſly. Sir Iſaac Newton has propoſed it as a query, Whether the ſun and fixed ſtars are not great *Earths* made vehemently hot, whoſe parts are kept from fuming away by the vaſt weight and denſity of their ſuperincumbent atmoſpheres, and whoſe heat is preſerved by the prodigious action and reaction of their parts upon one another? But though he has propoſed this as a query, and taken the exiſtence of a ſolar atmoſphere for granted, there have yet been no proofs adduced in favour of that opinion beſides thoſe of analogy and probability. There is, however, an appearance in the heavens termed the *ſemita luminoſa*, or *zodiacal light*, which is now generally ſuppoſed to be owing to the ſun's atmoſphere. This was firſt diſcovered by Caſſini in 1683. It is ſomething like the milky-way, a faint twilight, or the tail of a comet, thin enough to let ſtars be ſeen through it, and ſeems to ſurround the ſun in the form of a lens, the plane whereof is nearly coincident with that of the ſun's equator. It is ſeen ſtretched along the zodiac, and accompanies the ſun in his annual motion through the twelve ſigns. Each end terminates in an angle of about 21°: the extent of it in length from either of the angular points varies from 50 to 100°; it reaches beyond the orbit of Venus, but not ſo far as that of the earth. The breadth of it near the horizon is alſo various; from 12 almoſt to 30°: near the ſun, where it may reaſonably be ſuppoſed to be broadeſt, it cannot be ſeen. This light is weakeſt in the morning and ſtrongeſt at night; diſappearing in full moonlight, or in ſtrong twilight, and therefore is not at all viſible about midſummer in places ſo near either of the poles as to have their twilight all the night long, but may be ſeen in thoſe places in the middle of winter both morning and evening, as it may in places under and near the equator, all the year round. In north latitude it is moſt conſpicuous after the evening twilight about the latter end of February, and before the morning twilight in the beginning of October; for at thoſe times it ſtands moſt erect above the horizon, and is therefore cleareſt from the thick vapours of the twilight. Beſides the difference of real extenſion of this light in length and breadth at different times, it is diminiſhed by the nearneſs of any other light in the ſky; not to mention that the extent of it will be differently determined by different ſpectators according to the goodneſs of their eyes.

Caſſini ſuppoſed that as by the rotation of the ſun ſome groſs parts are thrown up on his ſurface, whereof ſpots and nebuloſities are formed; ſo the great rapidity wherewith the equatorial parts are moved, may throw out to a conſiderable diſtance a number of particles of a much finer texture, of ſufficient denſity to reflect light: now, that this light was cauſed by an emanation from the ſun, ſimilar to that of the ſpots, he thought probable from the following obſervation: That after the year 1688, when this light began to grow weaker, no ſpots appeared upon the ſun; whereas, in the preceding years, they were frequently ſeen there; and that the great inequality in the intervals between the times of the appearances of the ſolar ſpots has ſome analogy to the irregular returns of weakneſs and ſtrength in this light, in like circumſtances of the conſtitution of the air, and of the darkneſs of the ſky. He was alſo of opinion that this light in the zodiac, as it is ſubject to great increaſe at one time and diminution at another, may ſometimes become quite imperceptible; and thought this was the caſe in the years 1665, 1672, and 1681, when he ſaw nothing of it, though he ſurveyed with great attention thoſe parts of the heavens where, according to his theory, it muſt have appeared if it had been as viſible then as it was in others. He cites alſo paſſages out of ſeveral authors both ancient and modern, which make it probable that it had been ſeen both in former and latter ages, but without being ſufficiently attended to, or its nature inquired into.

With regard to the ſolar ſpots, Long informs us, that "they do not change their places upon the ſun, but adhere to his ſurface, or float in his atmoſphere, very near his body; and if there be 20 ſpots or faculæ upon him at a time, they all keep in the ſame ſituation with reſpect to one another; and, as long as they laſt, are carried round together in the ſame manner; by the motion of the ſpots therefore we learn, what we ſhould not otherwiſe have known, that *the ſun is a globe, and has a rotation* about his axis." Notwithſtanding this he tells us afterwards, "The ſpots, generally ſpeaking, may be ſaid to adhere to the ſun, or to be ſo near him as to be carried round upon him uniformly; nevertheleſs, ſometimes, though rarely, a ſpot has been ſeen to move with a velocity a little different from the reſt;

ſpots that were in different parallels have appeared to be carried along, not keeping always the ſame diſtance, but approaching nearer to each other; and when two ſpots moved in the ſame parallel, the hindmoſt has been obſerved to overtake and paſs by the other. The revolution of ſpots near the equator of the ſun is ſhorter than of thoſe that are more diſtant from it."

The apparent change of ſhape in the ſpots, as they approach the circumference of the diſk, according to this author, is likewiſe a proof of the ſun's rotation round his axis, and that they either adhere to the ſurface of the luminary, or are carried round his atmoſphere very near his ſurface.

The time of the apparent revolution of a ſpot being known, the true time of its going round upon the ſun may be thus found; in fig. 4, the arc AC, which, in the month of May, the earth goes through in her orbit in 27 days 12 hours and 20 minutes, is 26° 22′; the arc *a c* being equal to AC: the apparent revolution of a ſpot is the whole circle *a b c d*, or 360°, with the addition of the arc *a c* of 26° 22′, which makes 386° 22: then ſay, as 386. 22 is to 27 d. 12 h. 20′; ſo is 360° to 25 d. 15 h. 16′; the true time of the rotation of the ſun, as it would be ſeen from a fixed ſtar.

The angle of interſection of the ſun's equator with the ecliptic is but ſmall, according to Scheiner being never more than 8°, nor leſs than 6°; for which reaſon he ſettled it at 7°, though Caſſini makes it 7½. This plane continued cuts the ecliptic in two oppoſite points, which are called the *ſun's nodes*, being 8° of ♊ and 8° of ♑; and two points in the ecliptic, 90° from the nodes, may be called the *limits*. Theſe are 8° of ♈ and 8° of ♎. When the earth is in either of theſe nodes, the equator of the ſun, if viſible, would appear as a ſtraight line; and, by reaſon of the vaſt diſtance of the ſun from us, all his parallels would likewiſe appear as ſtraight lines; but in every other ſituation of the earth, the equator and parallels of the ſun would, if viſible, appear as ellipſes growing wider the farther the earth is from the nodes, and wideſt of all when the earth is in one of her limits.

The nature and formation of the ſolar ſpots have been the ſubject of much ſpeculation and conjecture. Some have thought that the ſun is an opaque body, mountainous and uneven as our earth is, covered all over with a fiery and luminous fluid; that this fluid is ſubject to ebbing and flowing, after the manner of our tides, ſo as ſometimes to leave uncovered the tops of rocks or hills, which appear like black ſpots; and that the nebuloſities about them are cauſed by a kind of froth. Others have imagined, that the fluid which ſends us ſo much light and heat, contains a nucleus or ſolid globe, wherein are ſeveral volcanoes, which, like Ætna or Veſuvius, from time to time caſt up quantities of bituminous matter to the ſurface of the ſun, and form thoſe ſpots which are ſeen thereon; and that as this matter is gradually conſumed by the luminous fluid, the ſpots diſappear for a time, but are ſeen to riſe again in the ſame places when thoſe volcanoes caſt up new matter. A third opinion is, that the ſun conſiſts of a fiery luminous fluid, wherein are immerſed ſeveral opaque bodies of irregular ſhapes; and that theſe bodies, by the rapid motion of the ſun, are ſometimes buoyed or raiſed up to the ſurface, where they form the appearance of ſpots, which ſeem to change their ſhapes according as different ſides of them are preſented to the view. A fourth opinion is, that the ſun conſiſts of a fluid in continual agitation; that, by the rapid motion of this fluid, ſome parts more groſs than the reſt are carried up to the ſurface of the luminary, like the ſcum of melted metal riſing up to the top in a furnace: that theſe ſcums, as they are differently agitated by the motion of the fluid, form themſelves into thoſe ſpots we ſee on the ſolar diſk; and, beſides the optical changes already mentioned, grow larger, are diminiſhed in their apparent magnitude, recede a little from, or approach nearer to, each other, and are at laſt entirely diſſipated by the continual rapid motion of the fluid, or are otherwiſe conſumed or abſorbed.

In the 64th volume of the Philoſophical Tranſactions, Wilſon advances a new opinion, viz. that they are hollows in the ſurface of the luminary. On this ſuppoſition he offers ſome queries and conjectures concerning the nature of the ſun himſelf. He aſks, Whether it is not reaſonable to think, that the vaſt body of the ſun is made up of two kinds of matter very different in their qualities; that by far the greateſt part is ſolid and dark; and that this dark globe is encompaſſed with a thin covering of that reſplendent ſubſtance, from which the ſun would ſeem to derive the whole of his vivifying heat and energy?—This, if granted, will afford a ſatisfactory ſolution of the appearance of ſpots; becauſe, if any part of this reſplendent ſurface ſhall be by any means diſplaced, the dark globe muſt neceſſarily appear; the bottom of the cavity correſponding to the nucleus, and the ſhelving ſides to the umbra. The ſhining ſubſtance, he thinks, may be diſplaced by the action of ſome elaſtic vapour generated within the ſubſtance of the dark globe. This vapour, ſwelling into ſuch a volume as to reach up to the ſurface of the luminous matter, would thereby throw it aſide in all directions: and as we cannot expect any regularity in the production of ſuch a vapour, the irregular appearance and diſappearance of the ſpots is by that means accounted for; as the reflux of the luminous matter muſt always occaſion the dark nucleus gradually to decreaſe, till at laſt it becomes indiſtinguiſhable from the reſt of the ſurface.

Here an objection occurs, That, on this ſuppoſition, the nucleus of a ſpot, whilſt on the decreaſe, ſhould always appear nearly circular, by the gradual deſcent of the luminous matter from all ſides to cover it. But to this he replies, that in all probability the ſurface of the dark globe is very uneven and mountainous, which prevents the regular reflux of the ſhining matter: and this, he thinks, is rendered very probable by the enormous mountains and cavities which are obſerved in the moon; and why, ſays he, may there not be the ſame on the ſurface of the ſun? He thinks his hypotheſis alſo confirmed by the dividing of the nucleus into ſeveral parts, which might ariſe from the luminous matter flowing in different channels in the bottom of the hollow.—The appearance of the umbra after the nucleus is gone, he thinks, may be owing to a cavity remaining in the luminous matter, though the dark globe is entirely covered.

As to a motion of the ſpots, diſtinct from what they are ſuppoſed to receive from the rotation of the ſun round his axis, he ſays he never could obſerve any, except what might be attributed to the enlargement or diminution of them when in the neighbourhood of one another. "But (ſays he) what would farther contribute towards forming a judgment of this kind, is the apparent alteration of the relative place, which muſt ariſe from the motion acroſs the diſk on a ſpherical ſurface; a circumſtance which I am uncertain if it has been ſufficiently attended to."

The abovementioned hypotheſis, he thinks, is further confirmed by the diſappearance of the umbræ on the ſides of ſpots contiguous to one another; as the action of the elaſtic vapour muſt neceſſarily drive the luminous matter away from each, and thus as it were accumulate it between them, ſo that no umbra can be perceived. As to the luminous matter itſelf, he conjectures, that it cannot be any very ponderous fluid, but that it rather reſembles a denſe fog which broods on the ſurface of the ſun's dark body. His general concluſion we ſhall give in his own words.

"According to the view of things given in the foregoing queries, there would ſeem to be ſomething very extraordinary in the dark and unignited ſtate of the great internal ſpot of the ſun. Does not this ſeem to indicate that the luminous matter

that encompaſſes it derives not its ſplendor from any intenſity of heat? For, if this were the caſe, would not the parts underneath, which would be perpetually in contact with that glowing matter, be heated to ſuch a degree as to become luminous and bright? At the ſame time it muſt be confeſſed, that although the internal globe was in reality much ignited, yet when any part of it forming the nucleus of a ſpot is expoſed to our view, and is ſeen in competition with a ſubſtance of ſuch amazing ſplendor, it is no wonder that an inferior degree of light ſhould, in theſe caſes, be unperceivable.

"In order to obtain ſome knowledge of this point, I think an experiment might be tried, if we had an opportunity of a very large ſpot, by making a contrivance in the eye-piece of a teleſcope, whereby an obſerver could look at the nucleus alone with the naked eye, without being in danger of light coming from any other part of the ſun. In this caſe, if the obſerver found no greater ſplendor than what might be expected from a planet very near the ſun, and illumined by as much of his ſurface as correſponds to the ſpot's umbra, we might reaſonably conclude, that the ſolar matter, at the depth of the nucleus, is in reality not ignited. But from the nature of the thing, doth there ſeem any neceſſity for thinking that there prevails ſuch a raging and fervent heat as many have imagined? It is proper here to attend to the diſtinction between this ſhining matter of the ſun and the rays of light which proceed from it. It may perhaps be thought, that the reaction of the rays upon the matter, at their emiſſion, may be productive of a violent degree of heat. But whoever would urge this argument in favour of the ſun being intenſely heated, as ariſing from the nature of the thing, ought to conſider that all poliſhed bodies are leſs and leſs diſpoſed to be heated by the action of the rays of light, in proportion as their ſurfaces are more poliſhed, and as their powers of reflection are brought to a greater degree of perfection. And is there not a ſtrong analogy betwixt the reaction of light upon matter in caſes where it is reflected, and in caſes where it is emitted?"

Concerning the moon, it is allowed on all hands, that there are prodigious inequalities on her ſurface. This is proved by looking at her through a teleſcope, at any other time than when ſhe is full; for then there is no regular line bounding light and darkneſs; but the confines of theſe parts appear as it were toothed and cut with innumerable notches and breaks; and even in the dark part, near the borders of the lucid ſurface, there are ſeen ſome ſmall ſpaces enlightened by the ſun's beams. Upon the fourth day after new moon, there may be perceived ſome ſhining points like rocks or ſmall iſlands within the dark body of the moon; and not far from the confines of light and darkneſs there are obſerved other little ſpaces which join to the enlightened ſurface, but run out into the dark ſide, which by degrees change their figure, till at laſt they come wholly within the illuminated face, and have no dark parts round them at all. Afterwards many more ſhining ſpaces are obſerved to ariſe by degrees, and to appear within the dark ſide of the moon, which before they drew near to the confines of light and darkneſs were inviſible, being without any light, and totally immerſed in the ſhadow. The contrary is obſerved in the decreaſing phaſes, where the lucid ſpaces which joined the illuminated ſurface by degrees recede from it, and, after they are quite ſeparated from the confines of light and darkneſs, remain for ſome time viſible, till at laſt they alſo diſappear. Now it is impoſſible that this ſhould be the caſe, unleſs theſe ſhining points were higher than the reſt of the ſurface, ſo that the light of the ſun may reach them.

Not content with perceiving the bare exiſtence of theſe lunar mountains, aſtronomers endeavoured to meaſure their height in the following manner. Let EGD, Fig. 5. be the hemiſphere of the moon illuminated by the ſun, ECD the diameter of the circle bounding light and darkneſs, and A the top of a hill within the dark part when it firſt begins to be illuminated. Obſerve with a teleſcope the proportion of the right line AE, or the diſtance of the point A from the lucid ſurface to the diameter of the moon FD; and becauſe in this caſe the ray of light ES touches the globe of the moon, AEC will be a right angle, and therefore in the triangle AEC having the two ſides AE and EC, we can find out the third ſide AC; from which ſubducting BC or EC, there will remain AB the height of the mountain. By this mode of meaſuring, which would be juſt if the line AE could be taken accurately, the height of St. Catherine would be nearly 8¼ miles, if according to Riccioli its top was about a ſixteenth part of the moon's diameter diſtant from the confines of the lucid ſurface. But by the more accurate obſervations and juſt calculations of Herſchel this diſproportionate height appears to be ill founded, and the generality of the lunar mountains do not exceed half a mile in perpendicular elevation. Thus he calculates their heights: Let SLM, or *s l m*, fig. 6, be a line drawn from the ſun to the mountain, touching the moon at L or *l*, and the mountain at M or *m*. Then, to an obſerver at E or *e*, the lines L M, *l m*, will not appear of the ſame length, though the mountain ſhould be of an equal height; for LM will be projected into *o n*, and *l m* into ON. But theſe are the quantities that are taken by the micrometer when we obſerve a mountain to project from the line of illumination. From the obſerved quantity *o n*, when the moon is not in her quadrature, to find L M, we have the following analogy. The triangles *o* O L, *r* ML, are ſimilar; therefore L *o* : LO : : L *r* : LM, or $\frac{LO \times on}{L\,o} = LM$: but LO is the radius of the moon, and L *r* or *on* is the obſerved diſtance of the mountain's projection; and L *o* is the ſine of the angle R O L = *o* L S; which we may take to be the diſtance of the ſun from the moon without any material error, and which therefore we may find at any given time from an ephemeris.

As the moon has on its ſurface mountains and valleys in common with the earth, ſome modern aſtronomers have diſcovered a ſtill greater ſimilarity, viz. that ſome of theſe are really volcanoes, emitting fire as thoſe on earth do. An appearance of this kind was diſcovered ſome years ago by Ulloa, in an eclipſe of the ſun. It was a ſmall bright ſpot like a ſtar near the margin of the moon, and which he at that time ſuppoſed to have been a hole with the ſun's light ſhining through it. Succeeding obſervations, however, have induced aſtronomers to attribute appearances of this kind to the eruption of volcanic fire; and Herſchel has particularly obſerved ſeveral eruptions of the lunar volcanoes, which he has deſcribed in the Philoſophical Tranſactions.

Concerning the nature of the moon's ſubſtance many conjectures have been formed. Some have imagined, that, beſides the light reflected from the ſun, the moon hath alſo ſome obſcure light of her own, by which ſhe would be viſible without being illuminated by the ſun-beams. In proof of this it is urged, that during the time of even total eclipſes the moon is ſtill viſible, appearing of a dull red colour, as if obſcured by a great deal of ſmoke. In reply to this it hath been advanced, that this is not always the caſe; the moon ſometimes diſappearing totally in the time of an eclipſe, ſo as not to be diſcernible by the beſt glaſſes, while little ſtars of the fifth and ſixth magnitudes were diſtinctly ſeen as uſual: and when the moon is viſible in a total eclipſe, a ſufficient reaſon may be aſſigned for this appearance from the refraction of the ſun's rays through our atmoſphere, which are reflected back to the earth by the otherwiſe dark ſurface of the moon.

Different conjectures have alſo been formed concerning the

ſpots on the moon's ſurface. Some philoſophers have been ſo taken with the beauty of the brighteſt places obſerved in her diſk, that they have imagined them to be rocks of diamonds; and others have compared them to pearls and precious ſtones. Keill and the greater part of aſtronomers now are of opinion, that theſe are only the tops of mountains, which by reaſon of their elevation are more capable of reflecting the ſun's light than others which are lower. The duſkiſh ſpots, he ſays, cannot be ſeas, nor any thing of a liquid ſubſtance; becauſe, when examined by the teleſcope, they appear to conſiſt of an infinity of caverns and empty pits, whoſe ſhadows fall within them, which can never be the caſe with ſeas, or any liquid ſubſtance: but, even within theſe ſpots, brighter places are alſo to be obſerved; which, according to his hypotheſis, ought to be the points of rocks ſtanding up within the cavities. Long, however, is of opinion, that ſeveral of the dark ſpots on the moon are really water.

It has been a matter of diſpute whether the moon has any atmoſphere or not. The following arguments have been urged by thoſe who take the negative ſide.

1. The moon conſtantly appears with the ſame brightneſs when there are no clouds in our atmoſphere; which could not be the caſe if ſhe were ſurrounded with an atmoſphere like ours, ſo variable in its denſity, and ſo frequently obſcured by clouds and vapours. 2. In an appulſe of the moon to a ſtar, when ſhe comes ſo near it that part of her atmoſphere is interpoſed between our eye and the ſtar, refraction would cauſe the latter to ſeem to change its place, ſo that the moon would appear to touch it later than by her own motion ſhe would do. 3. Some philoſophers are of opinion, that becauſe there are no ſeas or lakes in the moon, there is therefore no atmoſphere, as there is no water to be raiſed up in waters.

All theſe arguments, however, have been anſwered by other aſtronomers in the following manner. 1. It is denied that the moon appears always with the ſame brightneſs, even when our atmoſphere appears equally clear. Hevelius relates, that he has ſeveral times found in ſkies perfectly clear, when even ſtars of the ſixth and ſeventh magnitude were viſible, that at the ſame altitude of the moon, and the ſame elongation from the earth, and with one and the ſame teleſcope, the moon and its maculæ do not appear equally lucid, clear, and conſpicuous at all times; but are much brighter and more diſtinct at ſome times than at others. From the circumſtances of this obſervation, ſay they, it is evident that the reaſon of this phænomenon is neither in our air, in the tube, in the moon, nor in the ſpectator's eye; but muſt be looked for in ſomething exiſting about the moon. An additional argument is drawn from the different appearances of the moon in total eclipſes, which are ſuppoſed to be owing to the different conſtitutions of the lunar atmoſphere.

To the ſecond argument Long replies, that Sir Iſaac Newton has ſhown that the weight of any body upon the moon is but a third part of what the weight of the ſame would be upon the earth: now the expanſion of the air is reciprocally as the weight that compreſſes it: the air, therefore, ſurrounding the moon, being preſſed together by a weight, or being attracted towards the centre of the moon by a force equal only to one-third of that which attracts our air towards the centre of the earth, it follows, that the lunar atmoſphere is only one-third as denſe as that of the earth, which is too little to produce any ſenſible refraction of the ſtars light. Other aſtronomers have contended, that ſuch refraction was ſometimes very apparent. Caſſini ſays, that he frequently obſerved Saturn, Jupiter, and the fixed ſtars to have their circular figure changed into an elliptical one, when they approached either to the moon's dark or illuminated limb, though they own, that in other occultations no ſuch change could be obſerved. With regard to the fixed ſtars, indeed, it has been urged, that, granting the moon to have an atmoſphere of the ſame nature and quantity as ours, no ſuch effect as a gradual diminution of light ought to take place; at leaſt, that we could by no means be capable of perceiving it. Our atmoſphere is found to be ſo rare at the height of 44 miles, as to be incapable of refracting the rays of light. This height is the 180th part of the earth's diameter; but ſince clouds are never obſerved higher than four miles, we muſt conclude that the vaporous or obſcure part is only one 198th. The mean apparent diameter of the moon is 31′ 29″, or 1889 ſeconds: therefore the obſcure parts of her atmoſphere, when viewed from the earth, muſt ſubtend an angle of leſs than one ſecond; which ſpace is paſſed over by the moon in leſs than two ſeconds of time. It can therefore hardly be expected that obſervation ſhould generally determine whether the ſuppoſed obſcuration takes place or not.

The third argument is neceſſarily inconcluſive, becauſe we know not whether there is any water in the moon or not; nor, though this could be demonſtrated, would it follow that the lunar atmoſphere anſwers no other purpoſe than the raiſing of water into vapour. There is, however, a ſtrong argument in favour of the exiſtence of a lunar atmoſphere, taken from the appearance of a luminous ring round the moon in the time of ſolar eclipſes; but ſome members of the academy at Paris have endeavoured to account for it without having recourſe to a lunar atmoſphere; and for this purpoſe they made the following experiments. The image of the ſun coming through a ſmall hole into a darkened room, was received upon a circle of wood or metal of a diameter a good deal larger than that of the ſun's image; then the ſhadow of this opaque circle was caſt upon white paper, and there appeared round it, on the paper, a luminous circle ſuch as that which ſurrounds the moon. The like experiment being made with a globe of wood, and with another of ſtone not poliſhed, the ſhadows of both theſe caſt upon paper were ſurrounded with a paliſh light, moſt vivid near the ſhadows, and gradually more diluted at a diſtance from them. They obſerve alſo, that the ring round the moon was ſeen in the eclipſe of 1706 by Wurzelbaur, who caſt her ſhadow upon white paper. The ſame appearance was obſerved on holding an opaque globe in the ſun, ſo as to cover his whole body from the eye; for, looking at it through a ſmoked glaſs, in order to prevent the eye from being hurt by the glare of light it would otherwiſe be expoſed to, the globe appeared ſurrounded with a light reſembling that round the moon in a total eclipſe of the ſun.

Thus they ſolve the phænomenon of the ring ſeen round the moon by the inflection, or *diffraction* as they call it, of the ſolar rays paſſing near an opaque ſubſtance. As for the ſmall ſtreaks of light, which are ſuppoſed to be lightning, they explain theſe by an hypotheſis concerning the cavities of the moon themſelves; which they conſider as concave mirrors reflecting the light of the ſun nearly to the ſame point; and as theſe are continually changing their ſituation with great velocity by the moon's motion from the ſun, the light which any one of them ſends to our eye is ſeen but for a moment. This, however, will not account for the flaſhes, if any ſuch there are, ſeen near the centre of the diſk, though it does, in no very ſatisfactory manner, account for thoſe at the edges.

It has already been obſerved, that the occultations of the fixed ſtars and planets by the moon, in general happen without any kind of refraction of their light by the lunar atmoſphere. The contrary, however, has ſometimes, it is ſaid, been obſerved, and the ſtars have been ſeen manifeſtly to change their ſhape and colour on going behind the moon's diſk; but in many this colour has been attributed rather to the dimneſs

refrangibility of the rays in the object-glaſs of the teleſcope, than to any real variation of colour in the planets or ſtars from appulſe to the moon.

It has been a queſtion, whether the moon and planets are inhabited? and the anſwers given to it in the negative depend on the poſition, that human beings could not exiſt in any of the planets on account of their diſtances from the ſun, and conſequent inequality of heat to that which the inhabitants of the earth experience; and the want of an atmoſphere in the moon would as effectually preclude that body from being a fit habitation for man. But in reply it is alleged, and with reaſon, that the ſame power which could make the earth a fit habitation for the animals upon it, could alſo adapt the organs of other animals to their ſituation in the planets and ſtars: and as the earth teems with life of all kinds, we may conclude, that as there is ſo great analogy between it and the planets in other reſpects, the ſame analogy prevails with reſpect to life and inhabitants.

Of all the celeſtial bodies, comets have given riſe to the greateſt number of ſpeculations and conjectures. Their ſtrange appearance has in all ages been a matter of terror to the vulgar, who uniformly have looked upon them to be evil omens and forerunners of war, peſtilence, &c. Others, leſs ſuperſtitious, ſuppoſed them to be meteors raiſed in the higher regions of the air. But we find that ſome part of the modern doctrine concerning them had been received into the ancient Italic and Pythagorean ſchools; for they held them to be ſo far of the nature of planets, that they had their periodical times of appearing; that they were out of ſight for a long time, while they were carried aloft at an immenſe diſtance from the earth, but became viſible when they deſcended into the lower regions of the air, when they were nearer to us.

Ariſtotle aſſerted that the heavens were unchangeable, and not liable to generation or corruption. Comets, therefore, which he believed to be generated when they firſt made their appearance, and deſtroyed when they vaniſhed from our ſight, he maintained, could not be heavenly bodies, but rather meteors or exhalations raiſed into the upper regions of the atmoſphere, where they blazed out for a while, and diſappeared when the matter of which they were formed was conſumed. Seneca plainly intimates, that he thought them above the moon; and argues ſtrongly againſt thoſe who ſuppoſed them to be meteors, or held other abſurd opinions concerning them; declaring his belief that they were not fires ſuddenly kindled, but the eternal productions of nature. He points out alſo the only way to come at a certainty on this ſubject, viz. by collecting a number of obſervations concerning their appearance, in order to diſcover whether they return periodically or not. "For this purpoſe (ſays he) one age is not ſufficient; but the time will come when the nature of comets and their magnitudes will be demonſtrated, and the routes they take, ſo different from the planets, explained. Poſterity will then wonder that the preceding ages ſhould be ignorant of matters ſo plain and eaſy to be known."

For a long time this prediction of Seneca ſeemed very unlikely to be fulfilled. The great authority which Ariſtotle maintained for many ages, determined them to be nothing but meteors caſually lighted up in the air; though they were manifeſtly at a great height, not only above the clouds, but ſubject to the diurnal revolution of the earth. In the dark and ſuperſtitious ages, they were held to be the forerunners of every kind of calamity, and were ſuppoſed to have different degrees of malignity according to the ſhape they aſſumed; from whence alſo they were differently denominated. Thus, ſome were ſaid to be bearded, ſome hairy; ſome to repreſent a beam, ſword, or ſpear; others a target, &c.; whereas modern aſtronomers acknowledge only one ſpecies of comets, and account for their different appearances from their different ſituations from the ſun and earth.

Kepler, in other reſpects a very great genius, indulged the moſt extravagant conjectures, not only concerning comets, but the whole ſyſtem of nature in general. The planets he imagined to be huge animals who ſwam round the ſun by means of certain fins acting upon the ethereal fluid, as thoſe of fiſhes do on the water: and agreeably to this notion, he imagined the comets to be monſtrous and uncommon animals generated in the celeſtial ſpaces; and he explained how the air engendered them by an animal faculty. A yet more ridiculous opinion, if poſſible, was that of John Bodin, a learned man of France in the 16th century. He maintained that comets "are ſpirits, which having lived on the earth innumerable ages, and being at laſt arrived on the confines of death, celebrate their laſt triumph, or are recalled to the firmament like ſhining ſtars! This is followed by famine, plague, &c. becauſe the cities and people deſtroy the governors and chiefs who appeaſe the wrath of God." Others, again, have denied even the exiſtence of comets, and maintained that they were only falſe appearances occaſioned by the refraction or reflection of light.

The firſt rational conjecture among the moderns we meet with is that of James Bernouilli, who imagined them to be the ſatellites of ſome very diſtant planet, which was inviſible to us on account of its diſtance, as were alſo the ſatellites, unleſs when in a certain part of their courſe.

Tycho Brahe firſt reſtored the comets to their true rank in the creation. Before his time ſeveral had been obſerved with tolerable exactneſs by Regiomontanus, Appian, Fabricius, and others; yet they all thought them below the moon. But Tycho, being provided with much better inſtruments, ſet himſelf with great diligence to obſerve the famous comet of 1577; and from many careful obſervations deduced that it had no ſenſible diurnal parallax; and therefore was not only far above the regions of our atmoſphere, but much higher than the moon. But though few have come ſo near the earth as to have any diurnal parallax, all of them have what may be called an annual parallax; that is, the revolution of the earth in her orbit cauſes their apparent motion to be very different from what it would be if viewed from the ſun: and this ſhows them to be much nearer than the fixed ſtars, which have no ſuch parallax. Kepler, the diſciple of Tycho, was alſo very attentive to the motions of the comets, and found that they did not move in ſtraight lines, as had been ſuppoſed. He ſhowed that their paths were concave towards the ſun, and ſuppoſed them to move in parabolic trajectories.

Their true motion, however, was only diſcovered from the obſervations made by Sir Iſaac Newton on the great comet of 1680. This deſcended almoſt perpendicularly towards the ſun with a prodigious velocity; aſcending again with the ſame velocity retarded, as it had been before accelerated. It was ſeen in the morning by a great number of aſtronomers in different parts of Europe, from the 4th to the 25th of November, in its way toward the ſun; and in the evening from the 12th of December to the 9th of March following. The many exact obſervations made on this comet enabled Sir Iſaac Newton to determine that they are a kind of planets which move in very eccentric ellipſes; and this opinion is now looked upon to be certainly eſtabliſhed.

A greater number of comets is ſeen in the hemiſphere towards the ſun than in the oppoſite; the reaſon of which will eaſily appear from fig. 7. wherein S repreſents the ſun, E the earth, A B C D the ſphere of the fixed ſtars: and becauſe comets either do not reflect light enough to be viſible, or emit tails conſpicuous enough to attract our notice, till they come within

the planetary regions, commonly a good way within the ſphere of Jupiter, let KLMN be a ſphere concentric to the ſun, at ſuch a diſtance from him, that no comet can be ſeen by us till it come within that diſtance; through E draw the plane BD perpendicular to SE, which will divide the ſphere KLMN into two hemiſpheres, one of which, BCD, is toward the ſun, the other, DAB, oppoſite. Now it is manifeſt, that the ſpherical portion LMN, which is in the hemiſphere BCD towards the ſun, is larger than the portion NKL in the hemiſphere oppoſite to him; and conſequently a greater number of comets will appear in the hemiſphere BCD than in that marked DAB.

Though the orbits of all comets are very eccentric ellipſes, there are vaſt differences among them. Excepting Mercury, there are no great differences among the planets either as to the eccentricity of their orbits, or the inclination of their planes; but the planes of ſome comets are almoſt perpendicular to others, and ſome of their ellipſes are much wider than others. The narroweſt ellipſis of any comet hitherto obſerved was that of 1680. There is alſo a much greater inequality in the motion of the comets than of the planets; the velocity of the former being incomparably greater in their perihelion than in their aphelion; but the planets are but very little accelerated.

Aſtronomers are now generally agreed, that comets are opaque bodies enlightened by the ſun. Hevelius, in a large work, wherein he gives the opinion of various authors on the ſubject, mentions ſome who were of the ſame ſentiments with himſelf, that comets were ſo far tranſparent as to let the light of the ſun paſs through them, which formed their tails. Sir Iſaac Newton was of opinion, that they are quite opaque; and in confirmation of this, he obſerves, that if a comet be ſeen in two parts of its orbit, at equal diſtances from the earth, but at unequal diſtances from the ſun, it always ſhines brighteſt in that neareſt the ſun. They are of very different magnitudes, which may be conjectured from their apparent diameter and brightneſs. Thus the head of a comet, when of the ſame brightneſs and apparent diameter with Saturn, may be ſuppoſed to be nearly about the ſame magnitude with that planet; though this muſt be attended with ſome uncertainty, as we know not whether the heads of comets reflect the ſun's light in the ſame manner the planets do. He found the diſtance of the comet of 1577 to be about 210 ſemidiameters of the earth, or about 840,000 miles diſtant from us, its apparent diameter being ſeven minutes; whence he concluded, that the true diameter of the comet was to that of the earth as 3 to 14. Hevelius, from the parallax and apparent diameter of the head of the comet in 1652, computed its diameter to be to that of the earth as 52 to 100. By the ſame method he found the diameter of the head of the comet of 1664 to be at one time 12 ſemidiameters of the earth, and at another not much more than 5: and the diameter of the nucleus of the comets of 1661 and 1665 to be only about a tenth part of that of the earth; and Cyſatus makes the true diameter of the comet of 1618 to be about the ſame ſize. Some comets, however, from their apparent magnitude and diſtance, have been ſuppoſed much larger than the moon, or even equal in magnitude to ſome of the primary planets; and ſome have imagined that, by an interpoſition of theſe bodies betwixt the earth and ſun, we might account for thoſe darkneſſes which cannot be derived from any interpoſition of the moon. Such are thoſe mentioned by Herodotus, l. 7. c. 37. and l. 9. c. 70; likewiſe the eclipſe mentioned by Dion, which happened a little before the death of Auguſtus; and it is obſervable that Seneca ſaw a comet that year. Some have even attempted to account in this manner for the darkneſs which happened at our Saviour's crucifixion; and indeed it is certain, that were a comet in its perigee to come between the earth and ſun, and to be moving the ſame way with the earth, it muſt cauſe a darkneſs much more intenſe, as well as of more conſiderable duration, than what could take place in any lunar eclipſe.

Various conjectures have been formed reſpecting the tails of comets; though it is acknowledged by all, that they depend on the ſun ſomehow or other; and for this plain reaſon, that they are always turned from him; but in what manner this is accompliſhed, we cannot eaſily determine. Appian, Tycho-Brahe, and others, thought the tail was formed by the ſun's rays tranſmitted through the nucleus of the comet, which they fancied tranſparent, and was there refracted as in a lens of glaſs, ſo as to form a beam of light behind the comet: but this cannot be the caſe, as well becauſe the figure of a comet's tail does not anſwer to ſuch a refraction, as that ſuch refracted light would not be ſeen by a ſpectator placed ſidewiſe to it, unleſs it fell upon ſome ſubſtance ſufficiently denſe to cauſe a reflection. Des Cartes and his followers were of opinion, that the tail of a comet was owing to the refraction of its head: but if this were the caſe, the planets and principal fixed ſtars muſt have tails alſo; for the rays from them paſs through the ſame medium as the light from the comets. Sir Iſaac Newton was of opinion, that the tail of a comet is a very thin vapour which the head ſends out by reaſon of its heat: that it aſcends from the ſun juſt as ſmoke does from the earth: that as the aſcent of ſmoke is cauſed by the rarefaction of the air wherein it is entangled, cauſing ſuch air to aſcend and carry the ſmoke up with it; ſo the ſun's rays acting upon the coma or atmoſphere of the comet, do by rarefaction and refraction heat the ſame: that this heated atmoſphere heats, and by heating rarefies, the ether that is involved therein; and that the ſpecific gravity with which ſuch ether tends to the ſun, is ſo diminiſhed by its rarefaction, that it will now aſcend from him by its relative lightneſs, and carry with it the reflecting particles whereof the tail is compoſed. Though the immenſely large tails of ſome comets ſeem to require a great quantity of matter to produce them, this is no objection to the foregoing ſolution: for every day's experience ſhows what a great quantity of ſmoke is produced from a very little wood or coal; and Newton has demonſtrated, that a cubic inch of air equally rarefied with that at the diſtance of a ſemidiameter from the earth's ſurface, would fill all the planetary regions to the orbit of Saturn and beyond. Mairan ſuppoſed the tails of the comets to be formed out of the luminous matter whereof the ſun's atmoſphere conſiſts, to extend as far as the orbit of the earth, and to furniſh matter for the aurora borealis. De la Lande joins the two laſt opinions together. Part of the matter which forms the tails of comets he ſuppoſes to ariſe from their own atmoſphere rarefied by heat and puſhed forward by the force of the light ſtreaming from the ſun: and alſo that a comet paſſing through the ſun's atmoſphere is drenched therein, and carries away ſome of it. Rowning objects to Newton's account, that it can hardly be ſuppoſed the thin vapour of the tail ſhould go before the more ſolid body of the comet, when its motion is ſometimes ſo extremely ſwift, as that of ſome of the comets is ſaid to be after the rate (as Newton calculated the motion of the comet of 1680 to be) of no leſs than 880,000 miles an hour. He therefore ſuppoſes the atmoſphere of the comet to extend every way round it as far as the tail reaches; and that the part of it which makes the tail is diſtinguiſhed from the reſt, ſo as to fall thick upon that part of the atmoſphere which goes before the comet in its progreſs along its elliptic orbit. The greateſt objection to this is the immenſe magnitude of the atmoſpheres, as it muſt now be ſuppoſed, to account for the vaſt lengths of the tails of ſome comets, which have been ſaid to meaſure above 80 millions of miles.

The ſimilarity of the tails of comets to the aurora borealis,

which is commonly looked upon to be an electrical phænomenon, has ſuggeſted an opinion at preſent far from being generally diſbelieved, that the tails of comets are ſtreams of electric matter: and Hamilton, in a ſmall treatiſe, intitled, *Conjectures on the Nature of the Aurora Borealis, and on the Tails of Comets*, ſuppoſes that the comets are of uſe to bring back the electric fluid to the planets, which is continually diſcharged from the higher regions of their atmoſpheres.

The near approach of ſome comets to the ſun ſubjects them to intenſe and inconceivable degrees of heat. Newton calculated that the heat of the comet of 1680 muſt have been near 2000 times as great as that of red-hot iron. The calculation is founded upon this principle, that the heat of the ſun falling upon any body at different diſtances is reciprocally as the ſquares of thoſe diſtances; but it may be obſerved, that the effect of the heat of the ſun upon all bodies near our earth depends very much on the conſtitution of thoſe bodies, and of the air that ſurrounds them. Whiſton, from Flamſtead's meaſure of its apparent diameter, concluding the nucleus of the comet to be about ten times as big as the moon, or equal to a fourth part of the earth, attributes the univerſal deluge in the time of Noah to the near approach thereof. His opinion was, that the earth paſſing through the atmoſphere of the comet, attracted therefrom great part of the water of the flood; that the nearneſs of the comet raiſed a great tide in the ſubterraneous waters, ſo that the outer cruſt of the earth was changed from a ſpherical to an oval figure; that this could not be done without making fiſſures and cracks in it, through which the waters forced themſelves, by the hollow of the earth being changed into a leſs capacious form; that along with the water thus ſqueezed up on the ſurface of the earth, much ſlime or mud would riſe; which, together with the groſſer part of the comet's atmoſphere, would, after the ſubſiding of the water, partly into the fiſſures and partly into the lower parts of the earth to form the ſea, cover all over, to a conſiderable depth, the antediluvian earth. Thus he accounts for trees and bones of animals being found at very great depths in the earth. He alſo held that, before the fall, the earth revolved round the ſun in the plane of the ecliptic, keeping always the ſame points of its ſurface towards the ſame fixed ſtars. By this means, as every meridian would come to the ſun but once in every revolution, a day and a year were then the ſame: but that a comet ſtriking obliquely upon ſome part of the earth gave it the diurnal rotation; that the antediluvian year conſiſted of 360 days; but that the additional matter depoſited upon the earth from the atmoſphere of the comet at the flood, ſo retarded the revolution thereof round the ſun, that it is not now performed in leſs than 365 days and about a quarter. The ſame comet he thought would probably, coming near the earth when heated in an immenſe degree in its perihelion, be the inſtrumental cauſe of that great cataſtrophe, the general conflagration, ſuppoſed to be foretold in the ſacred writings, and conjectured from ancient tradition.

The analogy between the periodical times of the planets and their diſtances from the ſun, diſcovered by Kepler, takes place alſo in the comets. In conſequence of this, the mean diſtance of a comet from the ſun may be found by comparing its period with the time of the earth's revolution round the ſun. Thus the period of the comet that appeared in 1531, 1607, 1682, and 1759, being about 76 years, its mean diſtance from the ſun may be found by this proportion: As 1, the ſquare of one year, the earth's periodical time, is to 5776 the ſquare of 76, the comet's periodical time; ſo is 1,000,000, the cube of 100 the earth's mean diſtance from the ſun, to 5,776,000,000, the cube of the comet's mean diſtance. The cube root of this laſt number is 1794; the mean diſtance itſelf in ſuch parts as the mean diſtance of the earth from the ſun contains 100. If the perihelion diſtance of this comet, 58, be taken from 3588 double the mean diſtance, we ſhall have the aphelion diſtance, 3530, of ſuch parts as the diſtance of the earth contains 100; which is a little more than 35 times the diſtance of the earth from the ſun. By a like method, the aphelion diſtance of the comet of 1680 comes out 138 times the mean diſtance of the earth from the ſun, ſuppoſing its period to be 575 years: ſo that this comet, in its aphelion, goes more than 14 times the diſtance from the ſun that Saturn does. Euler computes the orbit of this comet from three of Flamſtead's obſervations taken near together, compared with a fourth taken at ſome diſtance from the other three; and from thence concludes the period to be a little more than 170 years.

The period of the comet in 1744 is much longer than even that of 1680. Betts, in attempting to compute the tranſverſe axis of its orbit, found it come out ſo near infinite, that, though the orbit ſhowed itſelf in this manner to be a very long one, he found it impoſſible to calculate it without ſome obſervations made after its perihelion. Halley, after he had finiſhed his tables of comets, found ſuch a ſimilitude in the elements of thoſe of 1531, 1607, and 1682, that he was induced to believe them to be returns of the ſame comet in an elliptic orbit: but as there was ſuch a difference in their periodical times and inclinations of their orbits as ſeemed to make againſt this opinion; and as the obſervations of the firſt of them in 1531 by Appian, and the ſecond in 1607 by Kepler, were not exact enough to determine ſo nice a point when he firſt publiſhed his ſynopſis in 1705; he only mentioned this as a thing probable, and recommended it to poſterity to watch for an appearance of the ſame in 1758. Afterwards, looking over the catalogue of ancient comets, and finding three others at equal intervals with thoſe now mentioned, he grew more poſitive in his opinion; and knowing a method of calculating with eaſe a motion in an elliptic orbit, how eccentric ſoever it might be, inſtead of the parabolic orbit which he had given for the comet of 1682, he ſet about adapting the plan of that orbit to an ellipſis of a given ſpace and magnitude, having the ſun in one of its foci, ſo as to tally with the obſervations of that comet made by Flamſtead with great accuracy, by the help of a very large ſextant. He likewiſe corrected the places of the comet of 1531 from Appian, and thoſe of the comet 1607 from Kepler and Longomontanus, by rectifying the places of the ſtars they had made uſe of, and found thoſe places agree as well with the motion in ſuch an ellipſis as could be expected from the manner of obſerving of theſe aſtronomers, and the imperfections of their inſtruments. The greateſt objection to this theory was ſome difference in the inclination of the orbits, and that there was above a year's difference between the two periods. The comet of 1531 was in its perihelion Auguſt 24; that of 1607, October 16; and that of 1682, September 4: ſo that the firſt of theſe periods was more than 76, the latter not quite 75 years. To obviate this, he reminds his readers of an obſervation made by him of the periodical revolution of Saturn having at one time been about 13 days longer than at another time; occaſioned, as he ſuppoſed, by the near approach of Saturn and Jupiter, and the mutual attraction and gravitation of the two planets: and obſerves, that in the ſummer of the year 1681, the comet in its deſcent was for ſome time ſo near Jupiter, that its gravitation towards that planet was one-fiftieth part of its gravitation towards the ſun. This, he concluded, would cauſe a change in the inclination of its orbit, and alſo in the velocity of its motion: for by continuing longer near the planet Jupiter on the ſide moſt remote from the ſun, its velocity would be more increaſed by the joint forces of both thoſe bodies, than it would be diminiſhed by them acting contrarywiſe, when on the ſide next the ſun where its motion was ſwifteſt. The projectile motion being thus increaſed, its orbit

would be enlarged, and its period lengthened; fo that he thought it probable it would not return till after a longer period than 76 years, about the end of the year 1758 or beginning of 1759.

As Halley expreſſed his opinion modeſtly, though clearly enough, that this comet would appear again about the end of 1758, or the beginning of the following year, De la Lande pretends he muſt have been at a loſs to know whether the period he foretold would have been of 75 or of 76 years; that he did not give a deciſive prediction, as if it had been the reſult of calculation; and that, by conſidering the affair in ſo looſe a manner as Halley did, there was a good deal of room for objecting to his reaſoning. After theſe reflections, he is very large in his commendation of the performance of Clairault; who, he ſays, not only calculated ſtrictly the effect of the attraction of Jupiter in 1681 and 1683, when the comet was again near Jupiter, but did not neglect the attraction of that planet when the comet was moſt diſtant; that he conſidered the uninterrupted attractions of Jupiter and Saturn upon the ſun and upon the comet, but chiefly the attractions of Jupiter upon the ſun, whereby that luminary was a little diſplaced, and gave different elements to the orbit of the comet. By this method he found the comet would be in its perihelion about the middle of April; but that, on account of ſome ſmall quantities neceſſarily neglected in the method of approximation made uſe of by him, Clairault deſired to be indulged one month; and that the comet came juſt 30 days before the time he had fixed for its appearance.

That comets may have their motion diſturbed by the planets, eſpecially by the two largeſt, Jupiter and Saturn, appears by an inſtance juſt now mentioned. They may alſo affect one another by their mutual gravitation when out of the planetary regions; but of this we can take no account, nor can we eſtimate the reſiſtance of the ether through which they paſs; and yet both theſe cauſes may have ſome influence on the inclination of their orbits and the length of their periods.

The conjectures of aſtronomers have reached beyond the boundaries of the ſolar ſyſtem: they have ſuppoſed every one of the innumerable multitude of fixed ſtars to be a ſun attended by planets and comets, each of which is an habitable world like our own. The ſtrongeſt argument for this hypotheſis is, that they cannot be magnified by a teleſcope on account of their extreme diſtance; whence we muſt conclude that they ſhine by their own light, and are therefore as many ſuns; each of which we may ſuppoſe to be equal, if not ſuperior, in luſtre and magnitude to our own. They are not ſuppoſed to be at equal diſtances from us, but to be more remote in proportion to their apparent ſmallneſs. This ſuppoſition is neceſſary to prevent any interference of their planets: and thus there may be as great a diſtance between a ſtar of the firſt magnitude and one of the ſecond apparently cloſe to it, as between the earth and the fixed ſtars firſt mentioned.

Thoſe who take the contrary ſide of the queſtion affirm, that the diſappearance of ſome of the fixed ſtars is a demonſtration that they cannot be ſuns, as it would be to the higheſt degree abſurd to think that God would create a ſun which might diſappear of a ſudden, and leave its planets and their inhabitants in endleſs night.

Some have thought that the variable ones, which diſappear for a time, were planets, which were only viſible during ſome part of their courſe. But this, their apparent immobility, notwithſtanding their decreaſe of luſtre, will not allow us to think. Some have imagined, that one ſide of them might be naturally much darker than the other, and when by the revolution of the ſtar upon its axis the dark ſide was turned towards us, the ſtar became inviſible, and, for the ſame reaſon, after ſome interval, reſumed its former luſtre. Maupertuis is of opinion that ſome ſtars, by their prodigious quick rotations on their axis, may not only aſſume the figures of oblate ſpheroids, but that, by the great centrifugal force ariſing from ſuch rotations, they may become of the figures of mill-ſtones, or be reduced to flat circular planes, ſo thin as to be quite inviſible when their edges are turned towards us; as Saturn's ring is in ſuch poſitions. But when very eccentric planets or comets go round any flat ſtar, in orbits much inclined to its equator, the attraction of the planets or comets in their perihelions muſt alter the inclination of the axis of that ſtar; on which account it will appear more or leſs large and luminous, as its broad ſide is more or leſs turned towards us. And thus he imagines we may account for the apparent changes of magnitude and luſtre in thoſe ſtars, and likewiſe for their appearing and diſappearing.

Laſtly, Dunn (Phil. Tranſ. vol. lii.) in a diſſertation concerning the apparent increaſe of magnitude in the heavenly bodies when they approach the horizon, conjectures that the interpoſition of ſome groſs atmoſphere may ſolve the phænomena both of nebulous and new ſtars.

In the Philoſophical Tranſactions for 1783, however, Michell, in propoſing a method to determine the diſtance, magnitude, &c. of the fixed ſtars by the diminution of the velocity of their light, ſhould any ſuch thing be diſcovered, ſuppoſes that by far the greater part, if not all of them, are ſyſtems of ſtars ſo near each other, as probably to be liable to be affected ſenſibly by their mutual gravitation; and it is therefore not unlikely, that the periods of the revolutions of ſome of theſe about their principals (the ſmaller ones being, upon this hypotheſis, to be conſidered as ſatellites to the other) may ſome time or other be diſcovered.

Herſchel, improving on Michell's idea of the fixed ſtars being collected into groups, and aſſiſted by his own obſervations with the extraordinary teleſcopic powers already mentioned, has ſuggeſted a theory concerning the conſtruction of the univerſe entirely new and ſingular. It had been the opinion of former aſtronomers, that our ſun, beſides occupying the centre of the ſyſtem which properly belongs to him, occupied alſo the centre of the univerſe: but Herſchel is of a very different opinion. "Hitherto (ſays he) the ſidereal heavens have, not inadequately for the purpoſe deſigned, been repreſented by the concave ſurface of a ſphere, in the centre of which the eye of the obſerver might be ſuppoſed to be placed. It is true, the various magnitudes of the fixed ſtars even then plainly ſuggeſted to us, and would have better ſuited, the idea of an expanded firmament of three dimenſions; but the obſervations upon which I am now going to enter, ſtill farther illuſtrate and enforce the neceſſity of conſidering the heavens in this point of view. In future therefore we ſhall look upon thoſe regions into which we may now penetrate by means of ſuch large teleſcopes *, as a naturaliſt regards a rich extent of ground or chain of mountains, containing ſtrata variouſly inclined and directed, as well as conſiſting of very different materials. A ſurface of a globe or map therefore will but ill delineate the interior parts of the heavens."

With the powerful teleſcope mentioned in the note, Herſchel firſt began to ſurvey the Via Lactea, and found that it completely reſolved the whitiſh appearance into ſtars, which the teleſcopes he formerly uſed had not light enough to do. The portion he firſt obſerved was that about the hand and club of

* Herſchel's obſervations, on which this theory is founded, were made with a Newtonian reflector of 20 feet focal length, and an aperture of 18 inches.

Orion; and found therein an aſtoniſhing multitude of ſtars, whoſe number he endeavoured to eſtimate by counting many fields *, and computing from a mean of theſe how many might be contained in a given portion of the milky-way. In the moſt vacant place to be met with in that neighbourhood he found 63 ſtars; other ſix fields contained 110, 60, 70, 90, 70, and 74 ſtars; a mean of all which gave 79 for the number of ſtars to each field; and thus he found, that by allowing 15 minutes for the diameter of his field of view, a belt of 15 degrees long and two broad, which he had often ſeen paſs before his teleſcope in an hour's time, could not contain leſs than 50,000 ſtars, large enough to be diſtinctly numbered; beſides which, he ſuſpected twice as many more, which could be ſeen only now and then by faint glimpſes for want of ſufficient light.

The ſucceſs he had within the milky-way ſoon induced him to turn his teleſcope to the nebulous parts of the heavens, of which an accurate liſt had been publiſhed in the *Connoiſſance des Temps* for 1783 and 1784. Moſt of theſe yielded to a Newtonian reflector of 20 feet focal diſtance and 12 inches aperture; which plainly diſcovered them to be compoſed of ſtars, or at leaſt to contain ſtars, and to ſhew every other indication of conſiſting of them entirely. "The nebulæ (ſays he) are arranged into ſtrata, and run on to a great length; and ſome of them I have been able to purſue, and to gueſs pretty well at their form and direction. It is probable enough that they may ſurround the whole ſtarry ſphere of the heavens, not unlike the milky-way, which undoubtedly is nothing but a ſtratum of fixed ſtars; and as this latter immenſe ſtarry bed is not of equal breadth or luſtre in every part, nor runs on in one ſtraight direction, but is curved, and even divided into two ſtreams along a very conſiderable portion of it; we may likewiſe expect the greateſt variety in the ſtrata of the cluſters of ſtars and nebulæ. One of theſe nebulous beds is ſo rich, that, in paſſing through a ſection of it in the time of only 36 minutes, I have detected no leſs than 31 nebulæ, all diſtinctly viſible upon a fine blue ſky. Their ſituation and ſhape, as well as condition, ſeem to denote the greateſt variety imaginable. In another ſtratum, or perhaps a different branch of the former, I have often ſeen double and treble nebulæ variouſly arranged; large ones with ſmall ſeeming attendants; narrow, but much extended lucid nebulæ or bright daſhes; ſome of the ſhape of a fan, reſembling an electric bruſh iſſuing from a lucid point; others of the cometic ſhape, with a ſeeming nucleus in the centre, or like cloudy ſtars, ſurrounded with a nebulous atmoſphere: a different ſort again contain a nebuloſity of the milky kind, like that wonderful inexplicable phænomenon about θ Orionis; while others ſhine with a fainter mottled kind of light, which denotes their being reſolvable into ſtars.

"It is very probable that the great ſtratum called the *milky-way*, is that in which the ſun is placed, though perhaps not in the very centre of its thickneſs. We gather this from the appearance of the galaxy, which ſeems to encompaſs the whole heavens, as it certainly muſt do if the ſun is within the ſame. For ſuppoſe a number of ſtars arranged between two parallel planes, indefinitely extended every way, but at a given conſiderable diſtance from one another, and calling this a ſidereal ſtratum, an eye placed ſomewhere within it will ſee all the ſtars in the direction of the planes of the ſtratum projected into a great circle, which will appear lucid on account of the accumulation of the ſtars, while the reſt of the heavens at the ſides will only ſeem to be ſcattered over with conſtellations, more or leſs crowded according to the diſtance of the planes or number of ſtars contained in the thickneſs or ſides of the ſtratum.

"Thus in fig. 8. an eye at S within the ſtratum *a b*, will ſee the ſtars in the direction of its length *a b*, or height *e d*, with all thoſe in the intermediate ſituation, projected into the lucid circle ABCD; while thoſe in the ſides *m e*, *n w*, will be ſeen ſcattered over the remaining part of the heavens at MVNW.

"If the eye were placed ſomewhere without the ſtratum, at no very great diſtance, the appearance of the ſtars within it would aſſume the form of one of the leſſer circles of the ſphere, which would be more or leſs contracted to the diſtance of the eye; and if this diſtance were exceedingly increaſed, the whole ſtratum might at laſt be drawn together into a lucid ſpot of any ſhape, according to the poſition, length, and height of the ſtratum.

"Let us now ſuppoſe, that a branch or ſmaller ſtratum ſhould run out from the former in a certain direction, and let it alſo be contained between two parallel planes extended indefinitely onwards, but ſo that the eye may be placed in the great ſtratum ſomewhere before the ſeparation, and not far from the place where the ſtrata are ſtill united; then will this ſecond ſtratum not be projected into a bright circle like the former, but will be ſeen as a lucid branch proceeding from the firſt, and returning to it again at a certain diſtance leſs than a ſemicircle. Thus, in the ſame figure, the ſtars in the ſmall ſtratum *p g* will be projected into a bright arch at PRRP, which, after its ſeparation from the circle CBD, unites with it again at P.

"What has been inſtanced in parallel planes may eaſily be applied to ſtrata irregularly bounded, and running in various directions; for their projection will of conſequence vary according to the quantities of the variations in the ſtrata and the the diſtance of the eye from the ſame. And thus any kind of curvatures, as well as various degrees of brightneſs, may be produced in the projections.

"From appearances, then, as I obſerved before, we may infer, that the ſun is moſt likely placed in one of the great ſtrata of the fixed ſtars, and very probably not far from the place where ſome ſmaller ſtratum branches out from it. Such a ſuppoſition will ſatisfactorily, and with great ſimplicity, account for all the phænomena of the milky-way; which, according to this hypotheſis, is no other than the appearance of the projection of the ſtars contained in this ſtratum and its ſecondary branch. As a farther inducement to look on the galaxy in this point of view, let it be conſidered, that we can no longer doubt of its whitiſh appearance ariſing from the mixed luſtre of the numberleſs ſtars that compoſe it. Now, ſhould we ſuppoſe it to be an irregular ring of ſtars, in the centre nearly of which we muſt then ſuppoſe the ſun to be placed, it will appear not a little extraordinary, that the ſun, being a fixed ſtar like thoſe which compoſe this imagined ring, ſhould juſt be in the centre of ſuch a multitude of celeſtial bodies, without any apparent reaſon for this ſingular diſtinction; whereas, on our ſuppoſition, every ſtar in this ſtratum, not very near the termination of its length or height, will be ſo placed as alſo to have its own galaxy, with only ſuch variations in the form and luſtre of it as may ariſe from the particular ſituation of each ſtar."

By a continued ſeries of obſervations, Herſchel became confirmed in his notions; and in a ſucceeding paper has given a ſketch of his opinions concerning the interior conſtruction of the heavens.—"That the milky-way (ſays he) is a moſt extenſive ſtratum of ſtars of various ſizes, admits no longer of the leaſt doubt; and that our ſun is one of the heavenly bodies belonging to it is as evident. I have now viewed and gauged this ſhining zone in almoſt every direction, and find it compoſed of ſhining ſtars, whoſe number, by the account of

* By this word we are to underſtand the apparent ſpace in the heavens he could ſee at once through his teleſcope.

thoſe gauges, conſtantly increaſes and decreaſes in proportion to its apparent brightneſs to the naked eye. But in order to develop the ideas of the univerſe that have been ſuggeſted by my late obſervations, it will be beſt to take the ſubject from a point of view at a conſiderable diſtance both of ſpace and time.

"Let us then ſuppoſe numberleſs ſtars of various ſizes ſcattered over an indefinite portion of ſpace, in ſuch a manner as to be almoſt equally diſtributed through the whole. The laws of attraction, which no doubt extend to the remoteſt regions of the fixed ſtars, will operate in ſuch a manner as moſt probably to produce the following remarkable effects.

"I. It will frequently happen, that a ſtar, being conſiderably larger than its neighbouring ones, will attract them more than they will be attracted by others that are immediately around them; by which means they will be in time, as it were, condenſed about a centre; or, in other words, form themſelves into a cluſter of ſtars of almoſt a globular figure, more or leſs regularly ſo according to the ſize and original diſtance of the ſurrounding ſtars. The perturbations of theſe mutual attractions muſt undoubtedly be very intricate, as we may eaſily comprehend by conſidering what Sir Iſaac Newton has ſaid, *Princip.* lib. i. prob. 38. et ſeq.: but in order to apply this great author's reaſoning of bodies moving in ellipſes to ſuch as are here for a while ſuppoſed to have no other motion than what their mutual gravity has imparted to them, we muſt ſuppoſe the conjugate axes of theſe ellipſes indefinitely diminiſhed, whereby the ellipſes will become ſtraight lines.

"II. The next caſe, which will happen almoſt as frequently as the former, is where a few ſtars, though not ſuperior in ſize to the reſt, may chance to be rather nearer each other than the ſurrounding ones; for here alſo will be formed a prevailing attraction in the combined centre of gravity of them all, which will occaſion the neighbouring ſtars to draw together; not, indeed, ſo as to form a regular globular figure, but, however, in ſuch a manner as to be condenſed towards the common centre of gravity of the whole irregular cluſter. And this conſtruction admits of the utmoſt variety of ſhapes, according to the number and ſituation of the ſtars which firſt gave riſe to the condenſation of the reſt.

"III. From the compoſition and repeated conjunction of both the foregoing forms, a third may be derived, when many large ſtars, or combined ſmall ones, are ſituated in long extended regular or crooked rows, hooks, or branches; for they will alſo draw the ſurrounding ones ſo as to produce figures of condenſed ſtars coarſely ſimilar to the former, which gave riſe to theſe condenſations.

"IV. We may likewiſe admit of ſtill more extenſive combinations; when, at the ſame time that a cluſter of ſtars is forming in one part of ſpace, there may be another collecting in a different, but perhaps not far diſtant, quarter, which may occaſion a mutual approach towards their common centre of gravity.

"V. In the laſt place, as a natural conſequence of the former caſes, there will be great cavities or vacancies formed by the retreat of the ſtars towards the various centres which attract them; ſo that, upon the whole, there is evidently a field of the greateſt variety for the mutual and combined attractions of the heavenly bodies to exert themſelves in.

"From this theoretical view of the heavens, which has been taken from a point not leſs diſtant in time than in ſpace, we will now retreat to our own retired ſtation, in one of the planets attending a ſtar in its great combination with numberleſs others; and in order to inveſtigate what will be the appearances from this contracted ſituation, let us begin with the naked eye. The ſtars of the firſt magnitude, being in all probability the neareſt, will furniſh us with a ſtep to begin our ſcale. Setting off, therefore, with the diſtance of Sirius or Arcturus, for inſtance, as unity, we will at preſent ſuppoſe, that thoſe of the ſecond magnitude are at double, thoſe of the third at treble, the diſtance, &c. Taking it for granted, then, that a ſtar of the ſeventh magnitude (the ſmalleſt ſuppoſed viſible with the naked eye) is about ſeven times as far as one of the firſt, it follows, that an obſerver who is incloſed in a globular cluſter of ſtars, and not far from the centre, will never be able with the naked eye to ſee to the end of it; for ſince, according to the above eſtimations, he can only extend his view to above ſeven times the diſtance of Sirius, it cannot be expected that his eyes ſhould reach the borders of a cluſter which has perhaps not leſs than 50 ſtars in depth every where around him. The whole univerſe to him, therefore, will be compriſed in a ſet of conſtellations richly ornamented with ſcattered ſtars of all ſizes: Or, if the united brightneſs of a neighbouring cluſter of ſtars ſhould, in a remarkably clear night, reach his ſight, it will put on the appearance of a ſmall, faint, whitiſh, nebulous cloud, not to be perceived without the greateſt attention. Let us ſuppoſe him placed in a much extended ſtratum, or branching cluſter of millions of ſtars, ſuch as may fall under the third form of nebulæ already conſidered. Here alſo the heavens will not only be richly ſcattered over with brilliant conſtellations, but a ſhining zone or milky-way will be perceived to ſurround the whole ſphere of the heavens, owing to the combined light of thoſe ſtars which are too ſmall, that is, too remote to be ſeen. Our obſerver's ſight will be ſo confined, that he will imagine this ſingle collection of ſtars, though he does not even perceive the thouſandth part of them, to be the whole contents of the heavens. Allowing him now the uſe of a common teleſcope, he begins to ſuſpect that all the milkineſs of the bright path which ſurrounds the ſphere may be owing to ſtars. He perceives a few cluſters of them in various parts of the heavens, and finds alſo that there are a kind of nebulous patches: but ſtill his views are not extended to reach ſo far as to the end of the ſtratum in which he is ſituated; ſo that he looks upon theſe patches as belonging to that ſyſtem which to him ſeems to comprehend every celeſtial object. He now increaſes his power of viſion; and, applying himſelf to a cloſe obſervation, finds that the milky-way is indeed no other than a collection of very ſmall ſtars. He perceives, that thoſe objects which had been called *nebulæ*, are evidently nothing but cluſters of ſtars. Their number increaſes upon him; and when he reſolves one nebula into ſtars, he diſcovers ten new ones which he cannot reſolve. He then forms the idea of immenſe ſtrata of fixed ſtars, of cluſters of ſtars and of nebulæ; till, going on with ſuch intereſting obſervations, he now perceives, that all theſe appearances muſt naturally ariſe from the confined ſituation in which we are placed. *Confined* it may juſtly be called, though in no leſs a ſpace than what appeared before to be the whole region of the fixed ſtars, but which now has aſſumed the ſhape of a crookedly branching nebula; not indeed one of the leaſt, but perhaps very far from being the moſt conſiderable, of thoſe numberleſs cluſters that enter into the conſtruction of the heavens."

Our author now proceeds to ſhow that this theoretical view of the heavens is perfectly conſiſtent with facts, and ſeems to be confirmed by a ſeries of obſervations. Many hundreds of nebulæ of the firſt and ſecond forms are to be ſeen in the heavens; and their places, he ſays, will hereafter be pointed out; many of the third form deſcribed, and inſtances of the fourth related; a few of the cavities mentioned in the fifth particulariſed, though many more have been already obſerved: ſo that, "upon the whole (ſays he), I believe it will be found, that the foregoing theoretical view, with all its conſequential appearances, as ſeen by an eye incloſed in one of the nebulæ, is no other than a drawing from nature, wherein the features of the original have been cloſely copied: and I hope the reſem-

blance will not be called a bad one, when it ſhall be conſidered how very limited muſt be the pencil of an inhabitant of ſo ſmall and retired a portion of an indefinite ſyſtem in attempting the picture of ſo unbounded an extent."

Having determined that the viſible ſyſtem of nature, by us called the *univerſe*, conſiſting of all the celeſtial bodies, and many more than can be ſeen by the naked eye, is only a group of ſtars or ſuns with their planets, conſtituting one of thoſe patches called a *nebula*, and perhaps not one ten thouſandth part of what is really the univerſe, Herſchel goes on to delineate the figure of this vaſt nebula, which he is of opinion may now be done; and for this purpoſe he gives a table, calculating the diſtance of the ſtars which form its extreme boundaries, or the length of the viſual ray in different parts, by the number of ſtars contained in the field of his teleſcope at different times. He then proceeds to offer ſome thoughts on the origin of the nebulous ſtrata of the heavens; in doing which he gives ſome hints concerning the antiquity of them. "If it were poſſible (ſays he) to diſtinguiſh between the parts of an indefinitely extended whole, the nebula we inhabit might be ſaid to be one that has fewer marks of antiquity than any of the reſt. To explain this idea perhaps more clearly, we ſhould recollect, that the condenſation of cluſters of ſtars has been aſcribed to a gradual approach; and whoever reflects on the number of ages that muſt have paſſed before ſome of the cluſters that are to be found in my intended catalogue of them could be ſo far condenſed as we find them at preſent, will not wonder if I aſcribe a certain air of youth and vigour to many very regularly ſcattered regions of our ſidereal ſtratum. There are, moreover, many places in it in which, if we may judge from appearances, there is the greateſt reaſon to believe that the ſtars are drawing towards ſecondary centres, and will in time ſeparate into cluſters, ſo as to occaſion many ſubdiviſions. Hence we may ſurmiſe, that when a nebulous ſtratum conſiſts chiefly of nebulæ of the firſt and ſecond forms, it probably owes its origin to what may be called the decay of a great compound nebula of the third form; and that the ſubdiviſions which happened to it in length of time, occaſioned all the ſmall nebulæ which ſprung from it to lie in a certain range, according as they were detached from the primary one. In like manner, our ſyſtem, after numbers of ages, may very poſſibly become divided, ſo as to give riſe to a ſtratum of two or three hundred nebulæ; for it would not be difficult to point out ſo many beginning or gathering cluſters in it. This throws a conſiderable light upon that remarkable collection of many hundreds of nebulæ which are to be ſeen in what I have called the *nebulous ſtratum* in Coma Berenices. It appears from the extended and branching figure of our nebula, that there is room for the decompoſed ſmall nebulæ of a large reduced former great one to approach nearer to us in the ſides than in any other parts. Nay, poſſibly there might originally be another very large joining branch, which in time became ſeparated by the condenſation of the ſtars: and this may be the reaſon of the little remaining breadth of our ſyſtem in that very place; for the nebulæ of the ſtratum of the Coma are brighteſt and moſt crowded juſt oppoſite to our ſituation, or in the pole of our ſyſtem. As ſoon as this idea was ſuggeſted, I tried alſo the oppoſite pole; where accordingly I have met with a great number of nebulæ, though under a much more ſcattered form.

"Some parts of our ſyſtem indeed ſeem already to have ſuſtained greater ravages of time than others; for inſtance, in the body of the Scorpion is an opening or hole, which is probably owing to this cauſe. It is at leaſt four degrees broad; but its height I have not yet aſcertained. It is remarkable, that the 80 *Nebuleuſe ſans Etoiles* of the *Connoiſſance des Temps*, which is one of the richeſt and moſt compreſſed cluſters of ſmall ſtars I remember to have ſeen, is ſituated juſt on the weſt border of it, and would almoſt authoriſe a ſuſpicion that the ſtars of which it is compoſed were collected from that place, and had left the vacancy. What adds not a little to this ſurmiſe is, that the ſame phænomenon is once more repeated with the fourth cluſter of the *Connoiſſance des Temps*; which is alſo on the weſtern border of another vacancy, and has moreover a ſmall miniature cluſter, or eaſily reſolvable nebula, of about 2½ minutes in diameter north, following it at no very great diſtance.

"There is a remarkable purity or clearneſs in the heavens when we look out of our ſtratum at the ſides; that is, towards Leo, Virgo, and Coma Berenices on one hand, and towards Cetus on the other; whereas the ground of the heavens becomes troubled as we approach towards the length or height of it. Theſe troubled appearances are eaſily to be explained by aſcribing them to ſome of the diſtant ſtraggling ſtars that yield hardly light enough to be diſtinguiſhed. And I have indeed often experienced this to be the cauſe, by examining theſe troubled ſpots for a long while together, when at laſt I generally perceived the ſtars which occaſioned them. But when we look towards the poles of our ſyſtem, where the viſual ray does not graze along the ſide, the ſtraggling ſtars will of courſe be very few in number; and therefore the ground of the heavens will aſſume that purity which I have always obſerved to take place in thoſe regions."

Thus, then, according to Herſchel, the univerſe conſiſts of *nebulæ*, or innumerable collections of innumerable ſtars, each individual of which is a ſun not only equal, but much ſuperior to ours: and none of the celeſtial bodies in our nebula are nearer to one another than we are to Sirius, whoſe diſtance is ſuppoſed not to be leſs than 400,000 times that of the ſun from us, or 38 millions of millions of miles. The whole extent of the nebula being in ſome places near 500 times as great, muſt be ſuch, that the light of a ſtar placed at its extreme boundary, ſuppoſing it to fly with the velocity of 12 millions of miles every minute, muſt have taken near 3000 years to reach us. Herſchel, however, is by no means of opinion, that our nebula is the moſt conſiderable in the univerſe. "As we are uſed (ſays he) to call the appearance of the heavens, where it is ſurrounded with a bright zone, the *milky-way*, it may not be amiſs to point out ſome other very remarkable nebulæ, which cannot well be leſs, but are probably much larger, than our own ſyſtem; and being alſo extended, the inhabitants of the planets that attend the ſtars which compoſe them, muſt likewiſe perceive the ſame phænomena: for which reaſon they may alſo be called *milky-ways*, by way of diſtinction.

"My opinion of their ſize is grounded on the following obſervations: There are many round nebulæ of the firſt form, of about five or ſix minutes in diameter, the ſtars of which I can ſee very diſtinctly; and on comparing them with the viſual ray calculated from ſome of my long gauges, I ſuppoſe by the appearance of the ſmall ſtars in thoſe gauges, that the centres of theſe round nebulæ may be 600 times the diſtance of Sirius from us."—He then goes on to tell us, that the ſtars in ſuch nebulæ are probably twice as much condenſed as thoſe of our ſyſtem; otherwiſe the centre of it would not be leſs than 6000 times the diſtance of Sirius from us; and that it is poſſibly much under-rated by ſuppoſing it only 600 times the diſtance of that ſtar.

"Some of theſe round nebulæ (ſays Herſchel) have others near them, perfectly ſimilar in form, colour, and the diſtribution of ſtars, but of only half the diameter: and the ſtars in them ſeem to be doubly crowded, and only at about half the diſtance from each other. They are indeed ſo ſmall, as not to be viſible without the utmoſt attention. I ſuppoſe theſe miniature nebulæ to be at double the diſtance of the firſt. An inſtance equally remarkable and inſtructive is a caſe

where, in the neighbourhood of two ſuch nebulæ as have been mentioned, I met with a third ſimilar, reſolvable, but much ſmaller and fainter nebula. The ſtars of it are no longer to be perceived; but a reſemblance of colour with the former two, and its diminiſhed ſize and light, may well permit us to place it at full twice the diſtance of the ſecond, or about four or five times the diſtance of the firſt. And yet the nebuloſity is not of the milky kind; nor is it ſo much as difficultly reſolvable or colourleſs. Now in a few of the extended nebulæ, the light changes gradually, ſo as from the reſolvable to approach to the milky kind; which appears to me an indication, that the milky light of nebulæ is owing to their much greater diſtance. A nebula, therefore, whoſe light is perfectly milky, cannot well be ſuppoſed to be at leſs than ſix or eight thouſand times the diſtance of Sirius; and though the numbers here aſſumed are not to be taken otherwiſe than as very coarſe eſtimates, yet an extended nebula, which an oblique ſituation, where it is poſſibly foreſhortened by one half, two-thirds, or three-fourths of its length, ſubtends a degree or more in diameter, cannot be otherwiſe than of a wonderful magnitude, and may well outvie our milky-way in grandeur."

Herſchel next proceeds to give an account of ſeveral remarkable nebulæ, and then concludes thus: "Now, what great length of time muſt be required to produce theſe effects (the formation of nebulæ) may eaſily be conceived, when, in all probability, our whole ſyſtem, of about 800 ſtars in diameter, if it were ſeen at ſuch a diſtance that one end of it might aſſume the reſolvable nebuloſity, would not, at the other end, preſent us with the irreſolvable, much leſs with the colourleſs and milky ſort of nebuloſities." Great indeed muſt be the length of time requiſite for ſuch diſtant bodies to form combinations by the laws of attraction, ſince, according to the diſtances he has aſſumed, the light of ſome of his nebulæ muſt be thirty-ſix or forty-eight thouſand years in arriving from them to us. It would be worth while then to enquire, whether *attraction* is a virtue propagated in time or not; or whether it moves quicker or ſlower than light?

In the courſe of Herſchel's obſervations and enquiries concerning the ſtructure of the heavens, an objection occurred, that if the different ſyſtems were formed by the mutual attractions of the ſtars, the whole would be in danger of deſtruction by the falling of them one upon another. A ſufficient anſwer to this, he thinks, is, that if we can really prove the ſyſtem of the univerſe to be what he has ſaid, there is no doubt that the great Author of it has amply provided for the preſervation of the whole, though it ſhould not appear to us in what manner this is effected. Several circumſtances, however, he is of opinion, manifeſtly tend to a general preſervation; as, in the firſt place, the indefinite extent of the ſidereal heavens; which muſt produce a balance that will effectually ſecure all the great parts of the whole from approaching to each other. "There remains then (ſays he) only to ſee how the particular ſtars belonging to ſeparate cluſters are prevented from ruſhing on to their centres of attraction." This he ſuppoſes may be done by projectile forces; "the admiſſion of which will prove ſuch a barrier againſt the ſeeming deſtructive power of attraction, as to ſecure it from all the ſtars belonging to a cluſter, if not for ever, at leaſt for millions of ages. Beſides, we ought perhaps to look upon ſuch cluſters, and the deſtruction of a ſtar now and then in ſome thouſands of ages, as the very means by which the whole is preſerved and renewed. Theſe cluſters may be the *laboratories* of the univerſe, wherein the moſt ſalutary remedies for the decay of the whole are prepared."

Theſe conjectures will doubtleſs appear very fanciful to many of our readers; yet as they may lead to a more accurate ſurvey of the heavenly bodies, great indulgence is to be granted to an obſerver to whom we are under ſo great obligations. Former aſtronomers have ſuppoſed, that the ſtars which we call fixed are by no means really ſo; and Herſchel ſeems to be well-founded in his opinion, that there is not a fixed ſtar in the heavens. For by the principles of attraction ſome effect will be produced on each by the others, and a great many changes have alſo been obſerved in ſome of theſe heavenly bodies. To diſcover their proper motion is indeed an arduous talk; yet the attempt has been made by Herſchel, and the confirmation or refutation of his ſyſtem will depend on ſubſequent obſervations.

SECT. IV. *Of the different Syſtems by which the Celeſtial Phænomena have been accounted for.*

MANY hypotheſes have been formed for explaining the motions and appearances of the heavenly bodies; and every hypotheſis that ever was framed, could account for ſome or other of them; but ſince men were, in the early ages, ignorant of the laws of motion, it could not be expected that they could diſcover the true ſyſtem, or ſuch a one as could explain all the phænomena. Since the uſe of teleſcopes, numerous other phænomena have offered themſelves, which were quite unknown before; from whence it followed that almoſt all theſe hypotheſes fell ſhort in accounting for them. While theſe things were thus diſputable, and one contended for one hypotheſis, and another for another, Sir Iſaac Newton laid down the laws of nature and motion, and, comparing all the phænomena in the heavens, found out the true ſyſtem of the world, and demonſtrated by unanſwerable arguments, that it could not poſſibly be otherwiſe without the utter ſubverſion of all the laws of nature. The true ſyſtem founded upon the laws of nature, and true mechanical principles, is as follows.

The ſun is placed nearly in the centre of the orbits of all the planets, and in theſe orbits they move round the ſun, each in its periodic time. (See fig. 9.) The ſun keeps always in or near the ſame place; but has a rotation round its axis from weſt to eaſt in about 25 days. The orbits of all the planets are nearly circular, having the ſun for their centre; but in ſtrictneſs they are ellipſes, having the ſun in the focus of each of them. Theſe orbits are not all in one plane, and yet do not vary a great deal; they interſect one another in lines that paſs through the centre of the ſun; the places of the orbits where they interſect are called the *nodes*. All the planets move round the ſun the ſame way, which is from weſt to eaſt, and are called *primary planets*. Their names and order are as follows: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Herſchel. Four of them have others revolving about them, which likewiſe revolve from weſt to eaſt, and are called *ſecondary planets* or *ſatellites*. The Earth has one called the *moon*, which revolves in 27 $\frac{1}{3}$ days. Jupiter has four, Saturn five, and Herſchel two.

Beſides the planets and their ſatellites, there is another ſort of bodies revolving about the ſun, which only appear ſometimes: theſe are the *comets*; and they move either in very long ellipſes, which run to an immenſe diſtance from the ſun; or in parabolic curves, and then they never return. Theſe move in all manner of directions round the ſun; ſome the ſame way as the planets, and ſome the contrary way; they cut the plane of the earth's orbit in all ſorts of angles, ſome greater and ſome leſs. Some of theſe bodies are ſeveral hundred years in making a revolution; and therefore the periodic times of few of them are known. Nor can their number be determined for want of a proper ſeries of obſervations. There have not been above forty of theſe bodies obſerved; and of theſe ſome may happen to be the ſame, coming about again. They are diſtinguiſhed from other ſtars, by a luminous ſtream of light

which they emit (called the tail), when they come near the ſun. The characters of the celeſtial bodies are, ☉ the Sun, ☽ the Moon, ☿ Mercury, ♀ Venus, ♂ Mars, ♃ Jupiter, ♄ Saturn, ♅ Herſchel, and ⊕ the Earth.

The fixed ſtars are at an immenſe diſtance; for by the niceſt obſervations, they have no annual parallax that is ſenſible; that is, they appear to the earth when on different ſides of its orbit to be exactly in the ſame places; and the Earth's orbit ſeen from a fixed ſtar, will appear only as a point. Conſequently, the fixed ſtars all ſhine with their own native light: for it would be impoſſible for light, tranſmitted from the ſun to them, ever to be viſible, as it would be infinitely weak at that immenſe diſtance.

Though the diſtance of the ſun is almoſt nothing in reſpect of that of the fixed ſtars, yet it is immenſely great in reſpect of the moon's diſtance. For the ſun's diurnal parallax is ſo ſmall, that is, the apparent ſemidiameter of the earth ſeen from the ſun is ſo ſmall, that no inſtruments could be ſo exactly made as to find it. Hence it is inferred that the ſun's magnitude is vaſtly greater than the earth's. For ſuppoſing the ſun's parallax to amount to as much as a minute, then ſince the apparent diameter of the ſun is half a degree, this would make the ſun's diameter 15 times as big as the earth's; but the ſun's parallax is no ſuch thing, for it is found not to exceed 10 ſeconds, which will make the ſun's diameter 90 times as big as the earth's. That the ſun is of a globular form, is plain from the apparent motion of the ſpots upon its ſurface; for while the ſun moves uniformly about its axis, the ſpots in the middle of the diſk move very quick, but near the edges grow ſlower and ſlower, agreeable to the motion of a globe about its axis. By obſervation of theſe ſpots, the ſun is found to revolve about its axis in 25 or 26 days.

In our planetary ſyſtem, none of the celeſtial bodies ſhine with their own native light, but only the ſun; ſo that all the planets both primary and ſecondary are opake bodies, that have no other light but what they receive from the ſun, and reflect it back towards the earth and other places. This is evident from the moon: for only that ſide of her is obſerved to ſhine which is directly oppoſed to the ſun; but the other ſide which is from the ſun is quite dark, except ſo far as it is illuminated by reflection from the earth; for the more of the illuminated ſide that is turned towards the earth, the more we ſee her enlightened, the reſt being dark; and the more of her dark ſide that is turned towards the earth, the more of her appears dark. Thus at the full ſhe appears all enlightened, and at the change all dark. The like phænomena are obſerved in Mercury and Venus, which ſhew all the phaſes of the moon, according to their various ſituations; and ſometimes appear like a black ſpot upon the body of the ſun. Mars likewiſe appears gibbous when near the quadratures with the ſun. The ſatellites of Jupiter are eclipſed when they are behind his body, being then immerſed in his ſhadow; they likewiſe caſt their ſhadows upon the body of Jupiter. And in Saturn the ſhadow of the ring upon his body proves his opacity. And the weakneſs of the light of thoſe that are far diſtant from the ſun, ſhows that it is not innate but borrowed.

All the planetary bodies are ſpherical, and all or moſt of them have a rotation round their axis. Theſe motions are found by means of certain ſpots upon their ſurfaces, which give us the time of their rotation. In ſome planets, for the want of ſuch marks, the times of their rotation have not yet been found. That they are ſpherical bodies appears from the ſlow motion of the ſpots near the edges, and their ſwifter motion near the middle. Likewiſe the line ſeparating the illuminated part from the dark is always elliptical, which proves their figure to be ſpherical.

Beſides the ſatellites of Saturn, he is encompaſſed with a thin ring, concentrical with him, and whoſe diameter is more than double his diameter; and the breadth of the ring is equal to the hollow ſpace between the ring and his body. Its plane makes an angle of 31 degrees with the ecliptic, and coincides nearly with the orbits of the ſatellites; from whence it is probable that this ring revolves in that plane, in the nature of a ſatellite, or rather of a vaſt number of ſatellites, which touch one another, and compoſe the ring. In ſome places of his orbit his ring cannot be ſeen, when its plane paſſes through the earth. In other poſitions it is viſible more or leſs.

The body of Jupiter is alſo encompaſſed with ſeveral dark lines, called Jupiter's *belts*; theſe run about his body parallel to his equinoctial. But theſe belts are obſerved not to be permanent, but to increaſe and decreaſe; and undergo ſeveral changes, and ſo do the ſpots upon his ſurface.

The ſurface of the moon is rough and uneven, and full of innumerable mountains, vallies, and deep pits. This is plain from the line that divides the light from the dark part, for this is always jagged and uneven; the higher parts running more into the dark than the lower. The high mountainous parts caſt a ſhadow to a great diſtance, which gradually grows ſhorter, as the ſun's light comes more perpendicular; and by degrees the light ſhines into the hollows and vallies, and then the ſhadows of the edges gradually diſappear. There are ſeveral ſpots in the moon, ſome brighter, and ſome duller; but no changes have ever been obſerved in them, and they keep their places and magnitude and colour. There are ſuppoſed to be no clouds, rain, or water in the moon; for ſhe always has the ſame appearance. There are no rivers, no ſeas; for ſuch places as are ſmooth, and look moſt like ſeas, are full of ſmall hills and hollows, and ſuch irregularities; and therefore can contain no water. She always turns the ſame face nearly, towards the earth. The moon is far leſs than any of the planets, and yet appears vaſtly greater; even as big as the ſun. And the reaſon is, becauſe it is vaſtly nearer than any of the reſt.

The ſyſtem of the world, as here deſcribed, is called the *Copernican ſyſtem*, from its author Copernicus, though it is maintained that Pythagoras and others of the antients were acquainted with this ſyſtem; but other ſyſtems have been eſtabliſhed and received at different times, which are founded upon the earth being fixed in the centre of the world. They are theſe that follow.

The *Ptolemaic ſyſtem* (fig. 10.) ſuppoſes the earth at reſt in the centre of the ſyſtem, about which the planets are ſuppoſed to move in circles; as firſt the Moon; the next above her, Mercury; and then Venus; and beyond her, the Sun; then Mars; then Jupiter; and above him, Saturn; and laſtly, the ſphere of the fixed ſtars. The planets and ſtars are all ſuppoſed to move round the earth from eaſt to weſt in 24 hours.

The *Tychonic ſyſtem* (fig. 11.) ſuppoſes the earth abſolutely at reſt, and that the moon and ſun revolve about the earth; the moon in a month, and the ſun in a year; and at the ſame time the reſt of the planets, Mercury, Venus, Mars, Jupiter, and Saturn, revolve round the ſun, the three laſt encompaſſing the earth. And beſides, they are all ſuppoſed to have a diurnal motion round the earth, as likewiſe all the ſtars.

The *Semi-tychonic ſyſtem* ſuppoſes the planets to revolve round the ſun, while the ſun and moon revolve about the earth as their centre of motion; and it ſuppoſes the earth to move about its axis from weſt to eaſt in 24 hours. This differs from the tychonic only in this, that it ſuppoſes a diurnal motion in the earth, but, like the tychonic, denies an annual one.

The *Carteſian ſyſtem*, ſo named from its author Des Cartes, ſuppoſes a variety of vortices or whirlpools, in which the motions of the heavenly bodies are performed, being carried round the ſun in a vortex of ethereal matter, in different times proportioned to their diſtances; and each planet having alſo a

particular vortex of its own, in which the motions of its satellites are performed. From the laws of motion it will easily appear, that the irregular motions of planets cannot be accounted for by these vortices; and besides, the supposition of an ethereal matter to perform these operations is without foundation.

The chief properties of the planets may be seen in the following Table:

Anno 1784	Mercury.	Venus.	Earth.	Mars.	Jupiter.	Saturn.	Herschel. 1782.
Greatest possible elongation of inferior, and parallax of superior planets,	28°. 20′.	47°. 48′	* *	47°. 24′	11°. 51′	6°. 29′	3°. 4¼′.
Proportional mean distances from the sun,	.387.10	.72333	1.00000	1.523.69	5.2.0c98	9.53937	19.03421
Periodical revolutions round the sun	87d. 23h. 15½m.	224d. 16h. 49¼m.	365d. 6h. 9½m.	686d. 23h. 3′ 8/4 m.	4332d. 8h. 51½m.	10761d. 14h. 36¼m.	30445d. 18h.
Diurnal rotations upon their axes,	* * *	23h. 22m.	23h. 56m. 04s.	24h. 39m. 22s.	9h. 56m.	* * *	* *
Inclinations of their orbits to the ecliptic,	7°. 00′	3°. 23 1/3′	* * *	1°. 51′	1°. 19¼′	2°. 30 1/3′	46′. 12″
Eccentricities, or distance of the centre from the focus,	7960	510	1680	14218	25277	53163	4759
Place of the ascending node,	1s. 15d. 46¾m.	2s. 14d. 44m.	* * *	1s. 17d. 59m.	3s. 8d. 50m.	3s. 21d. 48¼m.	3s. 13d. 1m.
Place of the aphelium, or point farthest from the sun,	8s. 14d. 13m.	10s. 9d. 38m.	9s. 9d. 15¼m.	5s. 2d. 6¾m.	6s. 10d. 57½m.	9s. 0d. 45½m.	11s. 23d. 23m.
Greatest apparent diameters,	11″	58″	*	25″	46″	20″	4″
Diameters in English miles; that of the sun being 882.217.	3.222	7.687	7.964	4.189	83.170	79.042	35.109
Mean distances from the sun in semidiameters of the earth,	9210	17210	23799	36262	123778	227028	453000
Mean distances from the sun in English miles,	37.000.000	68 000.000	95.000.000	144.000.000	490.000.000	900.000.000	1.800.000.000
Proportion of light; that of the earth being 1,	6.68	1.91	1.00	.43	.037	.011	.00276
Proportion of bulk; that of the sun being 1.380.000	1/1 3	8/9	1	7/2 4	1.400	1000	90
Proportion of density; that of the sun being ¼	2	1¼	1	7/1 0	22/1 00	9/1 00	* *

§ 1. *Of Centripetal Powers in general.*

Before we attempt to give any particular explanation of the causes producing the planetary motions, it will be necessary to premise something of Sir Isaac Newton's doctrine of centripetal forces, as upon that depends his doctrine of gravitation, and of the whole celestial system. Let a body (fig. 12.) projected in the direction AB, be acted upon by a power at C in such a manner as at certain intervals to draw it out of its course. Thus at D, let it act by an impulse, which, if the body had been at rest, would have made it go through the space D*a* in the same time that it would otherwise have gone through DB. Then since the body is acted upon by two powers, one in the direction DB, the other in the direction of D*a*, it must move in the diagonal of the parallelogram D*a*BE, and, arriving at E in the same time that it would otherwise have arrived at B, have now a motion in the direction DE, by which, if not prevented by any other force, it would describe ED and EF equal to ED in equal times. At E let it be again impelled towards the centre by a force, which would make it describe E*b* in the same time that it would otherwise have described EF; and consequently by the composition of these two forces as before, the body must describe the diagonal of the parallelogram EFG*b*. At G let it be impelled again towards the centre, and it will describe the diagonal of the parallelogram GHI*c*; and so on by impulses in this manner the body will continually move in the diagonal of a parallelogram, one of whose sides represents the space it would otherwise have gone over according to the

laſt direction, and the other ſide repreſents the ſpace it would have deſcribed in the ſame time by the impulſe towards the centre. Suppoſing theſe impulſes to be more frequently repeated, the ſpaces DE, EG, GI will be ſmaller; and by the more we increaſe the number of impulſes, the nearer will theſe diagonals approach to ſome curvilinear figure; and the reaſoning on a body thus moving in theſe diagonals may at laſt be applied to the motion of a body in a curve, to which the tangents DE, EG, GI, are ultimately equal. C in this caſe is called the centre of force; and from the body having a conſtant impulſe towards the centre, the force by which it is drawn out of its rectilinear direction is called the centripetal force. Since the body would have deſcribed DE and EF in equal times, it muſt deſcribe DE and EG in equal times; and for the ſame reaſon it muſt deſcribe EG and GI in equal times: and the areas of the triangles DCE, ECG, GCI are equal, becauſe DCE and ECF are equal, being on equal baſes, and having the ſame altitudes; and ECF and ECG are equal, being on the ſame baſe, and between the ſame parallels: in the ſame manner ECG is proved equal to GCI. Hence the body will deſcribe equal areas in equal times about the centre of force in this rectilinear figure, and conſequently in the curve, to which this is ultimately equal, by indefinitely increaſing the number of impulſes.

Draw CY perpendicular to DE produced. Since DE, EG, GI are deſcribed in equal times, the velocity with which the body moves through theſe ſpaces will vary as the ſpaces: but the baſe of every triangle multiplied into its perpendicular altitude equals half the area of the triangle; and conſequently when the areas of triangles are equal, the baſes vary inverſely as the perpendicular altitudes. Therefore in this caſe DE varies inverſely as CY; that is, the velocity of the body in each ſpace varies inverſely as the perpendicular drawn to that ſpace from the centre of force; and conſequently, when a body moves in a curve, its velocity in any point varies inverſely as the perpendicular drawn from the centre of force to the tangent to that point of the curve.

By reaſoning upon theſe principles, Newton inveſtigated the motions of bodies in various ſpecies of curves, found out the velocity which they had in any part, the time in which they performed a revolution, and the quantity of force by which they were affected. Thus, if a body moved in an ellipſe having the centre of force in one of its foci, the centripetal force would vary inverſely as the ſquare of the diſtance from that focus, and its periodical time would vary in the ſeſquiplicate ratio of the major axis; that is, if two bodies revolved round the ſame centre of force, being alſo the focus of the ellipſes in which they moved, the ſquares of their periodical times would vary as the cubes of their major axes, or mean diſtances. The velocity of a body in a curve varying inverſely as the perpendicular on the tangent, the velocity of a body thus moving in an ellipſe muſt be greateſt at the leaſt focal diſtance, and leaſt at its greateſt focal diſtance. All theſe poſitions agree with the motions of the heavenly bodies round the ſun. Kepler had diſcovered that the ſquares of their periodical times were as the cubes of their mean diſtances: their velocities were found to be greateſt and leaſt at the leaſt and greateſt focal diſtances; and the centripetal force in this caſe called the force of gravity was found to vary inverſely as the ſquare of the diſtance.

Let C be the ſun, (fig. 13.) P a planet moving in its orbit, AB the major axis, EF the minor axis of the ellipſes of which C is the focus. Then CE equal to half AB is the mean diſtance. The velocity at A is the leaſt, at B the greateſt; the point A is called the aphelion, B the perihelion. In moving from A to B the motion is conſtantly accelerated; from B to A it is conſtantly retarded.

Since the body is ſuppoſed to be always acted upon by a force tending to the centre, the common objection urged againſt this ſyſtem is, that it muſt at laſt fall into the centre; but the futility of this notion will appear evident by conſidering the motion of the body at A and B (fig. 13). Suppoſing the body to be projected at A with the proper velocity, ſo that it ſhall move in the ellipſe AEBF, it continually approaches to the centre: but when it comes to B, the velocity has conſiderably increaſed, and it is found to be greater than that which a body revolving in a circle, whoſe radius is BC, would have, if acted upon by the ſame force at C. Conſequently, ſince the tangent at B is at right angles to BC, the velocity of B muſt carry it without the circle; and though the velocity is afterwards continually decreaſing, and the force increaſing, the body will not be brought into a ſituation for the force to act ſo as to draw it towards the centre, till it comes to A. Then the direction of the body is again perpendicular to CA; but its velocity being leſs than that in a circle whoſe radius is CA, it muſt move within ſuch a circle; and the direction of the body conſpiring now with the increaſing force, the body muſt approach to the centre, as before, till it comes to B, when, the ſame cauſes producing the ſame effects, the body will again fly off from the centre till it comes to A, and ſo for ever.

Suppoſing the force to vary inverſely as the ſquare of the diſtance, a body may move in a parabola, hyperbola, or ellipſe, having the centre of the force in the focus of theſe curves: and the motion in theſe curves will depend on the direction of the body and the force of projection. If the force varied as the diſtance, a body would move in a circle or an ellipſe having the centre of force in the centre of theſe curves. If the force follows other laws, curves of different ſpecies will be deſcribed, and motions in many of theſe curves have been inveſtigated by Newton: but it is ſufficient for our purpoſe to have ſhewn the principles on which he inveſtigated the motions of the heavenly bodies, was enabled to calculate the law of the force from the curve which a body deſcribed, or, having given the law of the force, to calculate the curve which it would deſcribe: and as his theory is confirmed by every obſervation, we cannot heſitate in aſſigning to the heavenly bodies thoſe laws which reſult from his doctrine of centripetal forces.

§ 2. *Of the Motions of the Primary Planets.*

The primary planets move above the ſun in ſuch a manner, that a line extended from the ſun to the planet deſcribes equal areas in equal times; and this ſingle property in the planetary motions proves, that they are continually acted upon by a power directed towards the ſun as the centre.

In order to know whether this centripetal power extends in the ſame proportion throughout the ſyſtem, and conſequently whether all the planets are influenced by it, Sir Iſaac inquires what relation there ought to be between the periods of the different planets, provided they were acted upon by the ſame power, decreaſing throughout in the proportion above mentioned; and he finds, that the period of each, in this caſe, would have that very proportion to the greater axis of its orbit which has been already related: which puts it beyond a doubt, that the different planets are preſſed towards the ſun in the ſame proportion to the diſtances as one planet is in its ſeveral diſtances; whence it is juſtly concluded, that there is ſuch a power acting towards the ſun in the foreſaid proportion at all diſtances from it. This power, when referred to the earth, Sir Iſaac calls *gravity*; when to the ſun, *attraction*; and to the planets, *centripetal* force. By theſe names, however, he deſigns only to ſignify a power endowed with the properties above mentioned; but by no means would have it underſtood as if theſe names referred any way to the cauſe of it.

The only inequalities which have been obſerved common to all the planets are, the motion of the aphelion and the nodes.

The tranſverſe axis of each orbit does not remain always fixed, but moves about the ſun with a very ſlow, progreſſive motion; nor do the planets keep conſtantly in the ſame planes, but change them and the lines by which theſe planes interſect each other by inſenſible degrees. The firſt of theſe inequalities, which is the motion of the aphelion, may be accounted for, by ſuppoſing the gravitation of the planets towards the ſun to differ a little farther from the forementioned reciprocal duplicate proportion of the diſtances; but the ſecond, which is the motion of the nodes, cannot be accounted for by any power directed towards the ſun; for no ſuch power can give it any lateral impulſe to divert it from the plane of its motion into any new plane, but of neceſſity muſt be derived from ſome other centre. Where that power is lodged, remains to be diſcovered. Now it is proved that the three primary planets, Saturn, Jupiter, and the Earth, which have ſatellites revolving about them, are endowed with a power of cauſing bodies, in particular thoſe ſatellites, to gravitate towards them with a force which is reciprocally in the duplicate proportion of their diſtances; and the planets are, in all reſpects in which they come under our conſideration, ſo ſimilar and alike, that there is no reaſon to doubt that they have all the ſame property, though it be ſufficient for the preſent purpoſe to have it proved of Jupiter and Saturn only; for theſe planets contain much greater quantities of matter than the reſt, and proportionally exceed the others in power. But the influence of theſe two planets being allowed, it is evident how the planets come to ſhift their places continually: for each of the planets moving in a different plane, the action of Jupiter and Saturn upon the reſt will be oblique to the planes of their motion, and therefore will gradually draw them into new ones. The ſame action of theſe two planets upon the reſt will likewiſe cauſe a progreſſive motion; and therefore will gradually draw them into new ones. The ſame action of theſe two planets upon the reſt will likewiſe cauſe a progreſſive motion of the aphelion; ſo that there will be no neceſſity for having recourſe to the other cauſe for this motion, which was before hinted at, viz. the gravitation of the planets toward the ſun differing from the exact duplicate proportion of their diſtances. And in the laſt place, the action of Jupiter and Saturn upon each other will produce in their motions the ſame inequalities as their joint action produces upon the reſt. All this is effected in the ſame manner as the ſun produces the ſame kind of inequalities and many others in the motion of the moon and other ſecondary planets; and therefore will be beſt apprehended by what is ſaid afterwards. Thoſe other irregularities in the motion of the ſecondary planets have place likewiſe here, but are too minute to be obſervable, becauſe they are produced and rectified alternately, for the moſt part in the time of a ſingle revolution; whereas the motion of the aphelion and nodes, which increaſe continually, become ſenſible after a long ſeries of years. Yet ſome of theſe other inequalities are diſcernible in Jupiter and Saturn; in Saturn chiefly: for when Jupiter, who moves faſter than Saturn, approaches to a conjunction with him, his action upon the latter will a little retard the motion of that planet; and, by the reciprocal action of Saturn, he will himſelf be accelerated. After conjunction, Jupiter will again accelerate Saturn, and be likewiſe retarded in the ſame degree as before the firſt was retarded and the latter accelerated. Whatever inequalities beſides are produced in the motion of Saturn by the action of Jupiter upon that planet, will be ſufficiently rectified by placing the focus of Saturn's ellipſis, which ſhould otherwiſe be in the Sun, in the common centre of gravity of the Sun and Jupiter. And all the inequalities of Jupiter's motions, cauſed by the action of Saturn upon him, are much leſs conſiderable than the irregularities of Saturn's motion. This one principle therefore of the planets having a power as well as the ſun to cauſe bodies to gravitate towards them, which is proved by the motion of the ſecondary planets to obtain in fact, explains all the irregularities relating to the planetary motions ever obſerved by aſtronomers *.

Sir Iſaac Newton after this proceeds to apply his theory to the farther correction of their motions. For as the planets poſſeſs a principle of gravitation as well as the ſun; the third law of motion, which makes action and reaction equal, is to be applied in this caſe. Thus the ſun does not only attract each planet, but is alſo itſelf attracted by them; the force wherewith the planet is acted on bearing, to the force wherewith the ſun itſelf is acted upon at the ſame time, the proportion which the quantity of matter in the ſun bears to the quantity of matter in the planet. From the action of the ſun and planet being thus mutual, the ſun and planet deſcribe about their common centre of gravity ſimilar ellipſes.

It will be aſked, perhaps, how this correction can be admitted, when the cauſe of the motions of the planets was before found, by ſuppoſing them to be the centre of the power which acted upon them? for, according to the preſent correction, this power appears rather to be directed to the common centre of gravity. But as the ſun was at firſt concluded to be the centre to which the power acting on the planets was directed, becauſe the ſpaces deſcribed in equal times round the ſun were found to be equal; ſo Sir Iſaac Newton proves, that if the ſun and planet move round their common centre of gravity, yet, to an eye placed in the planet, the ſpaces which will appear to be deſcribed about the ſun will have the ſame relation to the times of their deſcription as the real ſpaces would if the ſun were at reſt. Suppoſing the planets to move round the ſun at reſt, and to be attracted by a power which ſhould every where act with degrees of ſtrength reciprocally in the duplicate proportions of their diſtances; then the periods of the planets muſt obſerve the ſame relations to their diſtances as aſtronomers have found them to do. But here it muſt not be ſuppoſed, that the obſervations of aſtronomers abſolutely agree without any the leaſt difference: and the preſent correction will not cauſe a deviation from any one aſtronomer's obſervations, ſo much as they differ from one another; for in Jupiter, where this correction is greateſt, it hardly amounts to the 3000th part of the whole axis.

Upon this head it is not improper to mention a reflection made by Newton upon theſe ſmall inequalities in the planet's motions, which contains in it a very ſtrong philoſophical argument againſt the eternity of the world. It is this, that theſe inequalities muſt continually increaſe by ſlow degrees, till they render at length the preſent frame of nature unfit for the purpoſes it now ſerves. And a more convincing proof cannot be deſired againſt the preſent conſtitution's having exiſted from eternity than this, that a certain period of years will bring it to an end. His thought has been repreſented even as impious, and as no leſs than caſting a reflection upon the wiſdom of the Author of nature for framing a periſhable work. But ſo bold an aſſertion ought to have been made with ſingular caution: for if this remark upon the increaſing irregularities in the heavenly

* Robiſon, however, informs us in his paper on Herſchel (Edinburgh Philoſophical Tranſactions, vol. i.), that *all* the irregularities in the planetary motions *cannot* be accounted for from the laws of gravitation; for which reaſon he was obliged to ſuppoſe the exiſtence of planets beyond the orbit of Saturn, even before the diſcovery of Herſchel. De la Lande alſo has obſerved ſome unaccountable inequalities in the motion of Saturn for more than 30 years paſt.

motions be true in fact, as it really is, the imputation muſt return upon the aſſerter, that this does not detract from the divine wiſdom. Certainly we cannot pretend to know all the Creator's purpoſes in making this world, and therefore cannot pretend to determine how long he deſigned it ſhould laſt; and it is ſufficient if it endure the time deſigned by the Author. The body of every animal ſhows the unlimited wiſdom of the Author no leſs, nay, in many reſpects more, than the larger frame of nature; and yet we ſee they are all deſigned to laſt but a ſmall ſpace of time.

§ 3. *The Motions of the Secondary Planets explained.*

The firſt thing demonſtrated of theſe ſecondary planets is, that they are drawn towards their reſpective primaries in the ſame manner as the latter are attracted by the ſun. That each ſecondary planet is kept in its orbit by a power directed towards its primary, &c. is proved from the phænomenon of the ſatellites of Jupiter and Saturn; becauſe they move in circles, as far as we can obſerve, about their reſpective primaries with an equable courſe, the primary being the centre of each orbit: and by comparing the times in which the different ſatellites of the ſame primary perform their periods, they are found to obſerve the ſame relation to the diſtances from their primary, as the primary planets obſerve in reſpect of their mean diſtances from the ſun. The ſame thing holds good alſo with regard to the earth and moon; for ſhe is found to move round the earth in an ellipſis after the ſame manner as the primary planets do about the ſun, excepting only ſome ſmall irregularities in her motions, the cauſe of which will be particularly explained in what follows; and it will appear that they are no objections againſt the earth's acting on the moon in the ſame manner as the ſun acts on the primary planets; that is, as Jupiter and Saturn act upon their ſatellites.

By the number of ſatellites which move round Jupiter and Saturn, the power of each of theſe planets may be meaſured to a very conſiderable diſtance; for the diſtance of the outermoſt ſatellite in each of theſe planets exceeds ſeveral times the diſtance of the innermoſt. The force of the earth upon the moon, however, at different diſtances, is more confirmed by the following conſideration than any analogical reaſoning. It will appear, that if the power of the earth by which it retains the moon in her orbit, be ſuppoſed to act at all diſtances between the earth and moon, according to the rule already mentioned, this power will be ſufficient to produce upon bodies near the ſurface of the earth all the effects aſcribed to the principle of gravity. This is diſcovered by the following method. Let A (in fig. 14.) repreſent the earth, B the moon, BCD the moon's orbit; which differs little from a circle of which A is the centre. If the moon in B were left to itſelf to move with the velocity it has in the point B, it would leave the orbit, and proceed ſtraight forward in the line BE which touches the orbit in B. Suppoſe the moon would upon this condition move from B to E in the ſpace of one minute of time: by the action of the earth upon the moon, whereby it is retained in its orbit, the moon will really be found at the end of this minute in the point F, from whence a ſtraight line drawn to A ſhall make the ſpace BFA in the circle equal to the triangular ſpace BEA; ſo that the moon in the time wherein it would have moved from B to E, if left to itſelf, has been impelled towards the earth from E to F. And when the time of the moon's paſſing from B to F is ſmall, as here it is only one minute, the diſtance between E and F ſcarce differs from the ſpace through which the moon would deſcend in the ſame time if it were to fall directly down from B toward A without any other motion. A B, the diſtance of the moon from the earth, is about 60 of the ſemidiameters of the latter; and the moon completes her revolution round the earth in about 27 days 7 hours and 43 minutes: therefore the ſpace EF will here be found by computation to be about $16\frac{1}{12}$ feet. Conſequently, if the power by which the moon is retained in its orbit be near the ſurface of the earth greater than at the diſtance of the moon in the duplicate proportion of that diſtance, the number of feet a body would deſcend near the ſurface of the earth, by the action of this power upon it, in one minute, would be equal to the number $16\frac{1}{12}$ multiplied twice into the number 60; that is, to 58050. But how faſt bodies fall near the ſurface of the earth may be known by the pendulum; and by the exacteſt experiments, they are found to deſcend the ſpace of $16\frac{1}{12}$ feet in one ſecond; and the ſpaces deſcribed by falling bodies being in the duplicate proportion of the times of their fall, the number of feet a body would deſcribe in its fall near the ſurface of the earth in one minute of time, would be equal to $16\frac{1}{12}$ twice multiplied by 60; the ſame as would be cauſed by the power which acts upon the moon.

In this computation the earth is ſuppoſed to be at reſt: but it would have been more exact to ſuppoſe it to move, as well as the moon, about their common centre of gravity. The action of the ſun upon the moon is alſo here neglected; and Newton ſhews, if you take in both theſe conſiderations, the preſent computation will beſt agree to a ſomewhat greater diſtance of the moon and earth, viz. to $60\frac{1}{2}$ ſemidiameters of the latter, which diſtance is more conformable to aſtronomical obſervations; and theſe computations afford an additional proof that the action of the earth obſerves the ſame proportion to the diſtance which is here contended for. Hence it follows, that the power which retains the moon in her orbit is the ſame as that which cauſes bodies near the ſurface of the earth to gravitate; for ſince the power by which the earth acts on the moon will cauſe bodies near the ſurface of it to deſcend with all the velocity they are found to do, it is certain no other power can act upon them beſides; becauſe, if it did, they muſt of neceſſity deſcend ſwifter; and it is at length very evident, that the power in the earth which we call *gravity* extends up to the moon, and decreaſes in the duplicate proportion of the increaſe of the diſtance from the earth.

If to the motion of the ſatellite whereby it would be carried round its primary at reſt, we ſuperadd the ſame motion, both in regard to the velocity and direction, as the primary itſelf has, it will deſcribe about the primary the ſame orbit with as great regularity as if the primary had been indeed at reſt. This proceeds from the law of motion, which makes a body near the ſurface of the earth deſcend perpendicularly, though the earth be in ſo ſwift a motion, that if the falling body did not partake of it, its deſcent would be remarkably oblique. From this we learn, that if the ſatellite moved about its primary with perfect regularity, beſides its motion about the primary it would have the ſame progreſſive velocity with which the primary is carried about the ſun, in a direction parallel to that impulſe of its primary. And, on the contrary, the want of either of theſe, in particular of the impulſe towards the ſun, will occaſion great inequalities in the motion of the ſecondary planet. The inequalities which would ariſe from the abſence of this impulſe towards the ſun are ſo great, that by the regularity which appears in the motion of the ſecondary planets, it is proved, that the ſun communicates to them the ſame velocity by its action as it gives to their primary at the ſame diſtance. For Newton informs us, that upon examination he found, that if any of the ſatellites of Jupiter were attracted by the ſun more or leſs than Jupiter himſelf at the ſame diſtance, the orbit of that ſatellite, inſtead of being concentrical to Jupiter, would have its centre at a greater or leſs diſtance than the centre of Jupiter from the ſun, nearly in the ſubduplicate proportion of the difference between the ſun's action upon the ſatellite and upon Jupiter.

Therefore, if any ſatellite were attracted by the ſun but one hundredth part more or leſs than Jupiter is at the ſame diſtance, the orbit of that ſatellite would be diſtant from the centre of Jupiter no leſs than a fifth part of the outermoſt ſatellite from Jupiter; which is almoſt the whole diſtance of the innermoſt ſatellite. By the like argument, the ſatellites of Saturn gravitate towards the ſun as much as Saturn itſelf at the ſame diſtance, and the moon as much as the earth.

Thus the ſun acts upon the ſecondary planets as much as upon the primaries at the ſame diſtance: but the action of the ſun upon bodies is reciprocally in the duplicate proportion of the diſtance; therefore the ſecondary planets being ſometimes nearer to the ſun than to the primary, and ſometimes more remote, they are not always acted upon in the ſame degree with their primary, but when nearer to the ſun are attracted more, and when farther off are attracted leſs. Hence riſe various inequalities in the motion of the ſecondary planets. Some of theſe inequalities, however, would take place, though the moon, if undiſturbed by the ſun, had moved in a circle concentrical to the earth, and in the plane of the earth's motion; others depend on the elliptical figure and oblique ſituation of the moon's orbit. One of the former is, that the moon does not deſcribe equal ſpaces in equal times, but is continually accelerated as ſhe paſſes from the quarter to the new or full, and is retarded again by the like degrees in returning from the new and full to the next quarter: but here we conſider not ſo much the abſolute as the apparent motions of the moon with reſpect to us. Theſe two may be diſtinguiſhed in the following manner. Let S, in fig. 15, repreſent the ſun, A the earth moving in its orbit BC, DEFG the moon's orbit, and H the place of the moon in her orbit. Suppoſe the earth to have moved from A to I. Becauſe it has been ſhown that the moon partakes of all the progreſſive motion of the earth, and likewiſe that the ſun attracts both the earth and moon equally when they are at the ſame diſtance from it, or that the mean action of the ſun upon the moon is equal to its action upon the earth; we muſt therefore conſider the moon as carrying about with it the moon's orbit: ſo that when the earth is removed from A to I, the moon's orbit ſhall likewiſe be removed from its former ſituation into that denoted by KLMN. But now the earth being in I, if the moon were found in O, ſo that OI ſhould be parallel to HA, though the moon would really have moved from H to O, yet it would not have appeared to a ſpectator upon the earth to have moved at all, becauſe the earth has moved as much as itſelf; ſo that the moon would ſtill appear in the ſame place with reſpect to the fixed ſtars. But if the moon be obſerved in P, it will then appear to have moved, its apparent motion being meaſured by the angle under OIP. And if the angle under PIS be leſs than the angle under HAS, the moon will have approached nearer its conjunction with the ſun. Now, to explain particularly the inequality of the moon's motion already mentioned, let S, in fig. 16, repreſent the ſun, A the earth, BCDE the moon's orbit, C the place of the moon when in the latter quarter. Here it will be nearly at the ſame diſtance from the ſun as the earth is. In this caſe, therefore, they will be both equally attracted, the earth in the direction AS, and the moon in that of CS. Whence, as the earth, in moving round the ſun, is continually deſcending towards it, ſo the moon in this ſituation muſt in any equal portion of time deſcend as much; and therefore the poſition of the line AC in reſpect of AS, and the change which the moon's motion produces in the angle CAS, will not be altered by the ſun: but as ſoon as the moon is advanced from the quarter toward the new or conjunction, ſuppoſe to G, the action of the ſun upon it will have a different effect. Were the ſun's action upon the moon here to be applied in the direction GH parallel to AS, if its action on the moon were equal to its action on the earth, no change would be wrought by the ſun on the apparent motion of the moon round the earth. But the moon receiving a greater impulſe in G than the earth receives in A, were the ſun to act in the direction GH, yet it would accelerate the deſcription of the ſpace DAG, and cauſe the angle under GAD to decreaſe faſter than it otherwiſe would. The ſun's action will have this effect upon account of the obliquity of its direction to that in which the earth attracts the moon. For the moon by this means is drawn by two forces oblique to one another: one drawing from G towards A, the other from G towards H; therefore the moon muſt neceſſarily be impelled towards D. Again, becauſe the ſun does not act in the direction GH parallel to SA, but in the direction GS oblique to it, the ſun's action on the moon will, by reaſon of this obliquity, farther contribute to the moon's acceleration. Suppoſe the earth, in any ſhort ſpace of time, would have moved from A to I, if not attracted by the ſun, the point I being in the ſtraight line CE, which touches the earth's orbit in A. Suppoſe the moon in the ſame time would have moved in her orbit from G to K, and beſides have partook of all the progreſſive motion of the earth. Then, if KL be drawn parallel to AI, and taken equal to it, the moon, if not attracted to the ſun, would be found in L. But the earth, by the ſun's action, is removed from I. Suppoſe it were moved down to M in the line IMN parallel to SA, and if the moon were attracted but as much, and in the ſame direction as the earth is here ſuppoſed to be attracted, ſo as to have deſcended during the ſame time in the line LO parallel alſo to AS, down as far as P, till LP were equal to IM, the angle under PMN would be equal to that under LIN; that is, the moon will appear advanced as much farther forward as if neither it nor the earth had been ſubject to the ſun's action. But this is on the ſuppoſition that the actions of the ſun upon the earth and moon are equal; whereas the moon being acted upon more than the earth, did the ſun's action draw the moon in the line LO parallel to AS, it would draw it down ſo far as to make LP greater than IM, whereby the angle under PMN will be rendered greater than that under LIN. But, moreover, as the ſun draws the earth in a direction oblique to IN, the earth will be found in its orbit ſomewhat ſhort of the point M. However, the moon is attracted by the ſun ſtill more out of the line LO than the earth is out of the line IN; therefore this obliquity of the ſun's action will yet farther diminiſh the angle under PMN. Thus the moon at the point G receives an impulſe from the ſun whereby her motion is accelerated; and the ſun producing this effect in every place between the quarter and the conjunction, the moon will move from the quarter with a motion continually more and more accelerated; and therefore, by acquiring from time to time an additional degree of velocity in its orbit, the ſpaces which are deſcribed in equal times by the line drawn from the earth to the moon will not be every where equal, but thoſe toward the conjunction will be greater than thoſe toward the quarter. But in the moon's paſſage from the conjuction D to the next quarter, the ſun's action will again retard the moon, till, at the next quarter at E, it be reſtored to the firſt velocity which it had in C. When the moon moves from E to the full, or oppoſition to the ſun in B, it is again accelerated; the deficiency of the ſun's action on the moon from what it has upon the earth producing here the ſame effect as before the exceſs of its action.

Let us now conſider the moon in Q as moving from E towards B. Here, if ſhe were attracted by the ſun in a direction parallel to AS, yet being acted on leſs than the earth, as the latter deſcends towards the ſun, the moon will in ſome meaſure be left behind. Therefore, QF being drawn parallel to SB, a ſpectator on the earth would ſee the moon move as if

attracted from the point Q in the direction QF, with a degree of force equal to that whereby the sun's action on the moon falls short of its action on the earth. But the obliquity of the sun's action has here also an effect. In the time the earth would have moved from A to I without the influence of the sun, let the moon have moved in its orbit from Q to R. Drawing, therefore, RT parallel and equal to AI, the moon, by the motion of its orbit, if not attracted by the sun, must be found in T; and therefore, if attracted in a direction parallel to SA, would be in the line TV parallel to AS; suppose in W. But the moon in Q being farther off the sun than the earth, it will be less attracted; that is, TW will be less than IM; and if the line SM be prolonged towards X, the angle under XMW will be less than XIT. Thus, by the sun's action, the moon's passage from the quarter to the full would be accelerated, if the sun were to act on the earth and moon in a direction parallel to AS; and the obliquity of the sun's action will still increase this acceleration: for the action of the sun on the moon is oblique to the line SA the whole time of the moon's passage from Q to T, and will carry her out of the line TV towards the earth. Here we suppose the time of the moon's passage from Q to T so short, that it shall not pass beyond the line SA. The earth will also come a little short of the line IN, as was already mentioned; and from these causes the angle under XMW will be still farther lessened. The moon, in passing from the opposition B to the next quarter, will be retarded again by the same degrees as it was accelerated before its appulse to the opposition; and thus the moon, by the sun's action upon it, is twice accelerated and twice restored to its first velocity every circuit it makes round the earth; and this inequality of the moon's motion about the earth is called by astronomers its variation.

The next effect of the sun upon the moon is, that it gives the orbit of the latter in the quarters a greater degree of curvature than it would receive from the earth alone; and, on the contrary, in the conjunction and opposition the orbit is less inflected. When the moon is in the conjunction with the sun at D, the latter attracting her more forcibly than it does the earth, the moon is by that means impelled less to the earth than otherwise it would be, and thus the orbit less incurvated: again, when the moon is in the opposition in B farther removed from the sun than the earth is, though the earth and moon are both drawn by the sun towards itself out of the place they would otherwise move into, yet the moon descends with less velocity than the earth: insomuch that, in any given space of time from its passing the point of opposition, it will have less approached the earth than otherwise it would have done; that is, its orbit, in respect to the earth, will approach nearer to a straight line. Lastly, when the motion is in the quarter in E, and equally distant from the sun as the earth, it was before observed, that they would both descend with equal velocity towards the sun, so as to make no change in the angle EAS; but the length of the line EA must necessarily be shortened. Therefore the moon, in moving from E toward the conjunction with the sun, will be impelled more toward the earth by the sun's action than it would have been by the earth alone, if neither the earth nor the moon had been acted upon by the sun; so that, by this additional impulse, the orbit is rendered more curve than it otherwise should be. The same effect will also be produced in the other quarter.

A third effect of the sun's action is, that though the moon undisturbed by the sun might move in a circle, having the earth for its centre, by the sun's action, if the earth were to be in the very middle or centre of the moon's orbit, the moon would be nearer the earth at the new and full than in the quarters. This may at first appear somewhat difficult to be understood, that the moon should come nearest to the earth where it is least attracted by it: yet, upon a little consideration, it will evidently appear to flow from that very cause, because her orbit, in the conjunction and opposition, is rendered less curve; for the less curve the orbit is, the less will the moon have descended from the place it would move into without the action of the earth. Now, if the moon were to move from any place without further disturbance from that action, since it would proceed on the line touching the orbit in that place it would continually recede from the earth; and therefore, if the power of the earth upon the moon be sufficient to retain it at the same distance, this diminution of that power will cause the distance to increase, though in a less degree. But, on the other hand, in the quarters, the moon being pressed in a less degree towards the earth than by the earth's single action will be made to approach it; so that, in passing from the conjunction or opposition to the quarters, the moon ascends from the earth; and in passing from the quarters to the opposition or conjunction, it descends again, becoming nearer in these last mentioned places than in the other.

All these inequalities are different in degree as the sun is more or less distant from the earth; being greatest when the earth is in its perihelion, and smallest when it is in its aphelion: for in the quarters, the nearer the moon is to the sun, the greater is the addition to the earth's action upon it by the power of the sun; and in the conjunction and opposition, the difference between the sun's action upon the earth and upon the moon is likewise so much the greater. This difference in the distance between the earth and the sun produces a further effect upon the moon's motion; causing her orbit to dilate when less remote from the sun, and become greater than when at a farther distance: for it is proved by Newton, that the action of the sun by which it diminishes the earth's power over the moon in the conjunction or opposition, is about twice as great as the addition to the earth's action by the sun in the quarters; so that upon the whole, the power of the earth on the moon is diminished by the sun; and therefore is most diminished when that action is strongest. But as the earth by its approach to the sun has its influence lessened, the moon, being less attracted, will gradually recede from the earth; and as the earth, in its recess from the sun, recovers by degrees its former power, the orbit of the moon must again contract. Two consequences follow from hence, viz. that the moon will be more remote from the earth when the latter is nearest the sun, and also will take up a longer time in performing its revolution through the dilated orbit than through the more contracted.

These irregularities would be produced if the moon, without being acted upon unequally by the sun, should describe a perfect circle about the earth and in the plane of its motion; but though neither of these circumstances take place, yet the above-mentioned inequalities occur only with some little variation with regard to the degree of them: but some others are observed to take place from the moon's motion being performed in the manner already described. For, as the moon describes an ellipsis, having the earth in one of its foci, this curve will be subjected to various changes, neither preserving constantly the same figure nor position; and because the plane of this ellipsis is not the same with that of the earth's orbit, it follows, that the former will continually change; so that neither the inclination of the two planes towards each other, nor the line in which they intersect, will remain for any length of time unaltered. The various forces by which its motion is disturbed, and the changes which take place in its orbit, may be investigated in the following manner:

Fig. 17. Let CADB be the moon's orbit, T the earth, S the sun, P the moon; make SK = ST; and let SK : SL :: SP^2 : SK^2. Then if SK or ST represent the sun's force at T, SL will represent his force at P. Draw LM parallel to PT; di-

vide the force LS into the two forces LM acting parallel to PT, and MS acting parallel to TS. But the force LM, and the part TM disturb the moon's motion. The force LM in its mean quantity is equal to PT, and by so much the force of the earth upon the moon is increased. Also TM in its mean quantity is equal to 3PK, acting in direction PN parallel and equal to TS; and this force MT draws the moon out of her orbit. Let P, p be the periodical times of the earth and moon; then the sun's centripetal force at T (ST) : the earth's centripetal force at P : : $\frac{ST}{PP} : \frac{PT}{pp}$; therefore the earth's centripetal force at P $= \frac{PT \times PP}{pp}$. And this is to the additional force PT : : $\frac{PT \times PP}{pp}$: PT : : PP : pp. That is, the force by which the moon is retained in her orbit : is to the increase of centripetal force by the sun's action : : PP : pp : : 178.725 : 1. Therefore the increase of the moon's centripetal force is $\frac{1}{178.725}$ of that force.

Also force PT : force 3PK or PL : : PT : 3PK. Therefore, ex æquo, the force by which the moon is retained in her orbit : disturbing force PL or TM : : PT $\times$ 178.725 : 3PK. Therefore the disturbing force TM $= \frac{3PK}{PT \times 178.725} \times$ earth's centripetal force on the moon $= 3a$ the sine of the moon's distance from the quadratures $\times$ earth's centripetal force, divided by 178.725 $\times$ radius.

Let C, c *be the centripetal forces of the sun and earth,* S $=$ *sine of the moon's distance from the quadrature, radius* $= r$. *Then the additional force* (PT) $= \frac{c}{178.725}$. *And the disturbing force* (TM) $= \frac{3sc}{178.725r}$.

Produce TP, *and make* PR $=$ PL *or* TM, *and draw* RQ *perpendicular to* TQ. *Then* QR *is the force that accelerates the moon, and* PQ *is the diminution of its centripetal force.*

For the force PR is divided into the two forces, PQ and QR, of which PQ acting towards Q diminishes the moon's centripetal force; and QR being parallel to the tangent at P, accelerates the moon at P.

There are therefore four points in the moon's orbit, each 35° 16′ *from the quadratures, where the moon's disturbing force makes no alteration in the earth's central force.*

For the triangles PKT and PQR are similar, whence PK : PT : : PQ (PT) : PR (3PK); therefore $3PK^2 = PT^2$, or $3ss = rr$, whence $s = \sqrt{\frac{rr}{3}} =$ S.35° 16′. And when PQ $=$ PT, the diminution of the force is equal to the addition, which makes no alteration.

The mean force PT *is* $= \frac{1}{643410}$ *of the force of gravity at the earth.*

For the force of gravity is 3600 times greater than the force at P.

The whole increase of the centripetal force at P *is* $\frac{c}{178.725} \times 1 - \frac{3ss}{rr}$

For rad $(r) : s : :$ PT $\left(\frac{c}{178.725}\right)$: PK $= \frac{cs}{178.725r}$. And PR $=$ 3PK $= \frac{3cs}{178.725r}$. And rad (r) : PR $\left(\frac{3cs}{178.725r}\right)$: : S.R (s) : PQ $= \frac{3css}{178.725rr}$. And PT $-$ PQ $=$ whole additional force $= \frac{1 - \frac{3ss}{rr}}{178.725} c$.

If A $=$ *sine of twice the moon's distance from the quadratures; then the force* QR, *accelerating or retarding the moon's motion in its orbit, is* $\frac{3c}{178.725} \times \frac{A}{2r}$.

Let $z =$ S.QPR or KPT $=$ cos. PTK; then rad (r) : RP $\left(\frac{3cs}{178.725r}\right)$: : S.QPR (z) : QR $= \frac{3c}{178.725rr} \times sz =$ (by trigonometry) $\frac{3c}{178.725} \times \frac{A}{2r}$.

Hence the moon is accelerated in the quadrants CA, DB; *and retarded in the quadrants* AD, BC; *and the force which accelerates or retards the moon's motion, is greatest in the octants.*

For it is greatest when A is greatest, that is when 2CP is 90 degrees, or CP $=$ 45°.

The disturbing force TM, *in the syziges* A *and* B, *is* 2PT. *And therefore the earth's force upon the moon in the syziges, is twice as much diminished, as it is increased in the quadratures.*

The moon's orbit is more flat in the syziges, and more curve in the quadratures; and therefore she goes further from the earth in the quadratures.

For the orbit will be more curve where the central force is greater, that is in the quadratures.

The motion of the moon's nodes, supposing her orbit to be nearly circular, may be thus found.

Fig. 18. Let AqBQ be the moon's orbit, T the earth, P the moon, SAB the line of the apsides, Q, q the quadratures, mNn the line of the nodes. PK, PH, AZ perpendiculars upon TQ and Nn. The force by which the moon is drawn out of her orbit, has been found to be $\frac{3s}{178.725r} c = \frac{s}{59.575r} c$. Let PM be the arch which the moon describes in any small time, and ML a small line, which the moon describes in the same time by the force $\frac{s}{59.575r} c$, as this force is directed to the sun, the line ML will be parallel to TS. As ML is the distance that the moon is drawn from the arch PM, by the said accelerative force; 2ML will be the uniform motion it has acquired in that time, by the said force. Let MP be continued back to m, in the moon's orbit, to cut the line of the nodes TN in m. Now since ML is parallel to the ecliptic; a plane drawn through ML and MPm, will cut the ecliptic in a line ml, which will be parallel to ML; therefore draw LPl to cut ml in l, and the triangles PML and Pml are similar, and therefore $ml = \frac{mP \times ML}{MP}$; but since MP is given, and ML is as the force 3PK, therefore ml is as mP $\times$ PK. Now when the moon was at P, the line of the nodes was at Tm, where the plane of the moon's orbit TMP cuts the ecliptic. But when the moon comes to L (instead of M), the plane of her orbit will then be in the plane TLP; and the line of the nodes at Tl, where the plane TLPl cuts the ecliptic. Therefore the angular motion of the nodes generated in that time will be $=$ angle mTl. But the angle mTl is as $\frac{ml}{Tm} \times$ sine of Tml or

STN; that is, as $\frac{mP \times PK}{mT} \times AZ$; that is, (becauſe by ſimilar triangles $\frac{mP}{mT} = \frac{PH}{PT}$) as $\frac{PH \times PK}{PT} \times AZ$, that is, (becauſe PT is given) as $PH \times PK \times AZ$.

The line ML is to the verſed ſine of the arch PM, as the forces that produce them; that is, as $\frac{s}{59{\cdot}575r} c$ to c, or as s to $59{\cdot}575r$. That is $ML : \frac{PM^2}{2MT} : : s : 59{\cdot}575r$; therefore $ML = \frac{PM^2}{2MT} \times \frac{s}{59{\cdot}575r}$. When P falls upon A, or the moon is in the ſyzigy; then $s = r$, and the angle PML is a right angle; therefore in the triangle PML, PM : ML $\left(\frac{PM^2}{2MT \times 59{\cdot}575}\right)$: : radius : S.LPM or $mPl = \frac{PM}{2MT \times 59{\cdot}575}$. And if N be at Q, or the nodes in the quadratures, and P at A; then PM and PL being parallel to the ecliptic, m and l will be at an infinite diſtance, and then the angle mTl will be equal to mPl, whoſe ſine is $\frac{PM}{2MT \times 59{\cdot}575}$. And the angle mTl anſwering to 2ML is the motion of the node, whoſe ſine is $\frac{PM}{MT \times 59{\cdot}575}$. Suppoſe PM to be deſcribed in an hour, then PM or the mean horary motion is $32' 56'' \frac{1}{2}$, whoſe ſine, as it differs inſenſibly from the arch, we ſhall have the arch $= \frac{32' 56'' \frac{1}{2}}{59{\cdot}575}$ (putting PM $=$ 1) $= 33''.18$, where all the angles PTK, PTN and STN are right angles. And in other caſes, the horary motion of the node will be to $33''.18$, as the product of the ſines of the three angles PTK, PTN and STN, to the radius cube; and the nodes are regreſſive when all the ſines are poſitive. But if any ſine changes to be negative, the nodes will be progreſſive.

Hence the nodes are progreſſive, when the moon is between either quadrature, and the node neareſt that quadrature; otherwiſe they are regreſſive. And by the exceſs of the regreſs above the progreſs, they are in the whole moved forward.

For in the arches QA*n* and *q*BN; PK and PH are both affirmative or both negative. And in the arches NQ, *nq*; only one is negative, the other being affirmative.

If it was not for the ſun's perturbating force, the moon would always deſcribe the ſame ellipſis, and the tranſverſe axis and eccentricity of the orbit would remain unaltered. But ſince the perturbating force of the ſun always acts upon her more or leſs, and cauſes all the irregularities of her motion; it is evident that all theſe effects will be the greater as that force is the greater. But when the tranſverſe axis or line of the apſides is in the ſyziges, then the perturbating force TM or 3PK is the greateſt poſſible, by which means the moon is removed farther from the earth, and conſequently the tranſverſe axis is lengthened, and the eccentricity becomes greater. And the contrary happens when the tranſverſe is in the quadratures; for by its being in the quadratures, the force LM is greater; and the whole centripetal force towards T being greater, the body will be drawn nearer the earth and deſcribe a leſs orbit, or one leſs eccentric than before. Therefore when the apſides are in the quadratures, the eccentricity is leſs; and when they are in the ſyziges, it is greater. But how much it is greater or leſs depends upon the mean eccentricity; and that depends upon obſervation.

Hence the eccentricity continually increaſes, as the apſides move from the quadratures to the ſyziges; and decreaſes from the ſyziges to the quadratures. And the eccentricity of the orbit continually increaſes, as the moon paſſes from the quadratures to the ſyziges; and decreaſes, in paſſing from the ſyziges to the quadratures.

For the perturbating force increaſes from the quadratures to the ſyziges, and decreaſes from the ſyziges to the quadratures.

§ 4. *Of the Nature and Motions of the Comets.*

That theſe bodies are not meteors in our air is manifeſt, becauſe they riſe and ſet in the ſame manner as the moon and ſtars. The aſtronomers had gone ſo far in their inquiries concerning them, as to prove by their obſervations that they moved in the celeſtial ſpaces beyond the moon; but they had no notion of the path which they deſcribed. Now the power of the ſun being reciprocally in the duplicate proportion of the diſtance, every body acted upon by him muſt either fall directly down, or move about him in one of the conic ſections; viz. either the ellipſis, parabola, or hyperbola. If a body which deſcends towards the ſun as low as the orbit of any planet, move with a ſwifter motion than the planet, it will deſcribe an orbit of a more oblong figure than that of the planet, and have at leaſt a longer axis. The velocity of the body may be ſo great, that it ſhall move in a parabola, ſo that having once paſſed the ſun, it ſhall aſcend for ever without returning, though the ſun will ſtill continue in the focus of that parabola; and with a velocity ſtill greater, they will move in an hyperbola. It is, however, moſt probable, that the comets move in very eccentric ellipſes; and hence thoſe bodies are ſometimes found at a moderate diſtance from the ſun, and appear within the planetary regions; at other times they aſcend to vaſt diſtances, far beyond the orbit of Saturn, and become inviſible.

As the great eccentricity of the orbits of comets renders them very liable to be diſturbed by the attraction of the planets and other comets, it is probably to prevent too great diſturbances from theſe, that while all the planets revolve nearly in the ſame plane, the comets are diſpoſed in very different ones, and diſpoſed all over the heavens; that when in their greateſt diſtance from the ſun, and moving ſloweſt, they might be removed as far as poſſible out of the reach of each other's action. The ſame end is likewiſe anſwered in theſe comets, which by moving ſloweſt in the aphelion or remoteſt diſtance from the ſun, deſcend neareſt to it by placing their aphelion at the greateſt height from the ſun.

§ 5. *Of the Bodies of the Sun and Planets, with the Method of computing the Quantity of Matter they contain.*

The primary planets and comets are retained in their orbits by a power directed towards the ſun, and the ſecondaries are alſo retained by a power of the like kind directed to the centre of their primaries. The ſame power is diffuſed through their whole ſubſtance, and inherent in every particle; and this is proved by ſhewing that each of the heavenly bodies attracts the reſt and other bodies with ſuch different degrees of force, as that the force of the ſame attracting body is exerted on others exactly in proportion to the quantity of matter contained in the body attracted. The firſt proof of this is from experiments made on bodies here on earth. Pendulums vibrate by the ſame power which makes heavy bodies fall to the ground; but if the ball of any pendulum of the ſame length with another were more or leſs attracted in proportion to the quantity of ſolid matter it contains, that pendulum muſt then vibrate

faſter or ſlower than the other. Now the vibrations of pendulums continue for a long time, and the number of vibrations they make may be eaſily determined without any ſuſpicion of error; and Newton aſſures us, that he examined ſeveral ſubſtances, as gold, ſilver, lead, glaſs, ſand, common ſalt, wood, water, and wheat; in all which he found not the leaſt deviation from the theory, though he made the experiment in ſuch a manner, that in bodies of the ſame weight, a difference in the quantity of their matter leſs than the thouſandth part of the whole would have diſcovered itſelf. It appears, therefore, that all bodies are made to deſcend here by the power of gravity with the ſame degree of ſwiftneſs. This deſcent has been determined at 16½ feet in a ſecond from the beginning of their fall. If any terreſtrial body could be conveyed as high up as the moon, it would deſcend with the very ſame degree of velocity with which the moon is attracted towards the earth; and therefore the power of the earth upon the moon bears the ſame proportion it would have upon thoſe bodies at the ſame diſtance as the quantity of matter in the moon bears to the quantity in thoſe bodies. Thus the aſſertion is proved in the earth, that its power on every body it attracts is, at the ſame diſtance from the earth, proportional to the quantity of ſolid matter in the body acted upon. As to the ſun, the power of his action upon the ſame primary planet is reciprocally in the duplicate proportion of its diſtance; and that his power decreaſes throughout in the ſame proportion, is teſtified by the motion of the planets traverſing the whole planetary region. This proves, that if any planet was removed from the ſun to any diſtance whatever, the degree of its acceleration towards the ſun would yet be reciprocally in the duplicate proportion of their diſtance. But the degree of acceleration given to the planets by the ſun is reciprocally in the duplicate proportion of their reſpective diſtances; all which, compared together, puts it out of doubt, that the power of the ſun upon any planet removed into the place of any other, would give it the ſame velocity of deſcent as it gives that other; and conſequently that the ſun's action upon different planets at the ſame diſtance would be proportionable to the quantity of matter in each. The ſun attracts the primary planets and their reſpective ſecondaries, when at the ſame diſtance, in ſuch a manner as to communicate to both the ſame degree of velocity; and therefore the force wherewith the ſun acts on the ſecondary planet bears the ſame proportion to the force wherewith it attracts the primary, as the quantity of matter in the ſecondary planet bears to the quantity of matter in the primary. This property therefore is found in the ſun with regard to both kinds of planets; ſo that he poſſeſſes the ſame quality found in the earth, viz. that of acting on bodies with a degree of force proportional to the quantity of matter they contain.

This point being granted, it is hardly to be ſuppoſed that the power of attraction with which the other planets are endowed, ſhould be different from that of the earth, if we conſider the ſimilitude of theſe bodies: and hence it follows, that this attraction extends itſelf to every particle of matter in the attracted body, and that no portion of matter is exempted from the influence of theſe bodies to which this attractive power has been proved to belong.

Here we may remark, that the attractive power both of the ſun and planets appears to be the ſame in all: for it acts in each in the ſame proportion to the diſtance, and in the ſame manner acts alike upon every particle of matter. This power, therefore, in the ſun and planets, is not of a different nature from the power of gravity in the earth: and this enables us to prove, that the attracting power lodged in the ſun and planets belongs likewiſe to every part of them; and that their reſpective powers upon the ſame body are proportional to the quantity of matter of which they are compoſed; for inſtance, that the force with which the earth attracts the moon, is to the force with which the ſun would attract it at the ſame diſtance, as the quantity of ſolid matter in the earth is to that in the ſun.

The law that action is equal to reaction, holds good in attractive powers as well as in any other. The moſt remarkable force of this kind with which we are acquainted, next to that of gravity, is the attraction the loadſtone has for iron. Now if a loadſtone and piece of iron were both made to ſwim on water, both of them would move towards each other, and thus the attraction would be ſhewn to be mutual; and when they meet, they will mutually ſtop each other: which ſhews that their velocities are reciprocally proportioned to the quantities of ſolid matter in each; and that by the ſtone's attracting the iron, it receives as much motion itſelf, in the ſtrict philoſophic ſenſe of the word, as it communicates to the iron: for it is proved from experiments on the percuſſion of bodies, that if two meet with velocities reciprocally proportional to their reſpective bodies, they will be ſtopped by the concourſe, unleſs they meet with ſome other velocity, or their elaſticity put them into freſh motion. From this mutual action of the ſun and planets upon each other, it follows, as has been already mentioned, that they both revolve about their common centre of gravity. Thus let A (in fig. 19.) repreſent the ſun, B a planet, and C their common centre of gravity. If theſe bodies were once at reſt, they would directly approach each other by their mutual attraction, and that with ſuch velocities, that their common centre of gravity would remain at reſt, and they would meet in that point. Were the planet B to receive an impulſe, as in the direction DE, this would prevent the two bodies from falling together; but their common centre of gravity would be put into motion in the direction of the line CF, equidiſtant from BE. In this caſe, the ſun and planet would deſcribe round their common centre of gravity ſimilar orbits, while that centre would proceed with an uniform velocity in the line CF, and ſo the ſyſtem of the two bodies would move on with the centre of gravity without end. In order to keep the ſyſtem in the ſame place, it is neceſſary, that when the planet received its impulſe in the direction BE, the ſun ſhould receive ſuch another the contrary way, ſo as to keep the centre of gravity C without any motion, in which caſe it would always remain fixed.

Thus the action between the ſun and planets is mutual. The power which acts between the ſun and primary planets is altogether of the ſame nature with that which acts between the ſecondary planets and their primaries, or which acts between the earth and bodies near its ſurface. In different planets the force of the ſun's action upon each at the ſame diſtance would be proportional to the quantity of ſolid matter contained in the planet: therefore the reaction of the planet on the ſun at the ſame diſtance, or the motion which he would receive from each planet, would alſo be proportional to the quantity of matter in the planet; that is, theſe planets, at the ſame diſtance, would act on the ſame body, with degrees of ſtrength proportioned to the quantity of ſolid matter contained in each.

From the principles above demonſtrated, it is proved by Newton, that each of the particles out of which the ſun, moon, and planets are formed, exert their power of gravitation by the ſame law; and in the ſame proportion to the diſtance, as the great bodies they compoſe. For this purpoſe, he firſt demonſtrates, that if a globe were compounded of particles which will attract the particles of any other body reciprocally in the duplicate proportion of their diſtances, the whole globe will attract the ſame in the reciprocal duplicate proportion of their diſtances from the centre of the globe, provided it be of equal

denſity throughout; and if a globe acts upon diſtant bodies by the law juſt now ſpecified, and the power of the globe be derived from its being compoſed of attracting particles, each of theſe will attract after the ſame proportion. For the globe is ſuppoſed to act upon the particles of a body without it conſtantly in the reciprocal duplicate proportion of their diſtances from the centre; and therefore, at the ſame diſtance from the globe, on which ſide ſoever the body be placed, the globe will act equally upon it. Now, if the particles of which the globe is compoſed acted upon thoſe without in the reciprocal duplicate proportion of their diſtances, the whole globe would act upon them in the ſame manner as it does: if the particles of the globe have not all of them that property, ſome muſt act ſtronger than in that proportion, whilſt others act weaker: and if this be the condition of the globe, it is plain, that when the body attracted is in ſuch a ſituation in reſpect of the globe, that the greater number of the ſtrongeſt particles are neareſt to it, the body will be more forcibly attracted than when, by turning the globe about, the greater quantity of weak particles ſhould be neareſt, though the diſtance of the body ſhould remain the ſame from the centre of the globe; which is contrary to what was at firſt remarked, that the globe acts equally on all ſides. If all the particles of one globe attract all the particles of another in the proportion already mentioned, the attracting globe will act upon the other in the ſame proportion to the diſtance between the centre of the globe which attracts, and the centre of that which is attracted: and the proportion holds true, though either or both of the globes be compoſed of diſſimilar parts, ſome rarer, and ſome more denſe; provided only, that all the parts in the ſame globe, equally diſtant from the centre, be homogeneous, and likewiſe if both globes attract each other.

Thus has Newton ſhown that this power in the great bodies of the univerſe is derived from the ſame being lodged in every particle of the matter which compoſes them; and conſequently that it is no leſs than univerſal in matter, though the power be too minute to produce any viſible effects on the ſmall bodies with which we are converſant, by their action on one another. In the fixed ſtars indeed we have no particular proof that they have this power, as we find no appearance to demonſtrate that they either act or are acted upon by it. But ſince this power is found to belong to all bodies whereon we can make obſervation, and we find that it is not to be altered by any change in the ſhape of bodies, but accompanies them in every form, without diminution, remaining ever proportional to the quantity of ſolid matter in each; ſuch a power muſt without doubt univerſally belong to matter.

By the times in which theſe ſatellites perform their revolutions, compared with their diſtances from their reſpective primaries, the proportion between the power with which one primary attracts his ſatellites and the force with which any other attracts his, will be known; and the proportion of the power with which any planet attracts his ſecondary to the power with which it attracts a body at its ſurface, is found by comparing the diſtance of the ſecondary planet from the centre of the primary to the diſtance of the primary planet's ſurface from the ſame; and from hence is deduced the proportion between the power of gravity upon the ſurface of one planet to the gravity upon the ſurface of another. By the like method of comparing the periodical time of a primary planet about the ſun with the revolution of a ſatellite about its primary, may be found the proportion of gravity or of the weight of any body on the ſurface of the ſun, to the gravity or to the weight of the ſame body upon the ſurface of the planet which carries about the ſatellite. Thus it is found, that the weight of any body on the ſurface of the Sun is about 23 times as great as on the ſurface of the Earth; about 10 times as great as on the ſurface of Jupiter; and near 19 times as great as on Saturn. The quantity of matter contained in each of theſe bodies is proportional to the power it has upon a body at a given diſtance. Thus the ſun contains 1067 times as much matter as Jupiter; Jupiter $158\frac{2}{3}$ times as much as the Earth, and $2\frac{2}{3}$ times as much as Saturn. The diameter of the Sun was calculated at 92 times, that of Jupiter about 9 times, and that of Saturn about 7 times as large as the diameter of the Earth.

By comparing the quantities of matter in each of theſe bodies with their reſpective magnitudes, their denſities are likewiſe eaſily diſcovered. Thus the Earth is found $4\frac{1}{2}$ times more denſe than Jupiter, while Saturn has only between two-thirds and three-fourths of the denſity of the latter, and the Sun has only one-fourth part of the denſity of the Earth. From all this Newton draws the following concluſions, viz. That the Sun is rarefied by its great heat; and of the three planets above-mentioned, the moſt denſe is that neareſt the Sun. The denſities of the planets Mars, Venus, Mercury, and Herſchel, as they are not attended with planets on which many obſervations have been made, cannot be aſcertained. From analogy, however, we ought to conclude, that the inferior planets, Venus and Mercury, are more denſe than the Earth, Mars more rare, and Herſchel much more rare, than any of the reſt.

Sect. V. *The Newtonian Doctrine applied more particularly to the Explication of the Celeſtial Phænomena.*

To a ſpectator placed in the ſun, all the planets would appear to deſcribe circles annually in the heavens; for though their motions are really elliptical, the eccentricity is ſo ſmall, that the difference between them and true circles is not eaſily perceived even on earth; and at the ſun, whether great or ſmall, it would entirely vaniſh. Theſe circles, which in ſuch a ſituation would appear to be annually deſcribed among the fixed ſtars, are called the *heliocentric circles* of the planets. To a ſpectator in the ſun, the comets, though moving in the moſt eccentric orbits, would alſo appear to deſcribe circles in the heavens: for though their orbits are in reality very long ellipſes, the planes of them extended to the heavens would mark a great circle of which the eye would be the centre; only, as the real motion is in an ellipſis, the body would appear to move much more ſlowly in ſome part of the circle than another, and to differ exceſſively in magnitude. To an inhabitant of any planet, however, the ſun appears to go round in its own heliocentric circle, or to deſcribe in the heavens that ſame curve which the planet would appear to do if ſeen from the ſun. Thus (fig. 20.) when the earth is at *a*, if we draw a line from *a* through the ſun at S, the point G, in the ſphere of the heavens where the line terminates, is the place where the ſun then appears to an inhabitant of the earth. In a month's time the earth will go from *a* to *b*; draw a line then through the ſun, and its extremity at H will point out his apparent place at that time. In like manner, if we draw lines from the earth in the twelve ſeveral ſituations in which it is repreſented for the twelve months of the year, the ſun's apparent place will be found as above, and ſo it would be found by a ſpectator placed in Venus or any other planet.

The heliocentric circle of the earth is called the *ecliptic*; becauſe eclipſes of the ſun or moon can only happen when the latter is in or near it. By ſome ancient writers, it has been called the circle of the ſun, or the oblique circle, becauſe it cuts the equator at oblique angles. It is alſo called by Ptolemy the circle which paſſes through the midſt of the animals; becauſe the twelve conſtellations through which it paſſes were anciently all repreſented by animals, or parts of them, though now the *balance* is introduced in place of the claws of the *ſcorpion*. For this reaſon, a belt taken in the concave ſphere of

the heavens about 10 degrees on each ſide of the ecliptic, is called the *zodiac*, from a Greek word which ſignifies an animal; and the conſtellations through which the ecliptic is drawn, are called the conſtellations of the zodiac.

Though the ſun apparently goes round the earth annually in the circle juſt mentioned, we cannot determine his place by mere inſpection, as we can do that of any of the other heavenly bodies; for the fixed ſtars are the only marks by which we can determine the place of any of the celeſtial bodies; and the ſuperior brightneſs of the ſun renders them totally inviſible, except in the time of a great eclipſe, when his light is for a time totally obſcured. But though we cannot know the place of the ſun directly, it is eaſily found from a knowledge of thoſe fixed ſtars which are oppoſite to him. Thus, in fig. 20, ſuppoſe it the time of the year in which the earth is at *g*, if we know that the point G is then diametrically oppoſite to the ſun, we know that A, its oppoſite, is the ſun's place, and conſequently, by finding the places throughout the year diametrically oppoſite to the ſun, as GHIKLMABCDEF, we may be aſſured that in theſe times the ſun's place was in the points ABCDEFGHIKLM. The point in the heavens diametrically oppoſite to the ſun may be known every night at twelve o'clock when the ſtars are viſible; for the ſtar which has an elevation above the horizon at that time equal to the ſun's depreſſion below it, is directly oppoſite to him.

The ecliptic being thus found, the latitude of the moon or any ſtar is counted by its diſtance from the ecliptic.

The latitude of any planet is either heliocentric or geocentric. The heliocentric latitude is its diſtance from the ecliptic as ſeen from the ſun, and its geocentric as ſeen from the earth. As the orbits of the planets are inclined in different angles to the ecliptic, the heliocentric latitude of any planet is almoſt always different from its geocentric latitude. Thus, let AB, fig. 21, be the orbit of the earth, CD the orbit of Venus, viewed with the eye in their common ſection, wherein they appear ſtraight lines; let E and F be two oppoſite points of the ecliptic; and ſuppoſe Venus to be in the point C. If ſhe were at that time viewed from the ſun S, ſhe would appear in the point of the heavens marked H, and her heliocentric latitude is then FH: but if viewed from the earth in B, ſhe will appear at *g*; and her geocentric is only F*g*.

The two points where the heliocentric circle of any planet cuts the ecliptic, are called its *nodes*; and that which the planet paſſes through as it goes into north latitude, is called the *aſcending* node, and is marked thus ☊; and the oppoſite to this is called the *deſcending* node, and is marked ☋. A line drawn from one node to the other is called the *line of the nodes of the planet*, which is the common ſection of the plane of the ecliptic, and that of the planet produced on each ſide to the fixed ſtars.

The zodiac is either *aſtral* or *local*. The aſtral is divided into 12 unequal parts, becauſe it contains 12 celeſtial conſtellations, ſome of which are larger than others. The local zodiac is divided into twelve equal parts, each containing 30 degrees, called *ſigns*. Theſe are counted from the point where the equator and ecliptic interſect each other at the time of the vernal equinox; and are denoted by particular marks, according to the apparent annual motion of the ſun. See fig. 22. A motion in the heavens in the order of theſe ſigns, as from Aries to Taurus, is ſaid to be a motion in *conſequence*; and ſuch are the true motions of all the planets, though their apparent motions are ſometimes contrary, and then they are ſaid to move in *antecedence*. The local zodiac is not always invariably the ſame as to the places of the ſeveral ſigns, though the whole always takes up the ſame place in the heaven, viz. 10 degrees on each ſide the ecliptic. The points where the celeſtial equator cuts the ecliptic, are found to have a motion in antecedence of about 50 ſeconds in a year. This change of place of the firſt point of the ecliptic, from whence the ſigns are counted, occaſions a like change in the ſigns themſelves; which, though ſcarce ſenſible for a few years, has now become very conſiderable. Thus, ſince aſtronomy was firſt cultivated among the Greeks, which is about 2000 years ago, the firſt point of the ecliptic is removed backward above a whole ſign: and though it was then about the middle of the conſtellation Aries, is now about the middle of Piſces. Notwithſtanding this alteration, however, the ſigns ſtill retain their ancient names and marks. When the zodiac is mentioned by aſtronomers, the local zodiac is generally meant.

The longitude of a phænomenon in the heavens is the number of degrees counted from the firſt point of Aries on the ecliptic to the place where a circle of latitude drawn through the phænomenon would cut the ecliptic at right angles. Every phænomenon in the heavens, whether in the zodiac or not, is thus referred to the ecliptic by its circle of latitude, or great circle, paſſing through the phænomenon, and cutting the ecliptic at right angles; and whatever ſign the circle of latitude paſſes through, the phænomenon is ſaid to have its place in that ſign, though ever ſo far diſtant from it.

Some aſtronomical writers have made the local zodiac invariable; for which purpoſe they imagine a circle of latitude drawn through the firſt ſtar of the conſtellation Aries, marked in Bayer's catalogue by the Greek letter γ; and reckon their longitude from the point where that circle cuts the ecliptic. This ſtar, from its uſe, is called the firſt ſtar of the Ram; and when this method is made uſe of, the longitude of any phænomenon is ſaid to be ſo many ſigns, degrees, minutes, &c. from the firſt ſtar of the Ram. Thus, in Street's Caroline Tables, the longitude of Jupiter's aſcending node is two ſigns eight degrees from the firſt ſtar of Aries, which is thus marked: Long. ♑ ☊ à 1° ♈ 2° 8°. The common way of reckoning the longitude of a phænomenon is to take ♈ for the firſt point of the ecliptic, and not to number the degrees quite round that circle as a continued ſeries, but to make a new beginning at the firſt point of every ſign, and to reckon from thence only the length of 30°. When this method is made uſe of, the longitude of any phænomenon is expreſſed by ſaying it is in ſuch a degree and ſuch a minute of a ſign: and thus we may expreſs the longitude of the aſcending node of Mercury, ☿ ☊ ♉ 14°40′; and ſo of any other. The place of a phænomenon in the heaven is expreſſed by ſetting down its longitude and latitude. Every planet, like the moon, is ſometimes in conjunction and ſometimes in oppoſition with the ſun. Its conjunction is when the geocentric place of the planet is the ſame with that of the ſun; though an exact or central conjunction can only take place when the line of its nodes paſſes through the earth, and the planet itſelf is in one of its nodes at the time. It is however, in general, called a conjunction or oppoſition, when the ſame circle of latitude paſſes through the ſun and planet at the ſame time. When the geocentric place of a planet is 90°, or a quarter of a circle from the ſun's place, the planet is ſaid to be in *quadrature* or in a *quartile* aſpect with the ſun; and theſe terms are uſed in a like ſenſe when applied to any two of the heavenly bodies. Thus the ſun and moon, or the moon and any planet, or any two planets, may be in conjunction, oppoſition, or quadrature. Beſides theſe, the ancients reckoned two other aſpects, the *trine* and the *ſextile*; the former when the bodies were diſtant 120°, and the latter when only half that diſtance. Theſe aſpects are marked thus:

Conjunction.	Oppoſition.	Quadrature.	Trine.	Sextile.
☌	☍	□	△	⚹

The aſpects were formerly ſuppoſed to influence the affairs of mankind.

The inferior planets have two kinds of conjunction with the

ſun; one in the inferior part of their ſemicircles, the other in the ſuperior part. In the former, the planet is between the earth and the ſun; and in the latter, the ſun is between the earth and planet. The inferior planets can never be in oppoſition to the ſun, nor even appear at a great diſtance from him. The length they go is called their *elongation*. Thus, in fig. 23. let OPQRT be part of the ecliptic; S the ſun; and the three circles round him, the orbits of Mercury, Venus, and the Earth. Suppoſe the earth to be at A, the ſun's geocentric place will be at Q. If Mercury be then at I, his geocentric place is likewiſe at Q; ſo that he is in conjunction with the ſun in his inferior ſemicircle: if at M, his geocentric place is likewiſe at Q: ſo that he is in conjunction in his ſuperior ſemicircle. In like manner, Venus at E is in conjunction in her inferior ſemicircle, at G in her ſuperior: but if we ſuppoſe the earth to be at A, and Venus at H, her geocentric place is T, and her elongation QT, which in this figure is the greateſt poſſible; for this always takes place when a ſtraight line from the earth touches the orbit of the planet, as is evident from the figure; that is, provided the planet be in its aphelion at the time. Thus the greateſt poſſible elongation of Mercury is QP when he is in his aphelion at L; and the quantity of this is found by aſtronomical obſervations to be about 28 degrees, that of Venus about 48. The inferior planets in their elongations are ſometimes eaſtward and ſometimes weſtward of the ſun; in the former caſe they appear in the evening, and in the latter in the morning. The ſmallneſs of Mercury and his nearneſs to the ſun prevent him from being often taken notice of; but the largeneſs and beauty of Venus have made her, in all ages, celebrated as the *evening* and *morning ſtar*.

The planets ſometimes appear to go forward, ſometimes backward, and ſometimes to ſtand ſtill. Theſe different conditions are by aſtronomers called *direct*, *retrograde*, and *ſtationary*. Were they to be viewed from the ſun, they would always appear direct; but when viewed from the earth, the inferior planets appear direct while moving in their upper ſemicircles, and retrograde when in their lower ones. Thus in fig. 23, ſuppoſe the earth at reſt at A, while Mercury is going on in his orbit from N to I; from I to L his motion appears to an obſerver at A to be retrograde, or contrary to the order of the ſigns, namely, from R to Q and from Q to P; but when in that part of his orbit which lies between L and N, his motion appears direct, or from P to Q and from Q to R.

When the earth is in the line of nodes of an inferior planet, the apparent motion of the former is then in a ſtraight line, becauſe the plane of it paſſes through the eye: if in a conjunction in his upper ſemicircle, he paſſes behind the ſun: if in his lower ſemicircle, he paſſes before it, and will then be ſeen by an obſerver on earth to paſs over the ſun's diſk like a round and very black ſpot. Were the plane of his orbit coincident with the ecliptic, this appearance would be ſeen every year; but by reaſon of the obliquity of the two planes to each other, it is much more rare. However, he was ſeen in this manner November 12th 1782, at 3 h. 44′ in the afternoon; May 4th 1786, at 6 h. 57′ in the morning; and December 6th 1789, at 3 h. 55′ in the afternoon: but will not be ſeen again, in this iſland at leaſt, until the year 1799, May 7th, at 2 h. 34′ in the afternoon. In like manner, Venus ſometimes appears as a black ſpot on the ſun, but much more ſeldom than Mercury. She was thus ſeen firſt, in 1639; afterwards in the years 1761 and 1769; but will not again be viſible in this manner till the year 1874.

When the earth is out of the line of the nodes of an inferior planet, its orbit appears an ellipſis, more or leſs eccentric according to the ſituation of the eye of the ſpectator. In theſe caſes, the motion of Mercury is unequal: faſter near the inferior conjunction, but moſt unequal in the inferior ſemicircle, going through the unequal ſpaces into which the ellipſis is divided. The motions of the inferior planets, both direct and retrograde, are very unequal: and this inequality proceeds not from the eccentricity of their orbits, but from the projection of their orbits into long ellipſes; and is therefore a mere optical deception.

Theſe planets appear ſtationary while changing their motion from direct to retrograde, or from retrograde to direct. If the earth ſtood ſtill, the times of their appearing ſtationary would be at their greateſt elongation; for though it be a property of the circle that a ſtraight line can only touch it in one point, yet when the circle is very large, the receſs from the tangent is not perceptible for a conſiderable time. Thus, in fig. 23. ſuppoſe the earth to be at reſt in A, Venus would appear ſtationary, her geocentric place continuing at T all the while ſhe is going in her orbit from *a* to *b*; becauſe her deviation from the viſual line AT would ſcarce be perceptible ſo near the point of contact H.

To an inhabitant of the earth, therefore, the inferior planets appear always near the ſun; alternately going from and returning to him, ſometimes in ſtraight lines, at others in elliptical curves, firſt on one ſide and then on the other; ſometimes ſo near as to be rendered inviſible by his ſtronger light. Sometimes, when in or near their nodes, they paſs behind the ſun in their ſuperior ſemicircles, or paſs between him and us; in which caſe they appear like black ſpots on his diſk, as has been juſt now mentioned. For the better comprehending of theſe motions, however, we have hitherto ſuppoſed the earth to ſtand ſtill in ſome part of its orbit, while they go round the ſun in theirs: but as this is not the caſe, it now remains to conſider the changes which take place in conſequence of the earth's motion. Were the earth to ſtand ſtill in any part of its orbit, as at A, the places of conjunction both in the ſuperior and inferior ſemicircle, as alſo of the greateſt elongation; and conſequently the places of direct and retrograde motion, and of the ſtations of an inferior planet, would always be in the ſame part of the heavens. Thus, in fig. 23, upon this ſuppoſition, the places of Mercury's ſtations would always be the points P and R, the are of his motion PR, and of his retrograde motion RP; whereas, on account of the earth's motion, the places where theſe appearances happen are continually advancing forward in the ecliptic according to the order of the ſigns. In fig. 24. let ABCD be the orbit of the earth; *e f g h* that of Mercury; ⊙ the ſun; GKI an arc of the ecliptic extended to the fixed ſtars. When the earth is at A, the ſun's geocentric place is at F; and Mercury, in order to a conjunction, muſt be in the line AF; that is, in his orbit he muſt be at *f* or *h*. Suppoſe him to be at *f* in his inferior ſemicircle: if the earth ſtood ſtill at A, his next conjunction would be when he is in his ſuperior ſemicircles at *h*; the places of his greateſt elongation alſo would be at *e* and *g*, and in the ecliptic at E and G: but ſuppoſing the earth to go on in its orbit from A to B, the ſun's geocentric place is now at K; and Mercury, in order to be in conjunction, ought to be in the line BK at *m*. As by the motion of the earth, the places of Mercury's conjunctions with the ſun are thus continually carried round in the ecliptic in conſequence, ſo the places of his utmoſt elongations muſt be carried in conſequence alſo. Thus, when the earth is at A, the places of his greateſt elongation from the ſun are in the ecliptic E and G; the motion of the earth from A to B advances them forward from G to L, and from E to I.

The geocentric motion of Venus may be explained in a ſimilar manner; only as the motion of Venus is much ſlower than that of Mercury, his conjunctions, oppoſitions, elongations, and ſtations, all return much more frequently than thoſe of Venus.

To explain the ſtationary appearances of the planets, it muſt be remembered, that the diameter of the earth's orbit, and even

of that of Saturn, are but mere points in comparison of the diſtance of the fixed ſtars; and, therefore, any two lines, abſolutely parallel, though drawn at the diſtance of the diameter of Saturn's orbit from each other, would, if continued to the fixed ſtars, appear to us to terminate in the ſame point. Let, then, the two circles, Plate 4. fig. H. repreſent the orbits of Venus and of the Earth; let the lines AE, BF, CG, DH, be parallel to SP, we may nevertheleſs affirm, that if continued to the diſtance of the fixed ſtars, they would all terminate in the ſame point with the line SP. Suppoſe, then, Venus at E while the earth is at A, the viſual ray by which ſhe is ſeen is the line AE. Suppoſe again, that while Venus goes from E to F, the earth goes from A to B, the viſual ray by which Venus is now ſeen is BF parallel to AE; and therefore Venus will be all that time ſtationary, appearing in that point of the heaven where SP extended would terminate: this ſtation is at her changing from direct to retrograde. Again, ſuppoſe, when the Earth is at C, Venus is at G, and the viſual line CG; if, while the Earth goes from C to D, Venus goes from G to H, ſo that ſhe is ſeen in the line GH parallel to CG, ſhe will be all that time ſtationary, appearing in the point where a line drawn from C through P would terminate. This ſtation is at her changing from retrograde to direct; and both are in her inferior ſemicircle. An inferior planet, when in conjunction with the ſun in its inferior ſemicircle, is ſaid to be in *perigee*, and in the other in *apogee*, on account of its different diſtances from the earth. Their real diſtances from the earth when in perigee are variable, partly owing to the eccentricities of their orbits, as well as that of the earth; and partly owing to the motions of the different bodies, by which it happens that they are in perigee in different parts of their orbits. The leaſt poſſible diſtance is when the perigee happens when the earth is in its perihelion, and the planet in its aphelion.

The difference of diſtance between the earth and inferior planets at different times, makes a conſiderable variation in their apparent diameters, which indeed is very obſervable in all the planets; and thus they ſometimes look conſiderably larger than at others. This difference in magnitude in Mercury is nearly at $5\frac{1}{2}$ to 1; and in Venus, no leſs than 32 to 1. A common ſpectator, unaſſiſted by any inſtrument, may obſerve an inferior planet alternately approach nearer and nearer the ſun, until at laſt it comes into conjunction with him, and then to recede farther and farther till it is at its greateſt elongation, which will be firſt on one ſide and then on the other: but if we obſerve the apparent change of place of an inferior planet in the ſphere of the heavens, its direct motions, ſtations, and retrogradations, meaſuring its diameter frequently with the micrometer, we ſhall find by its decreaſe at ſome times and increaſe at others, that its diſtance from us is very conſiderably varied; ſo that, taking the whole of its courſe into conſideration, it appears to move in a very complicated curve. Fig. 25. FG.

As the ſuperior planets move in a larger orbit than the earth, they can only be in conjunction with the ſun when they are on that ſide oppoſite to the earth; as, on the other hand, they are in oppoſition to him when the earth is between the ſun and them. They are in quadrature with him when their geocentric places are 90° diſtant from that of the ſun. In order to underſtand their apparent motions, we ſhall ſuppoſe them to ſtand ſtill in ſome part of their orbit while the earth makes a complete revolution in hers; in which caſe, any ſuperior planet would then have the following appearances: 1. While the earth is in her moſt diſtant ſemicircle, the motion of the planet will be direct. 2. While the earth is in her neareſt ſemicircle, the planet will be retrograde. 3. While the earth is near thoſe places of its orbit where a line drawn from the planet would be a tangent, it would appear to be ſtationary. Thus, in fig. 26. let *a b c d* repreſent the orbit of the Earth; S the Sun: EFG an arc of the orbit of Jupiter; ABC an arc of the ecliptic projected on the ſphere of the fixed ſtars. Suppoſe Jupiter to continue at F, while the earth goes round in her orbit according to the order of the letters *a b c d*. While the earth is in the ſemicircle moſt diſtant from Jupiter, going from *a* to *b* and from *b* to *c*, his motion in the heavens would appear direct, or from A to B and from B to C: but while the earth is in its neareſt ſemicircle *c d e*, the motion of Jupiter would appear retrograde from C to B and from B to A; for *a*, *b*, *c*, *d*, may be conſidered as ſo many different ſtations from whence an inhabitant of the earth would view Jupiter at different ſeaſons of the year, and a ſtraight line drawn from each of theſe ſtations, through F the place of Jupiter, and continued to the ecliptic, would ſhew his apparent place there to be ſucceſſively at A, B, C, B, A. While the earth is near the points of contact *a* and *c*, Jupiter would appear ſtationary, becauſe the viſual ray drawn through both planets does not ſenſibly differ from the tangent F*a* or F*c*. When the earth is at *b*, a line drawn from *b* through S and F to the ecliptic, ſhews Jupiter to be in conjunction with the ſun at B. When the earth is at *d*, a line drawn from *d* through S, continued to the ecliptic, would terminate in a point oppoſite to B; which ſhews Jupiter then to be in oppoſition to the ſun: and thus it appears that his motion is direct in the conjunction, but retrograde when in oppoſition, with the ſun.

The direct motion of a ſuperior planet is ſwifter the nearer it is to a conjunction, and ſlower as it approaches to a quadrature with the ſun. Thus, in fig. 27, let ⊙ be the ſun; the little circle round it, the orbit of the earth, whereof *a b c d e f g* is the moſt diſtant ſemicircle; OPQ, an arc of the orbit of Jupiter; and ABCDEFG, an arc of the ecliptic in the ſphere of the fixed ſtars. If we ſuppoſe Jupiter to ſtand ſtill at P, by the earth's motion from *a* to *g*, he would appear to move direct from A to G, deſcribing the unequal arcs AB, BC, CD, DE, EF, FG, in equal times. When the earth is at *d*, Jupiter is in conjunction with the ſun at D, and there his direct motion is ſwifteſt. When the earth is in that part of her orbit where a line drawn from Jupiter would touch it, as in the points *e* or *g*, Jupiter is nearly in quadrature with the ſun; and the nearer the earth is to any of thoſe points, the ſlower is the geocentric motion of Jupiter; for the arcs CD and DE are greater than BC or EF, and the arcs BC and EF are greater than AB or FG.

The retrograde motion of a ſuperior planet is ſwifter the nearer it is to an oppoſition, and ſlower as it approaches to a quadrature, with the ſun. Thus, let ⊙, fig. 28, be the ſun; the little circle round it the orbit of the earth, whereof *g h i k l m n* is the neareſt ſemicircle; OPQ, an arc of the orbit of Jupiter; NKG an arc of the ecliptic: if we ſuppoſe Jupiter to ſtand ſtill at P, by the earth's motion from *g* to *n*, he would appear to move retrograde from G to N, deſcribing the unequal arcs GH, HI, IK, KL, LM, MN, in equal times. When the earth is at *k*, Jupiter appears at K, in oppoſition to the ſun, and there his retrograde motion is ſwifteſt. When the earth is either at *g* or *n*, the points of contact of the tangents P*g* and P*n*, Jupiter is nearly in quadrature with the ſun: and the nearer he is to either of theſe points, the ſlower is his retrogradation; for the arcs IK and KL are greater than HI or LM: and the arcs HI and LM are greater than GH or MN. Since the direct motion is ſwifteſt when the earth is at *d*, and continues diminiſhing till it changes to retrograde, it muſt be inſenſible near the time of change: and, in like manner, the retrograde motion being ſwifteſt when the earth is in *k*, and diminiſhing gradually till it changes to direct, muſt alſo at the time of that change be inſenſible; for any motion gradually decreaſing till it changes into a contrary one gradually increaſing, muſt at the time of the change be altogether inſenſible.

The ſame changes in the apparent motions of this planet will alſo take place if we ſuppoſe him to go on ſlowly in his orbit; only they will happen every year when the earth is in different parts of her orbit, and conſequently at different times of the year. Thus, (fig. 26.) let us ſuppoſe, that while the earth goes round her orbit Jupiter goes from F to G, the points of the earth's orbit from which Jupiter will now appear to be ſtationary will be *a* and *y*; and conſequently his ſtations muſt be at a time of the year different from the former. Moreover, the conjunction of Jupiter with the ſun will now be when the earth is at *f*, and his oppoſition when it is at *e*; for which reaſon theſe alſo will happen at times of the year different from thoſe of the preceding oppoſition and conjunction. The motion of Saturn is ſo ſlow, that it makes but little alteration either in the times or places of his conjunction or oppoſition; and no doubt the ſame will take place in a more eminent degree in Herſchel; but the motion of Mars is ſo much ſwifter than even that of Jupiter, that both the times and places of his conjunctions and oppoſitions are thereby very much altered.

A ſuperior planet is in apogee when in conjunction with the ſun, and in perigee when in oppoſition; and every one of the ſuperior planets is at its leaſt poſſible diſtance from the earth where it is in perigee and perihelion at the ſame time. Their apparent diameters are variable, according to their diſtanees, like thoſe of the inferior planets; and this, as might naturally be expected, is moſt remarkable in the planet Mars, who is neareſt us. In his neareſt approach, this planet is 25 times larger than when fartheſt off, Jupiter twice and a half, and Saturn once and a half.

As the times of conjunction, utmoſt elongation, direct or retrograde motions of the inferior planets, depend on the combinations of their motions in their orbits with the motion of the Earth in its orbit; any of theſe appearances will be more frequent in Mercury than in Venus, becauſe the former moves with a ſwifter motion in his orbit, and conſequently muſt more frequently paſs through thoſe places where he is in conjunction, &c. The time in which any of the inferior planets will return into a given ſituation, may be eaſily known. Compute the diurnal heliocentric motions of Venus and of the Earth: the difference of theſe motions is the diurnal motion of Venus from the Earth, or the quantity by which Venus would be ſeen to recede from the Earth every day by a ſpectator placed in the Sun: thus the mean motion of Venus is every day about 59 minutes and 8 ſeconds; the difference is 37 minutes. Say, therefore, As 37 minutes is to 360°, or to 21,600 minutes, ſo is one day to the time wherein Venus, having left the earth, recedes from her 360 degrees; that is, to the time wherein ſhe returns to the earth again, or the time between two conjunctions of the ſame kind.

The times are here computed according to the mean or equable motions of the planets: and this is therefore called a mean conjunction: but becauſe Venus and the Earth are really carried in elliptic orbits, in which their motions are ſometimes ſwifter and ſometimes ſlower, the true conjunctions may happen ſome days either ſooner or later than what theſe rules will give. The time of the true conjunction is to be computed from that of the mean conjunction in the following manner. Find by aſtronomical tables the places of Venus and the Earth in the ecliptic, from which we ſhall have the diſtance of the two as ſeen from the Sun; compute alſo for the ſame time the angular motions of theſe two planets for any given time, ſuppoſe ſix hours; the difference of theſe two motions will give the acceſs of Venus to the earth, or her receſs from it in ſix hours: then ſay, As this difference is to the arc between the places of Venus and the earth at the time of a mean conjunction, ſo is ſix hours to the time between the mean conjunction and the true. This time added to or ſubtracted from the time of the mean conjunction, according as Venus is in antecedence or conſequence from the earth, ſhows the time of their true conjunction.

With regard to the conjunctions, oppoſitions, direct and retrograde motions, &c. of the ſuperior planets, as they depend on the combinations of their motions with that of the earth, they will be more frequent in Saturn than in Jupiter, in Jupiter than in Mars, but moſt frequent of all in Herſchel; becauſe the ſlower the motion of the planet is, the ſooner the earth will overtake it, ſo as to have it again in any given ſituation. Thus, ſuppoſe Saturn to be in conjunction with the ſun in ♈, if he were to ſtand ſtill for one year, then he would again be in conjunction in ♈; but as he goes on ſlowly, according to the order of the ſigns, about 12° annually, the earth muſt go through almoſt 13° more than an entire revolution; ſo that there will be almoſt a year and 13 days between any conjunction between the Sun and Saturn and the conjunction immediately following. As Jupiter moves in his orbit with greater velocity than Saturn, the Earth muſt have a proportionably larger ſpace added to the year; and as Mars moves ſwifter ſtill, the time betwixt any two of his conjunctions muſt be ſtill longer.

The time when a ſuperior planet will return into any given ſituation, may be found by the methods already laid down for the inferior planets; and the true conjunctions, &c. may be found in the ſuperior planets as in the inferior.

The Earth is the next planet above Venus in the ſyſtem. It is 95,173,000 miles from the ſun; and goes round him in 365 days 5 hours 49 minutes, from any equinox or ſolſtice to the ſame again; but from any fixed ſtar to the ſame again, as ſeen from the ſun, in 365 days 6 hours 9 minutes; the former being the length of the tropical year, and the latter the length of the ſidereal. It travels at the rate of 68,000 miles every hour; which motion, though upwards of 140 times ſwifter than that of a cannon ball, is little more than half as ſwift as Mercury's motion in his orbit. The earth's diameter is 7970 miles; and by turning round its axis every 24 hours from weſt to eaſt, it cauſes an apparent diurnal motion of all the heavenly bodies from eaſt to weſt. By this rapid motion of the earth on its axis, the inhabitants about the equator are carried 1042 miles every hour, whilſt thoſe on the parallel of London are carried only about 580, beſides the 68,000 miles by the annual motion above mentioned, which is common to all places whatever.

That the earth is of a globular figure may be proved from ſeveral different and evident circumſtances. 1. When we are at ſea on board a ſhip, we may be out of ſight of land when the land is near enough to be viſible if it were not hid from our eye by the convexity of the water. Thus, let ABCD (fig. 29.) repreſent a portion of the globe of our earth. Let M be the top of a mountain; this cannot be ſeen by a perſon on board the ſhip at B, becauſe a line drawn from M to his eye at E is intercepted by the convexity of the water: but let the ſhip come to C, then the mountain will be viſible, becauſe a line may be drawn from M to his eye at E. 2. The higher the eye, the farther will the view be extended. It is very common for ſailors from the top of the maſt of a ſhip to diſcover land or ſhips at a much greater diſtanee than they can do when they ſtand upon deck. 3. When we ſtand on ſhore, the higheſt part of a ſhip is viſible at the greateſt diſtance. If a ſhip is going from us out to ſea, we ſhall continue to ſee the maſt after the hull or body of the ſhip diſappears, and the top of the maſt will continue to be ſeen the longeſt. If a ſhip is coming towards us, the top of the maſt comes firſt in view, and we ſee more and more till at laſt the hull appears. If the ſurface of the ſea were a flat plain (fig. 30.) a line might be drawn from any object ſituated upon it, as the ſhip D, to the eye, whether placed high or low, at A or B. In this caſe, any object upon the earth or ſea would be viſible at any diſtance

which was not ſo great as to make the appearance of it too faint, or the angle under which it appears too ſmall, to be ſeen by us. An object would be viſible at the ſame diſtance, whether the eye were high or low. Not the higheſt, but the largeſt, objects would be viſible to the greateſt diſtance, ſo that we ſhould be able to ſee the hulk of a ſhip farther off than the maſt. 4. Several navigators, ſuch as Ferdinand Magellan, Sir Francis Drake, Captain Cook, have ſailed round the globe; not in an exact circle, the land preventing them, but by going in and out as the ſhores happened to lie. 5. All the appearances in the heavens are the ſame, whether at land or ſea. 6. Eclipſes of the moon ariſe from the ſhadow of the earth, and this ſhadow is always circular Although the earth preſents, during ſeveral hours, different portions of its ſurface to the moon, yet ſtill the ſhadow is round. The ſmall inequalities upon the ſurface of the earth bear no kind of proportion to its magnitude ſufficient to alter the appearance of its ſhadow.

There is no ſuch thing in nature as a heavy body moving round a light one as its centre of motion. A pebble faſtened to a mill-ſtone by a ſtring, may by an eaſy impulſe be made to circulate round the mill-ſtone: but no impulſe can make a mill-ſtone circulate round a looſe pebble; for the mill-ſtone would go off, and carry the pebble along with it.

The ſun is ſo immenſely bigger and heavier than the earth, that, if he was moved out of his place, not only the earth, but all the other planets, if they were united into one maſs, would be carried along with the ſun as the pebble would be with the mill ſtone.

The ſtrongeſt objection that can be made againſt the earth's moving round the ſun like the other planets is, that in oppoſite points of the earth's orbit, its axis, which always keeps a parallel direction, would point to different fixed ſtars; which is not found to be fact. But this objection is eaſily removed, by conſidering the immenſe diſtance of the ſtars in reſpect of the diameter of the earth's orbit; the latter being no more than a point when compared to the former. If we lay a ruler on the ſide of a table, and along the edge of the ruler view the top of a ſpire at ten miles diſtance; then lay the ruler on the oppoſite ſide of the table in a parallel ſituation to what it had before, and the ſpire will ſtill appear along the edge of the ruler; becauſe our eyes, even when aſſiſted by the beſt inſtruments, are incapable of diſtinguiſhing ſo ſmall a change at ſo great a diſtance. But this motion of the earth is clearly aſcertained by a diſcovery of Bradley, who found that there is a ſmall apparent motion of the fixed ſtars to be accounted for in no other manner than by the motion of light and the motion of the earth in its orbit. This may be eaſily explained on the ſuppoſition of the earth's motion.

It is found by frequent obſervations of the eclipſes of Jupiter's ſatellites, that light is about 8 minutes in moving from the ſun to the earth. And ſince the earth deſcribes about 1 degree (or 3600″) in a day (or 1440ᵐ), in 8 minutes it will deſcribe 20″, in its orbit; therefore the velocity of light is to the velocity of the earth in its orbit, as radius to an arch of 20 ſeconds, or the third part of a minute, that is, as 1 to $\frac{.0002909}{3}$ or .00009697, or as 10300 to 1. That is, the velocity of light is 10300 times greater than the velocity of the earth in its orbit.

Fig. 31. Now if AN be the way or path of a body in free ſpace, as of a ray of light; its apparent way on a moveable plane will be different. For it will be that which is made by the reſolution of the two motions of the body and plane. Thus if AN be deſcribed in any time by the body, and NF be deſcribed by (a point in) the plane, in the ſame time. As the plane moves forward in direction NF or AB, it leaves all the points of the fixed line AN behind it, all which will therefore ſeem to move backwards in the plane. Therefore make ND = NF, being taken backwards or contrary to the motion of the plane; and the body, inſtead of going to N in free ſpace, will ſeem to go to D, in the ſame time, upon the moveable plane; and therefore AD will be the apparent path of the body in that plane.

It will be the very ſame thing, if you ſuppoſe the plane fixed, and the body to have the plane's motion communicated to it, in a contrary direction, ſo as the relative motion be the ſame as before. Thus if the body moves from B to A, in the ſame time that it would alſo move from A to N, then by that compound motion it would move along the diagonal BN of the parallelogram whoſe ſides are BA, AN, and in the ſame time.

Therefore rays of light emitted from the ſtar in direction AN, will fall upon the point D of the moving plane; that is, upon the eye of the obſerver, in the direction AD: and an obſerver at D will ſuppoſe the ſtar ſituated in the line DA. If BN be parallel to AD, and the point D tranſlated to N in the ſaid time; an obſerver at N will ſuppoſe the ſtar ſituated in the line NB; making the angle BNF or ADF leſs than ANF, the angle it would appear under if the plane was at reſt. So that the angle of elevation BNF, above the line of direction NF, of the obſerver, is leſs than before, being taken on the ſide F, towards which the obſerver moves. The obſerver, inſtead of ſeeing the ſtar at A its real place, will ſee it at B its apparent place; but if the obſerver moves from F to N and D, and B be the real place of the ſtar, its apparent place would be at A to an obſerver at N.

The apparent place B is always in the plane of aberration, drawn through the way of the obſerver NF, and the line NA drawn from the obſerver to the real place of the ſtar; for AB being parallel to NF, is in the plane ADNF. The angle BNA or NAD is the angle of aberration; by the quantity of this angle the ſtar is depreſſed, in going towards it; or raiſed in going from it.

In the triangle AND; AN : ND : : S.ADN : S.NAD; and AN and ND being given; the S.NAD the aberration will be as the S.ADN.

Becauſe AN is 10300 times greater than ND; the S.NAD does not differ from its arch or angle; whence, the angle of aberration NAD or ANB is always as the ſine of the angle of the earth's way, ADN or ANF. Hence the angle of aberration ANB is greateſt, when AN is perpendicular to ND; and becomes nothing, when ANF is nothing.

Since AN is to ND, as radius to 20′; when AN is perpendicular to ND, the angle NAD or ANB will be 20″, which is the greateſt it can be. In other caſes, as radius to S. angle of the earth's way ANF : : ſo 20″, to the aberration, anſwering to that angle; which angle is always taken in the plane of aberration ADNF.

Fig. 32. Let BCDE be the earth's orbit, S the ſun, A or Q a ſtar, N any place of the earth in its orbit. Through the ſtar A draw the circle AH perpendicular to the plane of the ecliptic, and draw KSBH, and ESC perpendicular to it, or parallel to the tangent at B. Draw the tangent N*d*, and draw NI towards the ſtar, and make NI to N*d* as the velocity of light to that of the earth, or as 10300 to 1, and draw *d*I which leads to the apparent place of the ſtar; and ſuppoſe DA, SA parallel to *d*I, NI; then DA will alſo lead to the apparent place of the ſtar. Draw SF perpendicular to SN, or parallel to N*d*. Then will IN*d* be the plane of aberration. This plane continually changes its ſituation, revolving round the ſun in a year along with the tangent N*d*. Since AS, SF are parallel to IN, N*f*, ASF is equal to IN*f*, and ASF is equal to the angle of the earth's way. Hence the plane ASF may be taken for the plane of aberration, which continually turns round the line AS, as the earth revolves about the ſun; the line SF being always in quadrature with the earth at N.

Let the earth be at E, then the plane of aberration ASB will be perpendicular to the ecliptic; and the angle of the earth's way ASB is the leaſt that it can be, and the angle of aberration the leaſt. Whilſt the earth moves to B, the angle of the earth's way, and of aberration increaſes, and at B the plane of aberration is ACS, and the angle of the earth's way ASC a right angle, which is the greateſt it can be; therefore the angle of aberration is the greateſt poſſible. Whilſt the earth moves to C, the angles of the earth's way and aberration decreaſe again, and at C are the leaſt: and in moving to K they increaſe again to K, where they are greateſt. From K to E they diminiſh again, where they are leaſt.

It is plain then, whilſt the earth is at E moving towards N, the ſtar's apparent place is at *e* lower than A; at B moving towards F, it appears at *b* forward. When the earth is at C, the ſtar appears at *c* above A. And when the earth is at K, the ſtar is ſeen at *k*, having gone backward.

Hence the apparent place of a ſtar deſcribes a ſmall ellipſis in a year, about the true place of the ſtar in its centre, whoſe tranſverſe axis is parallel to the ecliptic; and leſſer axis perpendicular to it. This ellipſis is *bcke* anſwering to the places of the earth at B, C, K, E. And the points *b*, *c*, *k*, *e*, anſwer reſpectively to the points C, K, E, B, where the plane of aberration cuts the ecliptic, being 90 degrees before the earth, or 90 degrees behind the ſun.

Since the apparent places of the ſtars correſpond with this theory, the motion of the earth and the motion of light are both determined.

We find that the ſun, and thoſe planets on which there are viſible ſpots, turn round their axes: for the ſpots move regularly over their diſks *. From hence we may reaſonably conclude, that the other planets on which we ſee no ſpots, and the earth, which is likewiſe a planet, have ſuch rotations. But being incapable of leaving the earth, and viewing it at a diſtance, and its rotation being ſmooth and uniform, we can neither ſee it move on its axis as we do the planets, nor feel ourſelves affected by its motion. Yet there is one effect of ſuch a motion, which will enable us to judge with certainty whether the earth revolves on its axis or not. All globes which do not turn round their axes will be perfect ſpheres, on account of the equality of the weight of bodies on their ſurfaces; eſpecially of the fluid parts. But all globes which turn on their axes will be oblate ſpheroides; that is, their ſurfaces will be higher or farther from the centre in the equatorial than in the polar regions: for as the equatorial parts move quickeſt, they will recede fartheſt from the axis of motion, and enlarge the equatorial diameter. That our earth is really of this figure, is demonſtrable from the unequal vibrations of a pendulum, and the unequal lengths of degrees in different latitudes. Since then the earth is higher at the equator than at the poles, the ſea, which naturally runs downward, or toward the places which are neareſt the centre, would run towards the polar regions, and leave the equatorial parts dry, if the centrifugal force of theſe parts, by which the waters were carried thither, did not keep them from returning. The earth's equatorial diameter is 36 miles longer than its axis.

Bodies near the poles are heavier than thoſe towards the equator, becauſe they are nearer the earth's centre, where the whole force of the earth's attraction is accumulated. They are alſo heavier, becauſe their centrifugal force is leſs, on account of their diurnal motion being ſlower. For both theſe reaſons, bodies carried from the poles towards the equator gradually loſe their weight. Experiments prove, that a pendulum which vibrates ſeconds near the poles, vibrates ſlower near the equator, which ſhows that it is lighter or leſs attracted there. To make it oſcillate in the ſame time, it is found neceſſary to diminiſh its length. By comparing the different lengths of pendulums ſwinging ſeconds at the equator and at London, it is found that a pendulum muſt be $2\frac{176}{1000}$ lines ſhorter at the equator than at the poles. A line is a twelfth part of an inch.

A perſon on the earth can no more be ſenſible of its undiſturbed motion on its axis, than one in the cabin of a ſhip on ſmooth water can be ſenſible of the ſhip's motion when it turns gently and uniformly round. It is therefore no argument againſt the earth's diurnal motion, that we do not feel it; nor are the apparent revolutions of the celeſtial bodies every day a proof of the reality of theſe motions; for whether we or they revolve, the appearance is the very ſame. A perſon looking through the cabin-windows of a ſhip, as ſtrongly fancies the objects on land to go round when the ſhip turns, as if they were actually in motion.

As to the common objections againſt the earth's motion on its axis, they are all eaſily anſwered and ſet aſide. That it may turn without being ſeen or felt by us to do ſo, has been already ſhown. But ſome are apt to imagine, that if the earth turns eaſtward (as it certainly does if it turns at all), a ball fired perpendicularly upward in the air muſt fall conſiderably weſtward of the place it was projected from. The objection, which at firſt ſeems to have ſome weight, will be found to have none at all, when we conſider that the gun and ball partake of the earth's motion; and therefore the ball, being carried forward with the air as quick as the earth and air turn, muſt fall down on the ſame place. A ſtone let fall from the top of a main-maſt, if it meets with no obſtacle, falls on the deck as near the foot of the maſt when the ſhip ſails as when it does not. As for thoſe ſcripture expreſſions which ſeem to contradict the earth's motion, this general anſwer may be made to them all, viz. The ſcriptures were never intended to inſtruct us in philoſophy or aſtronomy; and therefore on thoſe ſubjects expreſſions are not always to be taken in the literal ſenſe, but for the moſt part as accommodated to the common apprehenſions of mankind. Men of ſenſe in all ages, when not treating of the ſciences purpoſely, have followed this method: and it would be in vain to follow any other in addreſſing ourſelves to the bulk of any community.

The diurnal or annual motions of the earth, together with the different lengths of days and nights, and all the beautiful variety of ſeaſons, depending on thoſe motions, may be thus explained.

Fig. 33. Let FGHI be the earth, O its centre; and let it revolve about an axis perpendicular to the plane of the figure, in the order IFGH; that is, from weſt to eaſt. Let A be the ſun, draw AFOHC, and GOI perpendicular to it; let a ſpectator be at I; then ſince the tangent at I (which repreſents the horizon) will be parallel to AFH, and A at an immenſe diſtance; they will nearly meet in A, and the ſun at A will be riſing in the horizon at I. As the earth moves round, the ſpectator is carried towards F, and the ſun at A ſeems to riſe higher and higher; and when the ſpectator is arrived at F, then the ſun is at the higheſt. As the earth ſtill turns round, and the ſpectator is carried from F towards G, the ſun appears to deſcend, as if it moved towards D; and when the ſpectator is arrived at G, then the ſun appears in the tangent at G; that is, in the horizon at G; and therefore the ſun is ſetting. Afterwards, all the time the ſpectator is moved through GHI, the ſun appears under the horizon, till it comes at I, where the

* This, however, muſt be underſtood with ſome degree of limitation, as will evidently appear from what has been already ſaid concerning the variable motion both of the ſpots of the ſun and planets.

in ſeems to riſe again. Now it is evident, that while the ſpectator is carried through the illuminated half of the earth FG, it is day-light; and at the middle point F, is noon-day. Alſo whilſt the ſpectator is carried through the dark hemiſphere GHI, it is night; and at H, it is midnight. And thus the ſeciſſitude of day and night appears, by the rotation of the earth about its axis.

What has been ſaid of the ſun, is equally true of the moon, or any ſtar placed at A. And therefore all the celeſtial bodies ſeem to riſe and ſet by turns, one after another, according to their various ſituations. For let A, B, C, D be four ſtars: when the ſpectator is at I, the ſtar A riſes; and when at G, ſets. When the ſpectator is at F, B riſes; and when it is at H, it ſets. When he is at G, C riſes; and when it is at I, ſets. When the ſpectator is at H, D riſes; and when at F, ſets.

Hence it is the very ſame thing, as to the diurnal motions, whether the earth moves uniformly about its axis, while the heavens ſtand ſtill; or whether the heavens move uniformly round, whilſt the earth ſtands ſtill; the phænomena being exactly the ſame either way.

For whether the ſpectator moves uniformly in the arch IF, from weſt to eaſt, whilſt A is fixed; or A moves uniformly in the arch AD, from eaſt to weſt, whilſt I is fixed; the ſame angle will be deſcribed, and therefore the altitude of A, above the horizon, will be the ſame either way.

To explain the variety of ſeaſons, let ♈ ♋ ♎ ♑ be the earth's orbit, S the ſun, (fig. 34.) This orbit is ſo ſmall in reſpect to the diſtance of the fixed ſtars, that the ſame aſpect of the heavens will appear, whether a man be placed in the earth or in the ſun. If the earth be at ♈, a ſpectator will ſee the ſun in ♎; when the earth comes to ♉, he will ſee the ſun in ♏; and the ſun will appear to have moved through ♎ ♏. Whilſt the earth is moving to ♊, the ſun will ſeem to paſs through ♏ ♐; and a perſon in the earth obſerves the ſun to go through the ſame ſpace in the heavens, that a ſpectator at the ſun would ſee the earth go through: and as he is not ſenſible of the earth's motion, he aſcribes that motion to the ſun, which in reality is unmoved. Hence, becauſe the relative motion is the ſame, whether of the two is moved, and all effects are the ſame as to their places; aſtronomers generally ſuppoſe the ſun to move along the ecliptic, deſcribing its orbit round the earth at reſt.

Let NEAQ be the earth, NA be its axis, N the north pole, A the ſouth; EQ the equinoctial, and PR a parallel of latitude paſſing through any place. Draw a plane G ♈ I perpendicular to ♈ S ♋, which divides the illuminated hemiſphere from the dark one. The axis NA is inclined to the plane of the ecliptic or earth's orbit, in an angle of 66½ degrees: and during the earth's motion in its orbit, the axis always remains in a parallel poſition, or pointing to the ſame ſtar. The earth alſo moves uniformly round this axis; and deſcribes equal arches in equal times. Now let the earth be at ♎; in this poſition, the circle dividing the light and dark hemiſpheres paſſes through the poles N and A, and divides all the parallels as PR into two equal parts; therefore any point in that parallel, as the earth revolves round, will ſtay as long in the light hemiſphere as in the dark; that is, the days and nights are equal. As it moves to ♏, the pole N comes into the light hemiſphere, by reaſon of the oblique poſition of the axis NA; and as it proceeds to ♐ and ♑, the light hemiſphere reaches farther and farther beyond N, till coming to ♑, it is at the fartheſt, reaching to G, and making the arch NG 23½ degrees, the complement of N ♑ S, or 66½ degrees. Then the oppoſite pole A is as far involved in the dark hemiſphere; whence in north latitudes, or in the hemiſphere ENQ the days have been increaſing from ♎ to ♑, where they are at their longeſt; for the greater part of the parallel PDQ as PD is in the illuminated hemiſphere, and only the part D R in the dark. In the oppoſite or ſouthern hemiſphere the days have been decreaſing, and are at their ſhorteſt at ♑: for all the parallels to EQ have their greater part in the dark hemiſphere. If through the point G a parallel be deſcribed, this parallel is called the *arctic circle*; and all the ſpace contained therein is illuminated, and there is no night, during the earth's ſtay at ♑. For the ſame reaſon, the ſpace within the parallel drawn through I, will be all dark, and all is night there. If a parallel be drawn through B, where S ♑ cuts the arch NE, that parallel is called the *tropic of Cancer*; and then the ſun will ſhine perpendicular upon the inhabitants in that parallel. This is the ſummer ſeaſon for thoſe that are in the hemiſphere ENQ, and the winter for thoſe that live in EAQ; and ſince EQ is equally divided by the circle of light and darkneſs GI, the days and nights are always equal under the equinoctial.

Whilſt the earth moves through ♒ and ♓ to ♈, the circle of light and darkneſs comes nearer and nearer to the pole N, the angle N ♑ G and conſequently B ♑ E grows leſs and, leſs, till they vaniſh in ♈; then the circle of light and darkneſs paſſes again through the poles N and A, biſecting all the parallels as PR; and the days and nights are again equal, all over the earth.

Whilſt the earth moves through ♈, ♉, ♊, to ♋, the ſun ſeems to go through ♎, ♏, ♐, to ♑; and the circle of light and darkneſs falls ſhort more and more of the north pole N, and goes further and further beyond the ſouth pole A; whence the parallels cut by that circle will have the greater part PD in the dark, in the north hemiſphere; but in the ſouth hemiſphere, the greater part will be in the light: and it is winter to the northern hemiſphere ENQ, the days being at the ſhorteſt; and ſummer to the ſouthern hemiſphere EAQ, their days being at their longeſt. Within the parallel drawn through G, there will be no day whilſt the earth ſtays at ♋; and in the parallel drawn through I, there will be no night. At the pole A it will be day for 6 months, and at the pole N it will be night for ſix months; juſt the contrary of what happens when the earth is at ♑. In this poſition, if a parallel be drawn through B, the ſun will ſhine perpendicular to the earth in that parallel, and it is called the *tropic of Capricorn*; and a parallel drawn through I is called the *antarctic circle*.

Let the earth move from ♋ through ♌ and ♍ to ♎ again; it is evident the circle of light and darkneſs draws nearer and nearer to the poles N and A, by which the light and dark parts of the parallels become nearer an equality, and ſo do the days and nights. Therefore in the north hemiſphere ENQ, the days are increaſing; and in the ſouth hemiſphere they are decreaſing: and the days and nights become equal in every place, when the earth arrives at ♎. In this manner are the ſeveral ſeaſons cauſed, being owing to the obliquity of the axis of rotation of the earth, to the plane of the earth's orbit. But if the axis was perpendicular to it, there could be no variety in the length of days, in whatever part of the orbit the earth was; and all ſeaſons would be alike.

Hence the obliquity of the earth's axis to the ecliptic, or (which is the ſame thing) of the equinoctial to the ecliptic, is the cauſe of the different ſeaſons, as ſummer, winter, ſpring, and autumn, during the year. Without this, there could be no difference of ſeaſons; and conſequently it could not be eaſy to know the length of the year, without obſervations of the ſtars.

For the length of the year is had from finding the time by obſervation, when the ſun is in the equinoctial points; and there being no ſuch points to obſerve by, there could be no method but to obſerve by the poſition of the ſtars, when the ſame ſtar was again in oppoſition to the ſun, which none but an aſtronomer could do; and perhaps nobody would undertake it, as it could be of no uſe when found.

The ſun appears 47 degrees higher in the ſummer tropic, than it does in the winter tropic.

For in ſummer it ſeems to have aſcended through the arch BE; and in winter, to have deſcended through the arch BQ equal to BE; and their ſum is 47 degrees.

Theſe phænomena may be thus repreſented: Take a ſmall globe that has the equinoctial and parallels drawn on it; and placing a candle upon a table move the globe round the candle in a circle parallel to the table, ſo that the axis of the equator may be oblique to that circle, and be kept always in a parallel poſition whilſt it moves about. The candle will illuminate the globe as it is carried round, juſt as the ſun does the earth in its orbit; and the poles and the parallels will be the ſame way affected with light and darkneſs as this globe.

The earth's orbit being elliptical, and the ſun conſtantly keeping in its lower focus, which is 1,617,941 miles from the middle point of the longer axis, the earth comes twice ſo much, or 3,235,882 miles nearer the ſun at one time of the year than at another; for the ſun appearing under a larger angle in our winter than ſummer, proves that the earth is nearer the ſun in winter. But here this natural queſtion will ariſe, Why have we not the hotteſt weather when the earth is neareſt the ſun? In anſwer it muſt be obſerved, that the eccentricity of the earth's orbit, or 1,617,941 miles, bears no greater proportion to the earth's mean diſtance from the ſun than 17 does to 1000; and therefore this ſmall difference of diſtance cannot occaſion any great difference of heat or cold. But the principal cauſe of this difference is, that in winter the ſun's rays fall ſo obliquely upon us, that any given number of them is ſpread over a much greater portion of the earth's ſurface where we live; and each point muſt then have fewer rays than in ſummer. Moreover, there comes a greater degree of cold in the long winter-nights than there can return of heat in ſo ſhort days; and on both theſe accounts the cold muſt increaſe. In ſummer the ſun's rays fall more perpendicularly upon us; come with greater force, and in greater numbers, on the ſame place; and by their long continuance, a much greater degree of heat is imparted by day than can fly off by night. Beſides, thoſe parts which are once heated, retain the heat for ſome time; which, with the additional heat daily imparted, makes it continue to increaſe, though the ſun declines towards the ſouth: this is the reaſon why July is hotter than June, although the ſun has withdrawn from the ſummer tropic; as we find it is generally hotter at three in the afternoon, when the ſun has gone towards the weſt, than at noon when he is on the meridian. Likewiſe thoſe places which are well cooled require time to be heated again; for the ſun's rays do not heat even the ſurface of any body till they have been ſome time upon it. Hence we find January for the moſt part colder than December, although the ſun has withdrawn from the winter tropic, and begins to dart his beams more perpendicularly upon us. An iron bar is not heated immediately upon being in the fire, nor grows cold till ſome time after it has been taken out.

When the ſun arrives at the ſame equinoctial or ſolſtitial point, he finiſhes what we call the *Tropical Year*; which, by obſervation, is found to contain 365 days 5 hours 48 minutes 57 ſeconds: and when he arrives at the ſame fixed ſtar again, as ſeen from the earth, he completes the ſidereal year, which contains 365 days 6 hours 9 minutes 14½ ſeconds. The ſidereal year is therefore 20 minutes 17½ ſeconds longer than the ſolar or tropical year, and 9 minutes 14½ ſeconds longer than the Julian or the civil year, which we ſtate at 365 days 6 hours; ſo that the civil year is almoſt a mean between the ſidereal and tropical.

As the ſun deſcribes the whole ecliptic, or 360 degrees, in a tropical year, he moves 59′ 8″ of a degree every day at a mean rate; and conſequently 50″ of a degree in 20 minutes 17½ ſeconds of time: therefore he will arrive at the ſame equinox or ſolſtice when he is 50″ of a degree ſhort of the ſame ſtar or fixed point in the heavens from which he ſet out the year before. So that, with reſpect to fixed ſtars, the ſun and equinoctial points fall back (as it were) 30 degrees in 2160 years, which will make the ſtars appear to have gone 30 deg. forward with reſpect to the ſigns of the ecliptic in that time: for the ſame ſigns always keep in the ſame points of the ecliptic, without regard to the conſtellations.

The anticipation of the equinoxes, and conſequently of the ſeaſons, is by no means owing to the preceſſion of the equinoctial and ſolſtitial points in the heavens (which can only affect the apparent motions, places, and declinations, of the fixed ſtars), but to the difference between the civil and ſolar year, which is 11 minutes 3 ſeconds; the civil year containing 365 days 6 hours, and the ſolar year 365 days 5 hours 48 minutes 57 ſeconds.

The above 11 minutes 3 ſeconds, by which the civil or Julian year exceeds the ſolar, amounts to 11 days in 1433 years; and ſo much our ſeaſons have fallen back with reſpect to the days of the months, ſince the time of the Nicene council in A. D. 325; and therefore, in order to bring back all the faſts and feſtivals to the days then ſettled, it was requiſite to ſuppreſs 11 nominal days: and, that the ſame ſeaſons might be kept to the ſame times of the year for the future, to leave out the biſſextile-day in February at the end of every century of years not diviſible by 4; reckoning them only common years, as the 17th, 18th, and 19th centuries, viz. the years 1700, 1800, 1900, &c. becauſe a day intercalated every fourth year was too much; and retaining the biſſextile-day at the end of thoſe centuries of years which are diviſible by 4, as the 16th, 20th, and 24th centuries, viz. the years 1600, 2000, 2400, &c. otherwiſe, in length of time, the ſeaſons would be quite reverſed with regard to the months of the year; though it would have required near 23,783 years to have brought about ſuch a total change. If the earth had made exactly 365¼ diurnal rotations on its axis, whilſt it revolved from any equinoctial or ſolſtitial point to the ſame again, the civil and ſolar years would always have kept pace together, and the ſtyle would never have needed any alteration.

The moon is not a planet, but only a ſatellite, or attendant of the earth, going round the earth from change to change in 29 days 12 hours and 44 minutes, and round the ſun with it every year. The moon's diameter is 2180 miles; and her diſtance from the earth's centre is 240,000. She goes round her orbit in 27 days 7 hours 43 minutes, moving about 2290 miles every hour; and turns round her axis exactly in the time that ſhe goes round the earth, which is the reaſon of her keeping always the ſame ſide towards us, and that her day and night taken together is as long as our lunar month.

The moon is an opaque globe like the earth, and ſhines only by reflecting the light of the ſun: therefore, whilſt that half of her which is towards the ſun is enlightened, the other half muſt be dark and inviſible. Hence ſhe diſappears when ſhe comes between us and the ſun; becauſe her dark ſide is then towards us. When ſhe is gone a little way forward, we ſee a little of her enlightened ſide: which increaſes to our view as ſhe advances, until ſhe comes to be oppoſite to the ſun; when her whole enlightened ſide is towards the earth, and ſhe appears with a round illuminated orb, which we call the *full moon*; her dark ſide being then turned away from the earth. From the full ſhe ſeems to decreaſe gradually as ſhe goes through the other half of her courſe; ſhowing us leſs and leſs of her enlightened ſide every day, till her next change or conjunction with the ſun, and then ſhe diſappears as before.

The moon has ſcarce any difference of ſeaſons; her axis being almoſt perpendicular to the ecliptic. What is very ſingular, one half of her has no darkneſs at all; the earth conſtantly affording it a ſtrong light in the ſun's abſence; while the other half has a fortnight's darkneſs and a fortnight's light by turns.

Our earth is thought to be a moon to the moon; waxing and waning regularly, but appearing 13 times as big, and affording her 13 times as much light as ſhe does us. When ſhe changes to us, the earth appears full to her; and when ſhe is in her firſt quarter to us, the earth is in its third quarter to her; and *vice verſa*.

But from one half of the moon the earth is never ſeen at all: from the middle of the other half, it is always ſeen over head; turning round almoſt 30 times as quick as the moon does. From the circle which limits our view of the moon, only one half of the earth's ſide next her is ſeen; the other half being hid below the horizon of all places on that circle. To her the earth ſeems to be the biggeſt body in the univerſe; for it appears 13 times as big as ſhe does to us.

As the earth turns round its axis, the ſeveral continents, ſeas, and iſlands, appear to the moon's inhabitants like ſo many ſpots of different forms and brightneſs, moving over its ſurface; but much fainter at ſome times than others, as our clouds cover them or leave them. By theſe ſpots the Lunarians can determine the time of the earth's diurnal motion, juſt as we do the motion of the ſun: and perhaps they meaſure their time by the motion of the earth's ſpots; for they cannot have a truer dial.

The moon's axis is ſo nearly perpendicular to the ecliptic, that the ſun never removes ſenſibly from her equator; and the obliquity of her orbit, which is next to nothing as ſeen from the ſun, cannot cauſe the ſun to decline ſenſibly from her equator. Yet her inhabitants are not deſtitute of means for aſcertaining the length of their year, though their method and ours muſt differ. We know the length of our year by the return of our equinoxes; but the Lunarians, having always equal day and night, muſt have recourſe to another method; and we may ſuppoſe, they meaſure their year by obſerving when either of the poles of our earth begins to be enlightened, and the other to diſappear, which is always at our equinoxes: they being conveniently ſituated for obſerving great tracts of land about our earth's poles, which are entirely unknown to us. Hence we may conclude, that the year is of the ſame abſolute length both to the earth and moon, though very different as to the number of days; we having 3^{d} 5^{h} natural days, and the Lunarians only 12^{d} $\frac{7}{9}$, every day and night in the moon being as long as 29$\frac{1}{2}$ on the earth.

The moon's inhabitants on the ſide next the earth may as eaſily find the longitude of their places as we can find the latitude of ours. For the earth keeping conſtantly, or very nearly ſo, over one meridian of the moon, the eaſt or weſt diſtances of places from that meridian are as eaſily found as we can find our diſtance from the equator by the altitude of our celeſtial poles.

As the ſun can only enlighten that half of the earth which is at any moment turned towards him, and being withdrawn from the oppoſite half, leaves it in darkneſs; ſo he likewiſe doth to the moon; only with this difference, that as the earth is ſurrounded by an atmoſphere, we have twilight after the ſun ſets; but if the moon has none of her own, nor is included in that of the earth, the lunar inhabitants have an immediate tranſition from the brighteſt ſun-ſhine to the blackeſt darkneſs.

Fig. 35. The moon being an opaque ſpherical body (for her hills take off no more from her roundneſs than the inequalities on the ſurface of an orange take off from its roundneſs), we can only ſee that part of the enlightened half of her which is towards the earth. And therefore, when the moon is at A, in conjunction with the ſun S, her dark half is towards the earth, and ſhe diſappears, as at *a*, there being no light on that half to render it viſible. When ſhe comes to her firſt octant at B, or has gone an eighth part of her orbit from her conjunction, a quarter of her enlightened ſide is towards the earth, and ſhe appears horned, as at *b*. When ſhe has gone a quarter of her orbit from between the earth and ſun to C, ſhe ſhows us one half of her enlightened ſide, as at *c*, and we ſay, ſhe is a quarter old. At D, ſhe is in her ſecond octant; and by ſhowing us more of her enlightened ſide ſhe appears gibbous, as at *d*. At E, her whole enlightened ſide is towards the earth; and therefore ſhe appears round, as at *e*; when we ſay it is full moon. In her third octant at F, part of her dark ſide being towards the earth, ſhe again appears gibbous, and is on the decreaſe, as at *f*. At G, we ſee juſt one half of her enlightened ſide; and ſhe appears half decreaſed, or in her third quarter, as at *g*. At H, we only ſee a quarter of her enlightened ſide, being in her fourth octant; where ſhe appears horned, as at *h*. And at A, having completed her courſe from the ſun to the ſun again, ſhe diſappears; and we ſay it is new moon. Thus, in going from A to E, the moon ſeems continually to increaſe; and in going from E to A, to decreaſe in the ſame proportion; having like phaſes at equal diſtances from A to E, but as ſeen from the ſun S ſhe is always full.

The moon appears not perfectly round when ſhe is full in the higheſt or loweſt part of her orbit, becauſe we have not a full view of her enlightened ſide at that time. When full in the higheſt part of her orbit, a ſmall deficiency appears on her lower edge; and the contrary when full in the loweſt part of her orbit.

It is plain by the figure, that when the moon changes to the earth, the earth appears full to the moon; and *vice verſa*. For when the moon is at A, new to the earth, the whole enlightened ſide of the earth is towards the moon; and when the moon is at E, full to the earth, its dark ſide is towards her. Hence a new moon anſwers to a full earth, and a full moon to a new earth. The quarters are alſo reverſed to each other.

The poſition of the moon's cuſps, or a right line touching the points of her horns, is very differently inclined to the horizon at different hours of the ſame days of her age. Sometimes ſhe ſtands, as it were, upright on her lower horn, and then ſuch a line is perpendicular to the horizon: when this happens, ſhe is in what the aſtronomers call *the nonageſimal degree*; which is the higheſt point of the ecliptic above the horizon at that time, and is 90 degrees from both ſides of the horizon where it is then cut by the ecliptic. But this never happens when the moon is on the meridian, except when ſhe is at the very beginning of Cancer or Capricorn.

That the moon turns round her axis in the time that ſhe goes round her orbit, is quite demonſtrable; for, a ſpectator at reſt, without the periphery of the moon's orbit, would ſee all her ſides turned regularly towards him in that time. She turns round her axis from any ſtar to the ſame ſtar again in 27 days 8 hours; from the ſun to the ſun again in 29$\frac{1}{2}$ days: the former is the length of her ſidereal day, and the latter the length of her ſolar day. A body moving round the ſun, would have a ſolar day in every revolution, without turning on its axis; the ſame as if it had kept all the while at reſt, and the ſun moved round it: but without turning round its axis it could never have one ſidereal day, becauſe it would always keep the ſame ſide towards any given ſtar.

If the earth had no annual motion, the moon would go round it ſo as to complete a lunation, a ſidereal, and a ſolar day, all in the ſame time. But, becauſe the earth goes forward in its orbit while the moon goes round the earth in her

orbit, the moon muſt go as much more than round her orbit from change to change in completing a ſolar day, as the earth has gone forward in its orbit during that time, *i. e.* almoſt a twelfth part of a circle.

If the earth had no annual motion, the moon's motion round the earth, and her track in open ſpace, would be always the ſame*. But as the earth and moon move round the ſun, the moon's real path in the heavens is very different from her viſible path round the earth; the latter being in a progreſſive circle, and the former in a curve of different degrees of concavity, which would always be the ſame in the ſame parts of the heavens, if the moon performed a complete number of lunations in a year without any fraction.

Let a nail in the end of the axle of a chariot-wheel repreſent the earth, and a pin in the nave the moon: if the body of the chariot be propped up ſo as to keep that wheel from touching the ground, and the wheel be then turned round by hand, the pin will deſcribe a circle both round the nail and in the ſpace it moves through. But if the props be taken away, the horſes put to, and the chariot driven over a piece of ground which is circularly convex; the nail in the axle will deſcribe a circular curve, and the pin in the nave will ſtill deſcribe a circle round the progreſſive nail in the axle, but not in the ſpace through which it moves. In this caſe, the curve deſcribed by the nail will reſemble in miniature as much of the earth's annual path round the ſun, as it deſcribes whilſt the moon goes as often round the earth as the pin does round the nail: and the curve deſcribed by the pin will have ſome reſemblance of the moon's path during ſo many lunations.

The moon's ſurface being ſo uneven, many have wondered why her edge appears not jagged, as well as the curve bounding the light and dark places. But if we conſider, that what we call the *edge* of the moon's diſk is not a ſingle line ſet round with mountains, in which caſe it would appear irregularly indented, but a large zone having many mountains lying behind one another from the obſerver's eye, we ſhall find that the mountains in ſome rows will be oppoſite to the vales in others; and ſo fill up the inequalities as to make her appear quite round: juſt as when one looks at an orange, although its roughneſs be very diſcernible on the ſide next the eye, eſpecially if the ſun or a candle ſhines obliquely upon that ſide, yet the line terminating the viſible part ſtill appears ſmooth and even.

Sect. VI. *Of the Ebbing and Flowing of the Sea, and the Phenomena of the Harveſt and Horizontal Moon.*

The cauſe of the tides was diſcovered by Kepler, who, in his *Introduction to the Phyſics of the Heavens*, thus explains it: "The orb of the attracting power which is in the moon, is extended as far as the earth; and draws the waters under the torrid zone, acting upon places where it is vertical, inſenſibly on confined ſeas and bays, but ſenſibly on the ocean, whoſe beds are large, and where the waters have the liberty of reciprocation, that is, of riſing and falling." And in the 70th page of his *Lunar Aſtronomy*—"But the cauſe of the tides of the ſea appears to be the bodies of the ſun and moon drawing the waters of the ſea." This hint being given, Newton improved it, and wrote ſo amply on the ſubject, as to make the theory of the tides in a manner quite his own, by diſcovering the cauſe of their riſing on the ſide of the earth oppoſite to the moon. For Kepler believed that the preſence of the moon occaſioned an impulſe which cauſed another in her abſence.

The waters at Z on the ſide of the earth ABCDEFGH next the moon M, (fig. 36.) are more attracted than the central parts of the earth O by the moon, and the central parts are more attracted by her than the waters on the oppoſite ſide of the earth at *n*: and therefore the diſtance between the earth's centre and the waters on its ſurface under and oppoſite to the moon will be increaſed. For, let there be three bodies at H, O, and D: if they are all equally attracted by the body M, they will all move equally faſt towards it, their mutual diſtances from each other continuing the ſame. If the attraction of M is unequal, then that body which is moſt ſtrongly attracted will move faſteſt, and this will increaſe its diſtance from the other body. M will attract H more ſtrongly than it does O, by which the diſtance between H and O will be increaſed; and a ſpectator on O will perceive H riſing higher toward Z. In like manner, O being more ſtrongly attracted than D, it will move farther towards M than D does: conſequently, the diſtance between O and D will be increaſed; and a ſpectator on O, not perceiving his own motion, will ſee D receding farther from him towards *n*; all effects and appearances being the ſame, whether D recedes from O, or O from D.

Suppoſe now there is a number of bodies, as A, B, C, D, E, F, G, H, placed round O, ſo as to form a flexible or fluid ring: then, as the whole is attracted towards M, the parts at H and D will have their diſtance from O increaſed; whilſt the parts at B and F being nearly at the ſame diſtance from M as O is, theſe parts will not recede from one another; but, rather, by the oblique attraction of M, they will approach nearer to O. Hence, the fluid ring will form itſelf into an ellipſe ZIBL*n*KFNZ, whoſe larger axis *n*OZ produced will paſs through M, and its ſhorter axis BOF will terminate in B and F. Let the ring be filled with fluid particles, ſo as to form a ſphere round O; then, as the whole moves towards M, the fluid ſphere being lengthened at Z and *n*, will aſſume an oblong or oval form. If M is the moon, O the earth's centre, ABCD EFGH the ſea covering the earth's ſurface, it is evident, by the above reaſoning, that whilſt the earth by its gravity falls towards the moon, the water directly below her at B will ſwell and riſe gradually towards her; alſo the water at D will recede from the centre (ſtrictly ſpeaking, the centre recedes from D), and riſe on the oppoſite ſide of the earth; whilſt the water at B and F is depreſſed, and falls below the former level. Hence as the earth turns round its axis from the moon to the moon again in 24$\frac{3}{4}$ hours, there will be two tides of flood and two of ebb in that time, as we find by experience.

As this explanation of the ebbing and flowing of the ſea is deduced from the earth's conſtantly falling towards the moon by the power of gravity, ſome may find a difficulty in conceiving how this is poſſible, when the moon is full, or in oppoſition to the ſun; ſince the earth revolves about the ſun, and muſt continually fall towards it, and therefore cannot fall contrary ways at the ſame time: or if the earth is conſtantly falling towards the moon, they muſt come together at laſt. To remove this difficulty, let it be conſidered, that it is not the centre of the earth that deſcribes the annual orbit round the ſun, but the common † centre of gravity of the earth and moon together: and that whilſt the earth is moving round the ſun, it alſo deſcribes a circle round that centre of gravity; going as many times round it in one revolution about the ſun as there are

* In this place, we may conſider the orbits of all the ſatellites as circular, with reſpect to their primary planets: becauſe the eccentricities of their orbits are too ſmall to affect the phenomena here deſcribed.

† This centre is as much nearer the earth's centre than the moon's as the earth is heavier, or contains a greater quantity of matter than the moon, namely, about 40 times. If both bodies were ſuſpended on it, they would hang *in æquilibrio*. So that

lunations or courſes of the moon round the earth in a year: and therefore the earth is conſtantly falling towards the moon from a tangent to the circle it deſcribes round the ſaid common centre of gravity. Let M be the moon, (fig. 37.) TW part of the moon's orbit, and C the centre of gravity of the earth and moon; whilſt the moon goes round her orbit, the centre of the earth deſcribes the circle *d g e* round C, to which circle *g a k* is a tangent; and therefore when the moon has gone from M to a little paſt W, the earth has moved from *g* to *e*; and in that time has fallen towards the moon, from the tangent at *a* to *e*: and ſo on round the whole circle.

The ſun's influence in raiſing the tides is but ſmall in compariſon of the moon's; for though the earth's diameter bears a conſiderable proportion to its diſtance from the moon, it is next to nothing when compared to its diſtance from the ſun. And therefore the difference of the ſun's attraction on the ſides of the earth under and oppoſite to him, is much leſs than the difference of the moon's attraction on the ſides of the earth under and oppoſite to her; and therefore the moon muſt raiſe the tides much higher than they can be raiſed by the ſun.

On this theory, the tides ought to be higheſt directly under and oppoſite to the moon; that is, when the moon is due north and ſouth. But we find, that in open ſeas, where the water flows freely the moon M is generally paſt the north and ſouth meridian of the place where it is high water. The reaſon is obvious: for though the moon's attraction was to ceaſe altogether when ſhe was paſt the meridian, yet the motion of aſcent communicated to the water before that time would make it continue to riſe for ſome time after; much more muſt it do ſo when the attraction is only diminiſhed; as a little impulſe given to a moving ball will cauſe it ſtill to move farther than otherwiſe it could have done; and as experience ſhows that the day is hotter about three in the afternoon, than when the ſun is on the meridian, becauſe of the increaſe made to the heat already imparted.

The tides anſwer not always to the ſame diſtance of the moon from the meridian at the ſame places; but are variouſly affected by the action of the ſun, which brings them on ſooner when the moon is in her firſt and third quarters, and keeps them back later when ſhe is in her ſecond and fourth; becauſe, in the former caſe, the tide raiſed by the ſun alone would be earlier than the tide raiſed by the moon; and, in the latter caſe, later.

The moon goes round the earth in an elliptic orbit; and therefore, in every lunar month, ſhe approaches nearer to the earth than her mean diſtance, and recedes farther from it. [illegible] long as ſhe is neareſt, ſhe attracts ſtrongeſt, and ſo raiſes the [illegible]oſt: the contrary happens when ſhe is fartheſt, becauſe of her weaker attraction. When both luminaries are in the equator, and the moon in perigee, or at her leaſt diſtance from the earth, ſhe raiſes the tides higheſt of all, eſpecially at her conjunction and oppoſition; both becauſe the equatorial parts have the greateſt centrifugal force from their deſcribing the largeſt circle, and from the concurring actions of the ſun and moon. At the change, the attractive forces of the ſun and moon being united, they diminiſh the gravity of the waters under the moon, and their gravity on the oppoſite ſide is diminiſhed by means of a greater centrifugal force. At the full, whilſt the moon raiſes the tide under and oppoſite to her, the ſun, acting in the ſame line, raiſes the tide under and oppoſite to him: whence their conjoint effect is the ſame as at the change; and, in both caſes, they occaſion what we call the *Spring Tides*. But at the quarters the ſun's action on the waters at O and H diminiſhes the effect of the moon's action on the waters at Z and N; ſo that they riſe a little under and oppoſite to the ſun at O and H, and fall as much under and oppoſite to the moon at Z and N; making what we call the *Neap Tides*, becauſe the ſun and moon then act croſs-wiſe to each other. But theſe tides happen not till ſome time after; becauſe in this, as in other caſes, the actions do not produce the greateſt effect when they are at the ſtrongeſt, but ſome time afterward.

The ſun, being nearer the earth in winter than in ſummer, is of courſe nearer to it in February and October than in March and September; and therefore the greateſt tides happen not till ſome time after the autumnal equinox, and return a little before the vernal.

The ſea, being thus put in motion, would continue to ebb and flow for ſeveral times, even though the ſun and moon were annihilated, or their influence ſhould ceaſe; as if a baſon of water were agitated, the water would continue to move for ſome time after the baſon was left to ſtand ſtill; or like a pendulum, which having been put in motion by the hand, continues to make ſeveral vibrations without any new impulſe.

When the moon is in the equator, the tides are equally high in both parts of the lunar day, or time of the moon's revolving from the meridian to the meridian again, which is 24 hours 50 minutes. But as the moon declines from the equator towards either pole, the tides are alternately higher and lower at places having north or ſouth latitude. For one of the higheſt elevations, which is that under the moon, follows her towards the pole to which ſhe is neareſt, and the other declines towards the oppoſite pole; each elevation deſcribing parallels as far diſtant from the equator, on oppoſite ſides, as the moon declines from it to either ſide; and conſequently the parallels deſcribed by theſe elevations of the water are twice as many degrees from one another as the moon is from the equator; increaſing their diſtance as the moon increaſes her declination, till it be at the greateſt, when the ſaid parallels are, at a mean ſtate, 47 degrees from one another: and on that day the tides are moſt unequal in their heights. As the moon returns towards the equator, the parallels deſcribed by the oppoſite elevations approach towards each other, until the moon comes to the equator, and then they coincide. As the moon declines towards the oppoſite pole, at equal diſtances, each elevation deſcribes the ſame parallel in the other part of the lunar day, which its oppoſite elevation deſcribed before. Whilſt the moon has north declination, the greateſt tides in the northern hemiſphere are when ſhe is above the horizon; and the reverſe whilſt her declination is ſouth.

In open ſeas, the tides riſe but to very ſmall heights in proportion to what they do in wide-mouthed rivers, opening in the direction of the ſtream of tide. For in channels growing narrower gradually, the water is accumulated by the oppoſition of the contracting bank: like a gentle wind, little felt on an open plain, but ſtrong and briſk in a ſtreet; eſpecially if the wider end of the ſtreet be next the plain, and in the way of the wind.

The tides are ſo retarded in their paſſage through different ſhoals and channels, and otherwiſe ſo variouſly affected by ſtriking againſt capes and headlands, that to different places they happen at all diſtances of the moon from the meridian, conſequently at all hours of the lunar day. The tide propagated by the moon in the German ocean, when ſhe is three

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dividing 240,000 miles, the moon's diſtance from the earth's centre, by 40, the exceſs of the earth's weight above the moon's, the quotient will be 6000 miles, which is the diſtance of the common centre of gravity of the earth and moon from the earth's centre.

hours paſt the meridian, takes 12 hours to come from thence to London bridge, where it arrives by the time that a new tide is raiſed in the ocean. There are no tides in lakes, becauſe they are generally ſo ſmall, that when the moon is vertical ſhe attracts every part of them alike; and therefore, by rendering all the water equally light, no part of it can be raiſed higher than another. The Mediterranean and Baltic ſeas have very ſmall elevations, becauſe the inlets by which they communicate with the ocean are ſo narrow, that they cannot, in ſo ſhort a time, receive or diſcharge enough to raiſe or ſink their ſurfaces ſenſibly.

Air being lighter than water, and the ſurface of the atmoſphere being nearer to the moon than the ſurface of the ſea, it cannot be doubted that the moon raiſes much higher tides in the air than in the ſea. And therefore many have wondered why the mercury does not ſink in the barometer when the moon's action on the particles of air makes them lighter as ſhe paſſes over the meridian. But we muſt conſider, that as theſe particles are rendered lighter, a greater number of them is accumulated, until the deficiency of gravity be made up by the height of the column; and then there is an equilibrium, and conſequently an equal preſſure upon the mercury as before; ſo that it cannot be affected by the aërial tides. It is very probable, however, that the ſtars which are ſeen through an aërial tide of this kind will have their light more refracted than thoſe which are ſeen through the common depth of the atmoſphere; and this may account for the ſuppoſed refractions by the lunar atmoſphere that have been ſometimes obſerved.

Of the Harveſt Moon.

From the revolution of the moon round the earth, it ſhould ſeem that there muſt be always a conſiderable difference in its time of riſing or ſetting in every ſucceeding day. But there are two periods in the year when this difference is obſerved to be much ſmaller than at other times; and the general employments in the country in theſe ſeaſons, have given riſe to the names of the harveſt and the hunter's moons. The reaſon of the moon at theſe periods riſing for ſeveral nights together at nearly the ſame time, will appear from a ſlight reflection on its ſituation.

The orbit of the moon is inclined at a very ſmall angle $5^\circ \frac{1}{2}$ to the ecliptic; and to make the explication eaſier, we will firſt ſuppoſe that the moon really moved in the ecliptic at the rate of $12^\circ\ 11'$ from the ſun every day. Different parts of the ecliptic make different angles with the horizon as they riſe or ſet; and the angle at riſing in northern latitudes is the leaſt when Aries riſes, and greateſt when Libra riſes. Conſequently, when the moon is in Aries, $12^\circ\ 11'$, or the daily motion of the moon, ſhe will riſe ſooner than when ſhe is in Libra. When the full moon is in the beginning of Aries or Libra, it ariſes at ſix o'clock; and the next night it will ariſe ſo much the later by the time which $12^\circ\ 11'$ takes in riſing, which is much leſs when in Aries than when in Libra or any of the intermediate ſigns; and conſequently the difference between the time of riſing for two ſucceeding nights will be leaſt when the moon is in the beginning of Aries. From Aries to Libra this difference continually increaſes, and from Libra to Aries continually decreaſes; and this phænomenon will be moſt obſerved therefore during the ſtay of the moon in the two ſigns of Piſces and Aries.

In the months of Auguſt and September the full moon riſes in theſe two ſigns: in other months the difference in its time of riſing is leſs noticed, either becauſe theſe two ſigns riſe in the day time, or at ſuch a time of night as to produce leſs beneficial effects to the inhabitants of the country.

As the moon does not move in the ecliptic, there will be a farther difference in her time of riſing from the inclination of her orbit: but as this is very ſmall, the difference will be very ſmall between the moon moving in her orbit, or as above deſcribed in the ecliptic. When ſhe is northward of the ecliptic ſhe riſes ſooner and ſets later than if ſhe moved in the ecliptic, and when ſhe is ſouthward of the ecliptic ſhe riſes ſooner and ſets later.

The ſun and moon generally appear larger when near the horizon than when at a diſtance from it; for which there have been various reaſons aſſigned. According to Ferguſon, "Theſe luminaries, although at great diſtances from the earth, appear floating as it were on the ſurface of our atmoſphere, a little way beyond the clouds; of which thoſe directly over our heads are nearer us than thoſe in the horizon. Therefore, when the ſun or moon appears in the horizon, they are not only ſeen in a part of the ſky which is really farther from us than if they were at any conſiderable altitude; but they are alſo ſeen through a greater quantity of air and vapours. Here we have two concurring appearances which deceive our imagination, and cauſe us to refer the ſun and moon to a greater diſtance at their riſing or ſetting, than when they are conſiderably high: firſt, their ſeeming to be on a more diſtant part of the atmoſphere; and, ſecondly, their being ſeen through a groſſer medium, which, by rendering them dimmer, cauſes us to imagine them to be at a yet greater diſtance. And as, in both caſes, they are ſeen much under the ſame angle, we naturally judge them to be largeſt when they ſeem fartheſt from us."

In the Philoſophical Tranſactions, vol. lxiv. is a diſſertation on this ſubject by Dunn, who was very attentive to the phænomenon, and made many judicious remarks upon it. He ſays, "Before ſun-riſing, when the ſun has been near the tropic, and the ſky, at the utmoſt extent of the horizon, hath appeared very clear; and when certain fogs have appeared in ſtrata placed alternately between the hills, and over intervening rivers, valleys, &c. ſo as to admit a ſight of the riſing ſun over thoſe fogs, I have obſerved the moſt diſtant trees and buſhments, which at other times have appeared ſmall to the naked eye; but while the ſun has been paſſing along a little beneath the horizon obliquely under them, juſt before ſun-riſing, when the ſun has been thus approaching towards trees and buſhments, they have grown apparently very large to the naked eye, and alſo through a teleſcope; and they have loſt that apparent largeneſs as the ſun has been paſſed by them. Thus a few trees ſtanding together on the riſing ground, at the diſtance of a few miles, have appeared to grow up into an apparent mountain. Such apparent mountains formed from trees put on all forms and ſhapes, as ſloping, perpendicular, over-leaning, &c. but ſoon recover their natural appearance when the ſun is paſſed by them, or got above the horizon.

"Mountains themſelves, at a diſtance, ſometimes appear larger than at other times. Beaſts and cattle in the midſt of, and being ſurrounded with, water, appear nearer to us than when no water ſurrounds them. Cattle, houſes, trees, all objects on the ſummit of a hill, when ſeen through a fog, and at a proper diſtance, appear enlarged. All bodies admit of larger apparent magnitude when ſeen through ſome mediums than others."

To aſcertain this more particularly, he took a cylindrical glaſs-veſſel about two feet high; and having graduated its ſides to inches, he placed it upright on a table, with a piece of paper under the bottom of the glaſs, on which paper were drawn parallel right lines at proper diſtances from each other; and having placed a ſhilling at the bottom of the veſſel, it was nearly as low as the paper. Pouring water into the veſſel, and viewing the ſhilling through the medium of water with one eye, whilſt he beheld with the other eye where the edges of the ſhilling were projected on the paper and its parallels, he

found the ſhilling appear larger at every additional inch depth of the water; and this was the caſe if either eye was uſed; and the ſame when the eye was removed far from the ſurface or near to it, or in any proportion thereto.

He then took large veſſels; and, filling them with water, placed different bodies at the bottoms of thoſe veſſels. It always followed, that the greater depth of water he looked through, in the direction from the eye to the objects in the water, the nearer thoſe objects appeared. Thus light bodies appeared more mellow and faint, and dark bodies rather better defined, than out of the water, when they were not deeply immerſed. And thus they appeared under whatever directions or poſitions he viewed the bodies.

He placed different bodies in proper veſſels of fair water, and immerſed his face in the water; viewing the bodies in and through the water. They all appeared plain, when not too far from the eye; and although a little hazy at the edges, they appeared much enlarged, and always larger through a greater depth of water. Thus a ſhilling appeared nearly as large as half-a-crown, with a red glowing arch on that ſide oppoſite to the ſun, when the ſun ſhined on the water. From this experiment he concluded, that divers ſee light objects not only larger, but very diſtinctly, in the water.

From theſe experiments he draws a confirmation of his doctrine, that the appearances treated of ariſe from the different ſtrata of the atmoſphere; and then concludes, that the rays coming from the ſun are by the horizontal vapours "firſt obſtructed, and many of them totally abſorbed; the reſt proceeding with a retarded motion, are thereby firſt reflected, and then leſs refracted through the humours of the eye; and, laſtly, that hereby the image on the retina becomes enlarged."

Sect. VII. *Of drawing a Meridian Line. Of Solar and Sidereal Time, and of the Equation of Time.*

1. Upon a plain board, ſet parallel to the horizon, (fig. 38.) deſcribe a circle ABF. And upon the centre C erect a ſtile or gnomon, exactly perpendicular to it, and ſo high, that the top of the ſhadow thereof may fall upon the circumference of the circle about the middle of the forenoon. Mark the point B exactly where the top of the ſhadow falls in the forenoon. Likewiſe mark the point F where the top of the ſhadow falls again on the circumference, in the middle of the afternoon. Then through the centre C, draw the line ACD, biſecting the arch BF. Then AD is the meridian required.

It will be proper to draw ſeveral concentric circles, and to make obſervation with them all, that they may confirm one another. And if the ſun happens to be clouded in one, it may anſwer in another. And it will be beſt to make the obſervation about the ſolſtices, when the ſun does not alter his declination ſenſibly. And the ſummer ſolſtice is to be preferred.

It is evident the ſun is higheſt when in the meridian; and at equal diſtances therefrom has equal altitudes. Therefore, when the diſtances DB, DF are equal, the ſhadows CB, CF will be equal, and therefore the altitudes equal. And the contrary.

2. Hang up two threads and plummets AB, CD, (fig. 39.) at a good diſtance, in veſſels of water, to keep them ſteady; of which CD is moveable towards the left and right, upon a pin C. Wait till the pole ſtar E, and the ſtar Allioth F (in the great bear's rump), come into the ſame plumb line AB, to an eye placed at I. At that inſtant (or rather before) move the thread CD alſo into the ſame line; ſo that the thread CD may hide the thread AB, and the pole ſtar E from the eye at I. Then the plane ABCD is the plane of the meridian; and where it interſects the horizontal plane, is the meridian line. And the ſame may be done with the ſtar called Caſſiopeia's hip.

Note, To take away the ſtar's rays, look through a ſmall hole in a thin plate. And this muſt be performed in a calm place.

Fig. 40. If you would have a meridian drawn in ſome other place, let the threads and plummets AB, CD, remain; and hang up two others *ab*, *cd*, in the place propoſed, letting *ab* be moveable upon a pin at *a*. Then wait till any ſtar as G comes into the plane ABCD, to the eye at H; and at that inſtant, move the thread *ab*, till the ſame ſtar G fall in the plane *abcd*, to the eye at *b*; then *abcd* is the plane of the meridian. This is beſt done by help of an aſſiſtant.

This method will in time deviate a little from the truth, occaſioned by the ſtars changing their places; but that change is very inconſiderable in a few years.

3. If you have a clock with minutes and ſeconds, find the northing of the ſtar Allioth F, by the aſtronomical tables; and wait till you find the pole ſtar E and F, in a plumb line. At that inſtant, ſet your clock to the ſaid time of northing. And next day at 12 o'clock, you may draw a meridian line, by the ſhadow of a plumb line hung in the ſun. Or you may find the time of ſouthing of any other ſtar G, and the clock remaining as before, when ſhe ſhews the time of ſouthing, place the threads *ab*, *cd*, ſo that the line *Gb* may paſs through them both. Then *abcd* will be in the plane of the meridian.

A meridian line being by either of theſe methods exactly drawn, the time when the ſun or any other of the celeſtial bodies is exactly in the meridian, may be found by a common quadrant, placing the edge of it along the line, and obſerving when the ſun or other luminary can be ſeen exactly through its two ſights, and noting exactly the time; which, ſuppoſing the luminary viewed to be the ſun, will be exactly noon, or 12 o'clock: but as the apparent diameter of the ſun is pretty large, it ought to be known exactly when his centre is in the meridian, which will be ſome ſhort ſpace after his eaſtern limb has arrived at it, and before his weſtern limb comes thither. It will be proper, therefore, to obſerve exactly the time of the two limbs being ſeen through the ſights of the quadrant; and the half of the difference between theſe times, added to the one or ſubtracted from the other, will give the exact time when the ſun's centre is in the meridian. What we ſay with regard to the ſun, is alſo applicable to the moon; but not to the ſtars, which have no ſenſible diameter.

By obſervation, it is found, that the ſtars appear to go round the earth in 23 hours 56 minutes 4 ſeconds, and the ſun in 24 hours: ſo that the ſtars gain three minutes 56 ſeconds upon the ſun every day, which amounts to one diurnal revolution in a year; and therefore, in 365 days, as meaſured by the returns of the ſun to the meridian, there are 366 days as meaſured by the ſtars returning to it: the former are called *ſolar days*, and the latter *ſidereal*.

If the earth had only a diurnal motion, without an annual, any given meridian would revolve from the ſun to the ſun again in the ſame quantity of time as from any ſtar to the ſame ſtar again; becauſe the ſun would never change his place with reſpect to the ſtars. But, as the earth advances almoſt a degree eaſtward in its orbit in the time that it turns eaſtward round its axis, whatever ſtar paſſes over the meridian on any day with the ſun, will paſs over the ſame meridian on the next day when the ſun is almoſt a degree ſhort of it; that is, 3 minutes 56 ſeconds ſooner. If the year contained only 360 days, as the ecliptic does 360 degrees, the ſun's apparent place, ſo far as his motion is equable, would change a degree every day; and then the ſidereal days would be juſt 4 minutes ſhorter than the ſolar.

The earth's motion on its axis being perfectly uniform

equal at all times of the year, the ſidereal days are always preciſely of an equal length; and ſo would the ſolar or natural days be, if the earth's orbit were a perfect circle, and its axis perpendicular to its orbit. But the earth's diurnal motion on an inclined axis, and its annual motion in an elliptic orbit, cauſe the ſun's apparent motion in the heavens to be unequal: for ſometimes he revolves from the meridian to the meridian again in ſomewhat leſs than 24 hours, ſhown by a well-regulated clock; and at other times in ſomewhat more: ſo that the time ſhown by an equal-going clock and a true ſun-dial is never the ſame but on the 15th of April, the 16th of June, the 31ſt of Auguſt, and the 24th of December. The clock, if it goes equably and true all the year round, will be before the ſun from the 24th of December till the 15th of April; from that time till the 16th of June, the ſun will be before the clock; from the 16th of June till the 31ſt of Auguſt, the clock will be again before the ſun; and from thence to the 24th of December, the ſun will be faſter than the clock.

As the equation of time, therefore, or difference between the time ſhown by a well-regulated clock and a true ſun dial, depends upon two cauſes, namely, the obliquity of the ecliptic, and the unequal motion of the earth in it, the united effects reſulting from their combination may be explained in the following manner.

Let ACB, ECD, (fig. 41, 42.) repreſent portions of the equator and ecliptic; A being the beginning of Cancer, and B the end of Sagittarius; and let S and *s* repreſent the ſun's place at different times. Draw AE, S*n*, *sm*, BD, at right angles to the equator, and let C*m* be always equal to CS or C*s*. If a body moved from E equably in the equator with the mean motion of the earth in its orbit, it is evident, that it would come every day to the meridian of any place exactly in the ſame time; and if the ſun moved thus in the equator, the ſolar days would be always equal. Let the ſun then be ſuppoſed to ſet off from the point A at the ſame time that this body moved from E, and let *o* mark the place of the latter correſponding to any ſituation S of the former. Since the apparent motion of the ſun is leaſt at A, C*m* will be greater than C*o*, but, from the nature of right angled triangles, C*n* being much leſs than CS will at firſt be leſs than C*o*. Now the points S and *n* come to the meridian at the ſame time, and the arc *no* gives the difference between the time of the ſun's and the body's appulſe to the meridian. This arc therefore meaſures the equation of time, and is to be added or ſubtracted according as the ſun or the body comes firſt to the meridian.

Firſt the point *o* will be to the weſt of *n*; but theſe points will after a ſhort time coincide, and their true and apparent time will be the ſame. From thence till the body comes to D it will be to the eaſt of the point marking the ſun's right aſcenſion. When the body arrives at D, the ſun will be at B; for they both paſs over a ſemicircle in the ſame time, and conſequently true and apparent time will again be the ſame. The ſun moving from Capricorn has a much greater velocity than the body, and conſequently *o* is to the weſt of *m*, and much more of *n*; but though the motion of the ſun is gradually retarded, it moves too faſt for *o* to overtake *m* before it comes to C; and a little beyond that point *n* and *o* will coincide, and true and apparent time will again be the ſame. From that point *o* gains upon *m*, and at E the three points will again coincide, and true and apparent time will again be the ſame.

Upon theſe principles tables for the equation of time are calculated, the one giving the difference between the ſun's true and mean motion, the other the difference between the ſun's longitude and right aſcenſion, from which the arc *no* is calculated by addition or ſubtraction. But the calculation cannot from the preceſſion of the equinoxes be depended upon for a conſiderable length of time.

Sect. VIII. *Of calculating the Diſtances, Magnitudes, &c. of the Sun, Moon, and Planets.*

This is accompliſhed by finding out the horizontal parallax of the body whoſe diſtance you deſire to know; that is, the angle under which the ſemidiameter of the earth would appear provided we could ſee it from that body; and in general the parallax of a planet is the difference between the real and apparent place of a planet, that is, between its place ſeen from ſome part of the ſurface, and from the centre of the earth: ſo that the parallax is the angle under which the ſemidiameter of the earth, terminated by the place of an obſerver, is ſeen at the planet; and to find this parallax many methods have been deviſed.

1. Let AD be the earth, (fig. 43.) C its centre, P the planet; and let the planet's diſtance CP from the centre of the earth be given. Then ZAP is the complement of the apparent altitude, ZCP the complement of the true altitude. Then it will be, as the planet's diſtance from the centre of the earth CP: to the earth's radius AC:: ſo the coſine of the apparent altitude, S.ZAP: to the ſine of the parallax.

For draw AF parallel to CP. Then angle FAP is equal to the angle APC. But ZAF is equal to ZCP, the true zenith diſtance, and ZAP is the apparent zenith diſtance; and their difference FAP or its equal APC is the parallax. But in the triangle CAP, it is CP: S.CAP or ZAP:: CA: S.CPA or PAF the parallax.

2. If the diſtances of two planets or ſtars, having the ſame apparent altitude, be known, and the parallax of one of them.

Let P and G be the planets in the line APG; then APC is the parallax of P, and AGC the parallax of G. Therefore in the triangle CPG, we have CP, CG, and an angle oppoſite, ſuppoſe G, to find the other oppoſite angle. Therefore diſtance CP: diſtance CG:: S.CGP: S.CPG or CPA; that is, the ſines of the parallaxes are reciprocally as the diſtances from the earth's centre.

3. Let S be the ſtar or planet, whoſe parallax is ſought. (Fig. 44.) Obſerve it when it is in the ſame vertical circle with any two fixed ſtars, A, B. Obſerve again when the ſame two ſtars come into a poſition parallel to the horizon at *a* and *b*; and let the planet be come to *s*. Then with an inſtrument meaſure the altitude of *a* or *b*, and likewiſe the altitude of *s*; and the difference of theſe altitudes is the parallax.

For the real place of the ſtar S is ſomewhere in the line AB, and therefore it is alſo ſomewhere in the line *ab*, and therefore its altitude is the ſame as that of *a* or *b*. Therefore the parallax is the difference of the altitudes of *a* and *s*, or of *b* and *s*.

4. Let S be the ſtar or planet; obſerve its diſtance from any fixed ſtar B, which is in the ſame vertical circle ZSB; and meaſure the diſtance SB with an inſtrument. Then obſerve again when the ſame two ſtars have equal altitudes above the horizon, at *b* and *s*, and then take the diſtance *bs*. This diſtance will be very near the true diſtance of the ſtars B and S; therefore the firſt diſtance BS ſubtracted from the latter diſtance *bs* (when B is below S), gives the parallax; or the latter diſtance ſubtracted from the former, when B is above S, gives the parallax.

5. The parallax may be found by obſerving the azimuth and altitude of the ſtar or planet. Let HZO (fig. 45.) be the meridian, EQ the equinoctial, HO the horizon, Z the zenith, P the pole, S the ſtar, ZSB a vertical circle paſſing through it. Obſerve the altitude BS, and the azimuth BO, and mark the moment

of time when these observations are made; then observe the moment of time that the star comes to the meridian, and then you have the distance of time from the observations. Convert this into degrees, allowing only 23 hours 56 minutes to 360 degrees (which is the time of the earth's rotation to the same star), and you have the arch ED or angle EPA, opposing PAD an hour circle. Therefore in the spherical triangle ZPA, we have the angle ZPA, and angle PZA equal to BO, and the side ZP the co-latitude, to find the side ZA the complement of the altitude; this subtracted from ZS, known by observation, the remainder AS is the parallax.

6. This is to be done with a telescope with cross hairs in the focus. Direct the telescope to the planet, and turn it round till its motion is along one of the cross hairs, which represents part of the planet's parallel circle; and the other hair perpendicular to it, will represent its hour circle. Observe the time when the planet comes to this hour circle, there fix the telescope, and then take its altitude; then observe the time when some fixed star, whose right ascension is known, comes to the same hour circle. The difference of time between the planet and star coming to this hour circle, turned into degrees (allowing 360 degrees to 23 hours, 56 minutes), gives the difference of right ascensions of the planet and star; and so the apparent right ascension of the planet is known. Again, when the planet comes to the meridian, observe it with the telescope, and note the time; and when the star comes to the meridian, note the time of that: then the difference of the times reduced to degrees as before, gives the true difference of right ascensions, so the true right ascension of the planet will be known. Therefore (fig. 46.) let HO be the horizon, HZO the meridian, Z the zenith, P the pole, A the true place of the planet, S its apparent place, ZSB a vertical circle; then in the triangle ZPS, we have ZP, ZS, and angle ZPS to find the angle PZS. In the triangle ZPA, we have ZP, angles ZPA, PZA; to find ZA, which taken from ZS, gives AS the parallax.

If the planet have a proper motion of its own, its true place will be always changing; and therefore the change of place must be computed for the time of the observations. This is done by observing its place when in the meridian, twice; and thence the change of place is had for 24 hours: and therefore the place at the times of observations will be had by proportioning the motion according to the times.

Here the angle ZPS should be about 90 degrees, to have APS the greatest possible.

7. This (fig. 47.) requires two observers in different places of the earth, and can be applied to none of the planets but Mars in opposition to the Sun, or to Venus in the Sun's disk. Let PERQ be the earth, PR its axis, EQ the equinoctial, S the planet Mars in opposition to the Sun, and if near the perihelion, it is better. And this will be best done when the Sun is about the equinoxes. Let there be taken two places, F, G, one in north latitude, the other in south latitude, and the further from the equinoctial the better, and nearly in the same meridian, or rather so placed, that the line FG drawn from one to the other may be nearly perpendicular to the orbit of Mars. By this means we have a greater base to work upon. Then let the two observers pitch upon some fixed star as A, which Mars in his motion comes very near at that time; and the nearer the better. And having two good instruments perfectly alike, furnished with micrometers, and being situated at F and G; let them observe for several nights successively about midnight, the places of Mars at B and C, as it passes by the star A; and take the distances AB and AC every night, during his transit by this star. These observations are to be continued till the distances begin to increase, and no longer; for then he is past the star. From this number of observations, the nearest distance of Mars from the star A may be found, as observed from the places F and G; at least they may be found by interpolation. Let these nearest distances be AB and AC, then we have the difference BC, or the angle BSC or FSG. And from the situation of the places F and G, the length and position of FG will be known; and by these, FS may be found. And lastly, the angle which the radius of the earth subtends at the distance FS, or the horizontal parallax of Mars will be known.

If, instead of Mars, Venus be observed in the body of the Sun; then her nearest distances from either limb of the Sun must be taken, whose difference will give the angle at Venus, subtended by FG, the rest as before; so the parallax of Venus will be obtained.

The parallax of Mars, when nearest the earth, has been found 25, 27, and 30 seconds at different times.

A star or planet appears lower than it really is by the quantity of the parallax, which is greater the lower the star is; and therefore the horizontal parallax is the greatest.

The parallaxes of two planets are as the cosines of the apparent altitudes directly, and their distances from the earth's centre reciprocally.

For when the distance is given, the parallax is as the sine of the zenith distance (by method 1.) and if the apparent altitude be given, the parallax is reciprocally as the distance, by method 2, and therefore is in a compound ratio, when neither is given. Here the parallax being very small, one may take the parallax itself for the sine of the parallax.

The parallax of a planet being known, its distance may be found.

For this is only working backward, saying, As sine of the parallax, to the earth's radius; so S. zenith distance, to the planet's distance.

Having the parallax of any of the planets, the distances of all the planets from the sun may be known, in diameters of the earth, or any sort of measure.

For the distances of the planets from the sun and from one another, are known in some assumed measure; and by the parallax of a planet, the true distance of the earth from it is known: and therefore all the other distances will be known by proportion.

With regard to the fixed stars, no method of ascertaining their distance hath hitherto been found out. Those who have formed conjectures concerning them, have thought that they were at least 400,000 times farther from us than we are from the sun.

Herschel has proposed a method of ascertaining the parallax of the fixed stars, something similar, but more complete, than that mentioned by Galileo and others; for it is by the parallax of the fixed stars that we should be best able to determine their distance. The method pointed out by Galileo, and first attempted by Hooke, Flamstead, Molineux, and Bradley, of taking distances of stars from the zenith that pass very near it, has given us a much juster idea of the immense distance of the stars, and furnished us with an approximation to the knowledge of their parallax, that is much nearer the truth than we ever had before. But Herschel mentions the insufficiency of their instruments, which were similar to the present zenith sectors, the method of zenith distances being liable to considerable errors on account of refraction, the change of position of the earth's axis arising from nutation, precession of the equinoxes, and other causes, and the aberration of light. The method of his own is by means of double stars; which is exempted from these errors, and of such a nature that the annual parallax, even if it should not exceed the tenth part of a second, may still become more visible, and be ascertained, at least to a much greater degree of approximation than it has ever been done. This method is capable of every improvement which the tele-

ſcope and mechaniſm of micrometers can furniſh; but as it goes on preſumptions which can hardly lead to any firm conviction, we are not likely to gain any farther knowledge than that the ſtars are at too great diſtance to be ſubjected as yet to our calculations. He ſuppoſes firſt, that the ſtars are one with another about the ſize of the ſun; and ſecondly, that the difference of their apparent magnitudes is owing to their apparent diſtances; neither of which ſuppoſitions will a philoſopher be inclined to acquieſce in from the analogy he has obſerved in nature.

The ſtars, on account of their apparently various magnitudes, have been diſtributed into ſeveral claſſes, or orders. Thoſe which appear largeſt are called *ſtars of the firſt magnitude*; the next to them in luſtre, *ſtars of the ſecond magnitude*; and ſo on to the *ſixth*, which are the ſmalleſt that are viſible to the bare eye. This diſtribution having been made long before the invention of teleſcopes, the ſtars which cannot be ſeen without the aſſiſtance of theſe inſtruments are diſtinguiſhed by the name of *teleſcopic ſtars*.

The ancients divided the ſtarry ſphere into particular conſtellations, or ſyſtems of ſtars, according as they lay near one another, ſo as to occupy thoſe ſpaces which the figures of different ſorts of animals or things would take up, if they were there delineated. And thoſe ſtars which could not be brought into any particular conſtellation were called *unformed ſtars*.

This diviſion of the ſtars into different conſtellations, or aſteriſms, ſerves to diſtinguiſh them from one another, ſo that any particular ſtar may be readily found in the heavens by means of a celeſtial globe; on which the conſtellations are ſo delineated, as to put the moſt remarkable ſtars into ſuch parts of the figures as are moſt eaſily diſtinguiſhed. The number of the ancient conſtellations is 48, and upon our preſent globes about 70. On Senex's globes are inſerted Bayer's letters; the firſt in the Greek alphabet being put to the biggeſt ſtar in each conſtellation, the ſecond to the next, and ſo on; by which means every ſtar is as eaſily found as if a name were given to it. Thus, if the ſtar γ in the conſtellation of the ram be mentioned, every aſtronomer knows as well what ſtar is meant as if it were pointed out to him in the heavens. See fig. 48, 49, where the ſtars are repreſented with the figures of the animals from whence the conſtellations are marked.

There is alſo a diviſion of the heavens into three parts. 1. The zodiac (ζωδιακος), from ζωδιον, *zodion*, an animal, becauſe moſt of the conſtellations in it, which are 12 in number, have the names of animals: as *Aries* the ram, *Taurus* the bull, *Gemini* the twins, *Cancer* the crab, *Libra* the balance, *Scorpio* the ſcorpion, *Sagittarius* the archer, *Capricornus* the goat, *Aquarius* the water-bearer, and *Piſces* the fiſhes. The zodiac goes quite round the heavens: it is about 16 degrees broad, ſo that it takes in the orbits of all the planets, and likewiſe the orbit of the moon. Along the middle of this zone or belt is the ecliptic, or circle which the earth deſcribes annually as ſeen from the ſun, and which the ſun appears to deſcribe as ſeen from the earth. 2. All that region of the heavens which is on the north ſide of the zodiac, containing 21 conſtellations. And, 3. That on the ſouth ſide, containing 15.

The names of the conſtellations, and the number of ſtars obſerved in each of them by different aſtronomers, are as follow:

The Ancient Conſtellations.

		Ptolemy.	*Tycho.*	*Hevelius.*	*Flamſtead.*
Urſa minor	The Little Bear	8	7	12	24
Urſa major	The Great Bear	35	29	73	87
Draco	The Dragon	31	32	40	80
Cepheus	Cepheus	13	4	51	35
Bootes, *Arctophilax*		23	18	52	54
Corona Borealis	The Northern Crown	8	8	8	21
Hercules, *Engonaſin*	Hercules kneeling	29	28	45	113
Lyra	The Harp	10	11	17	21
Cygnus, *Gallina*	The Swan	10	18	47	81
Caſſiopeia	The Lady in her Chair	13	26	37	55
Perſeus	Perſeus	29	29	46	59
Auriga	The Waggoner	14	9	40	66
Serpentarius, *Opiuchus*	Serpentarius	29	15	40	74
Serpens	The Serpent	18	13	22	64
Sagitta	The Arrow	5	5	5	18
Aquila, *Vultur*	The Eagle	15	12	23	71
Antinous	Antinous		3	19	
Delphinus	The Dolphin	10	10	14	18
Equulus, *Equi ſectio*	The Horſe's Head	4	4	6	10
Pegaſus, *Equus*	The Flying Horſe	20	19	38	89
Andromeda	Andromeda	23	23	47	66
Triangulum	The Triangle	4	4	12	16
Aries	The Ram	18	21	27	66
Taurus	The Bull	44	43	51	141
Gemini	The Twins	25	25	38	85
Cancer	The Crab	23	15	29	83
Leo	The Lion	35	30	49	95
Coma Berenices	Berenice's Hair		14	21	43
Virgo	The Virgin	32	33	50	110
Libra, *Chelæ*	The Scales	17	10	20	51
Scorpius	The Scorpion	24	10	20	44
Sagittarius	The Archer	31	14	22	69
Capricornus	The Goat	28	28	29	51
Aquarius	The Water-bearer	45	41	47	108

		Ptolemy.	*Tycho.*	*Hevelius.*	*Flamſteed.*
Piſces — —	The Fiſhes — — —	38	36	39	113
Cetus — —	The Whale — — —	22	21	45	97
Orion — —	Orion — — —	38	42	62	78
Eridanus, *Fluvius*	Eridanus, *the River* — —	34	10	27	84
Lepus — —	The Hare — — —	12	13	16	19
Canis major —	The Great Dog — —	29	13	21	31
Canis minor —	The Little Dog — —	2	2	13	14
Argo Navis —	The Ship — — —	45	3	4	64
Hydra — —	The Hydra — — —	27	19	31	60
Crater —. —	The Cup — — —	7	3	19	31
Corvus — —	The Crow — — —	7	4		9
Centaurus — —	The Centaur — —	37			35
Lupus — —	The Wolf — — —	19			24
Ara — —	The Altar — — —	7			9
Corona Auſtralis —	The Southern Crown —	13			12
Piſcis Auſtralis —	The Southern Fiſh — —	18			24

The New Southern Conſtellations.

Columba Noachi —	Noah's Dove —	10	Apis, *Muſca* —	The Bee or Fly —	4
Robur Carolinum	The Royal Oak —	12	Chamæleon — —	The Chameleon —	10
Grus — —	The Crane — —	13	Triangulum Auſtralis	The South Triangle —	5
Phœnix — —	The Phœnix —	13	Piſcis volans, *Paſſer*	The Flying Fiſh —	8
Indus — —	The Indian — —	12	Dorado, *Xiphias* —	The Sword Fiſh —	6
Pava — —	The Peacock —	14	Toucan — —	The American Gooſe	9
Apus, *Avis Indica*	The Bird of Paradiſe	11	Hydrus — —	The Water Snake —	10

Hevelius's Conſtellations made out of the unformed Stars.

		Hevel.	*Flamſt.*			*Hevel.*	*Flamſt.*
Lynx — —	The Lynx —	19	44	Scutum Sobieſki	Sobieſki Shield —	7	
Leo minor —	The Little Lion —		53	Lacerta —	The Lizard —	10	16
Aſterion and Chara	The Greyhounds	23	25	Camelopardalus	The Camelopard	32	58
Cerberus —	Cerberus —	4		Monoceros —	The Unicorn —	19	31
Vulpeeula and Anſer	The Fox and Gooſe	27	35	Sextans —	The Sextant —	11	41

The obliquity of the ecliptic to the equinoctial is found at preſent to be above the third part of a degree leſs than Ptolemy found it. And moſt of the obſervers after him found it to decreaſe gradually down to Tycho's time. If it be objected, that we cannot depend on the obſervations of the ancients, becauſe of the incorrectneſs of their inſtruments, we have to anſwer, that both Tycho and Flamſtead are allowed to have been very good obſervers; and yet we find that Flamſtead makes this obliquity 2½ minutes of a degree leſs than Tycho did about 100 years before him; and as Ptolemy was 1324 years before Tycho, ſo the gradual decreaſe anſwers nearly to the difference of time between theſe three aſtronomers. If we conſider, that the earth is not a perfect ſphere, but an oblate ſpheroid, having its axis ſhorter than its equatorial diameter; and that the ſun and moon are conſtantly acting obliquely upon the greater quantity of matter about the equator, pulling it, as it were, towards a nearer and nearer coincidence with the ecliptic; it will not appear improbable that theſe actions ſhould gradually diminiſh the angle between thoſe planes. Nor is it leſs probable that the mutual attractions of all the planets ſhould have a tendency to bring their orbits to a coincidence: but this change is too ſmall to become ſenſible in many ages.

SECT. IX. *Of calculating the periodical Times, Places, &c. of the Sun, Moon, and Planets: Delineation of the Phaſes of the Moon for any particular Time; and the Conſtruction of Aſtronomical Tables.*

THIS title includes almoſt all of what may be called the *Practical part of Aſtronomy*; and as it is by far the moſt difficult and abſtruſe, ſo the thorough inveſtigation of it would neceſſarily lead us into very deep geometrical demonſtrations. The great labours of former aſtronomers have left little for ſucceeding ones to do in this reſpect: tables of the motions of all the celeſtial bodies have been made long ago, the periodical times, eccentricities, &c. of the planets determined; and as we ſuppoſe few will deſire to repeat theſe laborious operations, we ſhall here content ourſelves with giving ſome general hints of the methods by which theſe things have been originally accompliſhed, that ſo the operations of the young aſtronomer who makes uſe of tables already formed to his hand may not be merely mechanical.

It hath been already obſerved, that the foundation of all aſtronomical operations was the drawing a meridian line. This being done, the next thing is to find out the latitude of the place where the obſervations are to be made, and for which the meridian line is drawn. Now the latitude of a place is equal to the elevation either of the north or ſouth pole above the horizon; but as there is no ſtar exactly in either of the celeſtial poles, to find the altitude of that inviſible point called the *Pole of the heavens*, we muſt chooſe ſome ſtar near it which does not ſet; and having found its greateſt and leaſt altitudes, divide their difference by 2; and half that difference added to the leaſt, or ſubtracted from the greateſt, altitude of the ſtar, gives the exact altitude of the pole or altitude of the place. Thus, ſuppoſe the greateſt altitude of the ſtar obſerved is 60° and its leaſt 50°, we then know that the latitude of the place where the obſervation was made is exactly 55°.

The latitude being once found, the obliquity of the ecliptic, or the angle made by the ſun's annual path with the earth's equa-

tor, is eaſily obtained by the following method. Obſerve, about the ſummer ſolſtice, the ſun's meridian diſtance from the zenith, which is eaſily done by a quadrant with a moveable index furniſhed with ſights; if this diſtance is ſubtracted from the latitude of the place, provided the ſun is nearer the equator than the place of obſervation, the remainder will be the obliquity of the ecliptic: but if the place of obſervation is nearer the equator than the ſun at that time, the zenith diſtance muſt be added. By this method, the obliquity of the ecliptic hath been determined to be 23° 29′.

By the ſame method the declination of the ſun from the equator for any day may be found, and thus a table of his declination for every day in the year might be conſtructed: thus alſo the declination of the ſtars might be found.

Having the declination of the ſun, his right aſcenſion and place in the ecliptic may be geometrically found by the ſolution of a caſe in ſpherical trigonometry. For let EQ (fig. 50) repreſent the celeſtial equator, y the ſun, and γX the ecliptic; then, in the right-angled ſpherical triangle Eγy, we have the ſide Ey, equal to the ſun's declination: the angle Eγy is always 23° 29′, being the angle of the ecliptic with the equator; and the angle yEγ is 90°, or a right angle. From theſe data we can find the ſide Eγ the right aſcenſion; and γy the ſun's place in the ecliptic, or his diſtance from the equinoctial point; and thus a table of the ſun's place for every day in the year, anſwerable to his declination, may be formed.

Having the ſun's place in the ecliptic, the right aſcenſion of the ſtars may be found by the help of it, and a good pendulum clock; for which purpoſe the motion of the clock muſt be ſo adjuſted, that the hand may run through the 24 hours in the ſame time that a ſtar leaving the meridian will arrive at it again; which time is ſomewhat ſhorter than the natural day, becauſe of the ſpace the ſun moves through in the mean time eaſtward. The clock being thus adjuſted, when the ſun is in the meridian, fix the hand to the point from whence we are to begin to reckon our time; and then obſerve when the ſtar comes to the meridian, and mark the hour and minute that the hand then ſhows: the hours and minutes deſcribed by the index, turned into degrees and minutes of the equator, will give the difference between the right aſcenſion of the ſun and ſtars; which difference, being added to the right aſcenſion of the ſun, will give the right aſcenſion of the ſtar. Now, if we know the right aſcenſion of any one ſtar, we may from it find the right aſcenſions of all the others which we ſee, by marking the time upon the clock between the arrival of a ſtar whoſe right aſcenſion we know to the meridian, and another ſtar whoſe aſcenſion is to be found. This time converted into hours and minutes of the equator, will give the difference of right aſcenſions; from whence, by addition, we collect the right aſcenſion of the ſtar which was to be found out.

The right aſcenſion and declination of a ſtar being known, its longitude and latitude, or diſtance from the firſt ſtar of Aries, and north or ſouth from the ecliptic, may thence be eaſily found; and the places of the fixed ſtars being all marked in a catalogue according to their longitudes and latitudes, it may thence be conceived how the longitude and latitude of a planet or comet may be found for any particular time by comparing its diſtance from them, and its apparent path may thus be traced; and thus the paths of Mercury and Venus were traced by M. Caſſini.

With regard to the planets, the firſt thing to be done is to find out their periodical times, which is done by obſerving when they have no latitude. At that time the planet is in the ecliptic, and conſequently in one of its nodes; ſo that, by waiting till it returns to the ſame node again, and keeping an exact account of the time, the periodical time of its revolution round the ſun may be known pretty exactly. By the ſame obſervations, from the theory of the earth's motion we can find the poſition of the line of the nodes; and when once the poſition of this line is found, the angle of inclination of that planet's orbit to the earth may alſo be known.

The eccentricity of the earth's orbit may be determined by obſerving the apparent diameters of the ſun at different times: when the ſun's diameter is leaſt, the earth is at the greateſt diſtance; and when this diameter is greateſt, the earth is at its leaſt diſtance from him. But as this method muſt neceſſarily be precarious, another is recommended by Keil, by obſerving the velocity of the earth in its orbit, or the apparent velocity of the ſun, which is demonſtrated to be always reciprocally as the ſquare of the diſtance.

The eccentricities of the orbits of the other planets may be likewiſe found by obſerving their velocities at different times; for all of them obſerve the ſame proportions with regard to the increaſe or decreaſe of their velocity that the earth does; only, in this caſe, care muſt be taken to obſerve the real, not the apparent, velocities of the planets, the laſt depending on the motion of the earth at the ſame time. Their aphelia, or points of their orbits where they are fartheſt from the ſun, may be known by making ſeveral obſervations of their diſtances from him, and thus perceiving when theſe diſtances ceaſe to increaſe.

The poſition of the aphelion being determined, the planet's diſtance from it at any time may alſo be found by obſervation, which is called its *true* or *coequated* anomaly; but by ſuppoſing the motion of the planet to be regular and uniform, tables of that motion may eaſily be conſtructed. From thence the planet's mean place in its orbit may be found for any moment of time; and one of theſe moments being fixed upon as an epocha or beginning of the table, it is eaſy to underſtand, that from thence tables of the planet's place in its orbit for any number of years either preceding or conſequent to that period may be conſtructed. Theſe tables are to be conſtructed according to the meridian of equal time, and not true or apparent time, becauſe of the inequalities of the earth's motion as well as of that of the planet, and equations muſt be made to be added to or ſubtracted from the mean motion of the planet as occaſion requires; which will be readily underſtood from what we have already mentioned concerning the unequal motion of the earth in its orbit. When all the neceſſary tables are conſtructed by this or ſimilar methods, the calculating of the planetary places becomes a mere matter of mechaniſm, and conſiſts only in the proper additions and ſubtractions according to the directions always given along with ſuch tables. It muſt be obſerved, however, that the accidental interference of the planets with one another by their mutual attractions, renders it impoſſible to conſtruct any tables that ſhall remain equally perfect; and therefore frequent actual obſervations and corrections of the tables will be neceſſary. This diſturbance, however, is inconſiderable, except in the planets Jupiter and Saturn, and they are in conjunction only once in 800 years.

What hath been already mentioned with regard to the planets, is alſo applicable to the moon; but with more difficulty, on account of the greater inequalities of her motions, the cauſe of which has been already explained. From theſe irregularities it may well be concluded, that the calculation of the moon's place in her orbit is a very difficult matter; and indeed, before Newton, aſtronomers in vain laboured to ſubject the lunar irregularities to any rule. By his labours, however, and thoſe of other aſtronomers, theſe difficulties are in a great meaſure overcome; and calculations with regard to this luminary may be made with as great certainty as concerning any other. Her periodical time may be determined from the obſervation of two lunar eclipſes, at as great a diſtance from one another as poſſible; for in the middle of every lunar eclipſe, the moon is

exactly in oppoſition to the ſun. Compute the time between theſe two eclipſes or oppoſitions, and divide this by the number of lunations that have intervened, and the quotient will be the ſynodical month, or time the moon takes to paſs from one conjunction to another, or from one oppoſition to another. Compute the ſun's mean motion in the time of the ſynodical month, and add this to the entire circle deſcribed by the moon. Then, as that ſum is to 360°, ſo is the quantity of the ſynodical month to the periodical, or time that the moon takes to move from one point of her orbit to the ſame point again. Thus, Copernicus, in the year 1500, November 6th, at 2 hours 20 minutes, obſerved an eclipſe of the moon at Rome; and Auguſt 1ſt, 1523, at 4 hours 25 minutes, another at Cracow: hence the quantity of the ſynodical month is thus determined:

	Y.	D.	H.	M.
Obſerv. 2d	1523	237	4	25
Obſerv. 1ſt	1500	310	2	20
Interval of time -	22	292	2	5
Add the intercalary days for leap years		5		
Exact interval -	22	297	2	5, or 11991005′.

This interval divided by 282, the number of months elapſed in that time, gives 29 days 12 hours 41 minutes for the length of the ſynodical month. But from the obſervations of two other eclipſes, the ſame author more accurately determined the quantity of the ſynodical month to be 29 degrees 11 hours 45 minutes 3 ſeconds; from whence the mean periodical time of the moon comes to 27 degrees 7 hours 43 minutes 5 ſeconds, which exactly agrees with the obſervations of later aſtronomers.

The quantity of the periodical month being given, we may find the moon's diurnal and horary motion; and thus may tables of the moon's mean motion be conſtructed: and if from the moon's mean diurnal motion that of the ſun be ſubtracted, the remainder will be the moon's mean diurnal motion from the ſun.

Having the moon's diſtance from the ſun, her phaſis for that time may be eaſily delineated by the following method laid down by Keil: Let the circle COBP (fig. 51, 52.) repreſent the diſk of the moon, which is turned towards the earth; and let OP be the line in which the ſemicircle OMP is projected, which ſuppoſe to be cut by the diameter BC at right angles; and making LP the radius, take LF equal to the coſine of the elongation of the moon from the ſun: and then upon BC, as the great axis, and LF the leſſer axis, deſcribe the ſemi-ellipſe BFC. This ellipſe will cut off from the diſk of the moon the portion BFCP of the illuminated face, which is viſible to us from the earth.

Since in the middle of a total eclipſe the moon is exactly in the node, if the ſun's place be found for that time, and ſix times added to it, if the eclipſe is a lunar one the ſun will give the place of the node, or if the eclipſe obſerved is a ſolar one, the place of the node and of the ſun are the ſame. From comparing two eclipſes together, the mean motion of the nodes will thus be found out. The apogee of the moon may be known from her apparent diameter, as already obſerved; and by comparing her place when in the apogee at different times, the motion of the apogee itſelf may alſo be determined.

Theſe ſhort hints will be ſufficient to give a general knowledge of the methods uſed for the ſolution of ſome of the moſt difficult problems in aſtronomy.

Sect. X. *Of Eclipſes.*

Every planet and ſatellite is illuminated by the ſun; and caſts a ſhadow towards that point of the heavens which is oppoſite to the ſun. This ſhadow is nothing but a privation of light in the ſpace hid from the ſun by the opaque body that intercepts his rays.

When the ſun's light is ſo intercepted by the moon, that to any place of the earth the ſun appears partly or wholly covered, he is ſaid to *undergo an eclipſe*; though, properly ſpeaking, it is only an eclipſe of that part of the earth where the moon's ſhadow or penumbra falls. When the earth comes between the ſun and moon, the moon falls into the earth's ſhadow; and having no light of her own, ſhe ſuffers a real eclipſe from the interception of the ſun's rays. When the ſun is eclipſed to us, the moon's inhabitants, on the ſide next the earth, ſee her ſhadow like a dark ſpot travelling over the earth, about twice as faſt as its equatorial parts move, and the ſame way as they move. When the moon is in an eclipſe, the ſun appears eclipſed to her, total to all thoſe parts on which the earth's ſhadow falls, and of as long continuance as they are in the ſhadow.

If the earth and ſun were equally large, the earth's ſhadow would be infinitely extended, and all of the ſame bulk; and the planet Mars, in either of its nodes, and oppoſite to the ſun, would be eclipſed in the earth's ſhadow. Were the earth larger than the ſun, its ſhadow would increaſe in bulk the farther it extended, and would eclipſe the great planets Jupiter and Saturn, with all their moons, when they were oppoſite to the ſun. But as Mars, in oppoſition, never falls into the earth's ſhadow, although he is not then above 42,000,000 miles from the earth, it is plain that the earth is much leſs than the ſun; for otherwiſe its ſhadow could not end in a point at ſo ſmall a diſtance. If the ſun and moon were equally large, the moon's ſhadow would go on to the earth with an equal breadth, and cover a portion of the earth's ſurface more than 2000 miles broad, even if it fell directly againſt the earth's centre, as ſeen from the moon; and much more if it fell obliquely on the earth: but the moon's ſhadow is ſeldom 150 miles broad at the earth, unleſs when it falls very obliquely on the earth, in total eclipſes of the ſun. In annular eclipſes, the moon's real ſhadow ends in a point at ſome diſtance from the earth. The moon's ſmall diſtance from the earth, and the ſhortneſs of her ſhadow, prove her to be leſs than the ſun. And, as the earth's ſhadow is large enough to cover the moon, if her diameter were three times as large as it is (which is evident from her long continuance in the ſhadow when ſhe goes through its centre), it is plain that the earth is much bigger than the moon.

Though all opaque bodies, on which the ſun ſhines, have their ſhadows, yet ſuch are the bulk of the ſun, and the diſtances of the planets, that the primary planets can never eclipſe one another. A primary can eclipſe only its ſecondary, or be eclipſed by it; and never but when in oppoſition or conjunction with the ſun. The primary planets are very ſeldom in theſe poſitions, but the ſun and moon are ſo every month: whence one may imagine, that theſe two luminaries ſhould be eclipſed every month. But there are few eclipſes in reſpect of the number of new and full moons; the reaſon of which we ſhall now explain.

If the moon's orbit were coincident with the plane of the ecliptic, in which the earth always moves and the ſun appears to move, the moon's ſhadow would fall upon the earth at every change, and eclipſe the ſun to ſome parts of the earth. In like manner, the moon would go through the middle of the earth's ſhadow, and be eclipſed at every full; but with this difference, that ſhe would be totally darkened for above an hour and an half; whereas the ſun never was above four minutes totally eclipſed by the interpoſition of the moon. But one half of the moon's orbit is elevated 5½ degrees above the ecliptic, and the other half as much depreſſed below it; and when the ſun and moon are more than 17 degrees from either of the nodes at the time of conjunction, the moon is then generally too high or

too low in her orbit to caſt any part of her ſhadow upon the earth: when the ſun is more than 12 degrees from either of the nodes at the time of full moon, the moon is generally too high or too low in her orbit to go through any part of the earth's ſhadow: and in both theſe caſes there will be no eclipſe. But when the moon is leſs than 17 degrees from either node at the time of conjunction, her ſhadow or penumbra falls more or leſs upon the earth, as ſhe is more or leſs within this limit. And when ſhe is leſs than 12 degrees from either node at the time of oppoſition, ſhe goes through a greater or leſs portion of the earth's ſhadow, as ſhe is more or leſs within this limit. Her orbit contains 360 degrees; of which 17, the limit of ſolar eclipſes on either ſide of the nodes, and 12, the limit of lunar eclipſes, are but ſmall portions: and as the ſun commonly paſſes by the nodes but twice in a year, it is no wonder that we have ſo many new and full moons without eclipſes.

To illuſtrate this (fig. 53.) let ABCD be the ecliptic, RSTU a circle lying in the ſame plane with the ecliptic, and VXYZ the moon's orbit, all thrown into an oblique view, which gives them an elliptical ſhape to the eye. One half of the moon's orbit, as VWX, is always below the ecliptic, and the other half XYV above it. The points V and X, where the moon's orbit interſects the circle RSTU, which lies even with the ecliptic, are the moon's nodes; and a right line, as XEV, drawn from one to the other, through the earth's centre, is the line of the nodes, which is carried almoſt parallel to itſelf round the ſun in a year.

If the moon moved round the earth in the orbit RSTU, which is coincident with the plane of the ecliptic, her ſhadow would fall upon the earth every time ſhe is in conjunction with the ſun, and at every oppoſition ſhe would go through the earth's ſhadow. Were this the caſe, the ſun would be eclipſed at every change, and the moon at every full, as already mentioned.

But although the moon's ſhadow N muſt fall upon the earth at *a*, when the earth is at E, and the moon in conjunction with the ſun at *i*, becauſe ſhe is then very near one of her nodes; and at her oppoſition *u* ſhe muſt go through the earth's ſhadow I, becauſe ſhe is then near the other node; yet, in the time that ſhe goes round the earth to her next change, according to the order of the letters XYVW, the earth advances from E to *e*, according to the order of the letters EFGH; and the line of the nodes VEX, being carried nearly parallel to itſelf, brings the point *f* of the moon's orbit in conjunction with the ſun at that next change; and then the moon being at *f*, is too high above the ecliptic to caſt her ſhadow on the earth: and as the earth is ſtill moving forward, the moon at her next oppoſition will be at *g*, too far below the ecliptic to go through any part of the earth's ſhadow; for by that time the point *g* will be at a conſiderable diſtance from the earth as ſeen from the ſun.

When the earth comes to F, the moon in conjunction with the ſun Z is not at *k* in a plane coincident with the ecliptic, but above it at Y in the higheſt part of her orbit; and then the point *b* of her ſhadow O goes far above the earth. The moon, at her next oppoſition, is not at *o*, but at W, where the earth's ſhadow goes far above her. In both theſe caſes, the line of the nodes is about ninety degrees from the ſun, and both luminaries are as far as poſſible from the limits of the eclipſes.

When the earth has gone half round the ecliptic from E to G, the line of the nodes VGX is nearly, if not exactly, directed towards the ſun at Z; and then the new-moon *l* caſts her ſhadow P on the earth G; and the full moon *p* goes through the earth's ſhadow L; which brings on eclipſes again, as when the earth was at E.

When the earth comes to H, the new moon falls not at *m* in a plane coincident with the ecliptic CD, but at W in her orbit below it; and then her ſhadow Q (ſee fig. 54.) goes far below the earth. At the next full ſhe is not at *q* (fig. 53.), but at Y in her orbit $5\frac{1}{3}$ degrees above *q*, and at her greateſt height above the ecliptic CD; being then as far as poſſible, at any oppoſition, from the earth's ſhadow M, as in fig. 54.

So, when the earth is at E and G, the moon is about her nodes at new and full, and in her greateſt north and ſouth declination (or latitude as it is generally called) from the ecliptic at her quarters; but when the earth is at F or H, the moon is in her greateſt north and ſouth declination from the ecliptic at new and full, and in the nodes about her quarters.

The point X, where the moon's orbit croſſes the ecliptic, is called the *aſcending node*, becauſe the moon aſcends from it above the ecliptic; and the oppoſite point of interſection V is called the *deſcending node*, becauſe the moon deſcends from it below the ecliptic. When the moon is at Y in the higheſt point of her orbit, ſhe is in her greateſt north latitude; and when ſhe is at W in the loweſt point of her orbit, ſhe is in her greateſt ſouth latitude.

If the line of the nodes, like the earth's axis, was carried parallel to itſelf round the ſun, there would be juſt half a year between the conjunctions of the ſun and nodes. But the nodes ſhift backwards, or contrary to the earth's annual motion, $19\frac{1}{2}$ deg. every year; and therefore the ſame node comes round the ſun 19 days ſooner every year than on the year before. Conſequently, from the time that the aſcending node X (when the earth is at E) paſſes by the ſun as ſeen from the earth, it is only 173 days (not half a year) till the deſcending node V paſſes by him. Therefore in whatever time of the year we have eclipſes of the luminaries about either node, we may be ſure that in 173 days afterward we ſhall have eclipſes about the other node. And when at any time of the year the line of the nodes is in the ſituation VGX, at the ſame time next year it will be in the ſituation *r*G*s*; the aſcending node having gone backward, that is, contrary to the order of ſigns, from X to *s*, and the deſcending node from V to *r*; each $19\frac{1}{2}$ deg. At this rate, the nodes ſhift through all the ſigns and degrees of the ecliptic in 18 years and 225 days; in which time there would always be a regular period of eclipſes, if any complete number of lunations were finiſhed without a fraction. But this never happens: for if both the ſun and moon ſhould ſtart from a line of conjunction with either of the nodes in any point of the ecliptic, the ſun would perform 18 annual revolutions and 222 degrees over and above, and the moon 230 lunations and 85 degrees of the 231, by the time the node came round to the ſame point of the ecliptic again; ſo that the ſun would then be 138 degrees from the node, and the moon 85 degrees from the ſun.

But in 223 mean lunations, after the ſun, moon, and nodes, have been once in a line of conjunction, they return ſo nearly to the ſame ſtate again, as that the ſame node, which was in conjunction with the ſun and moon at the beginning of the firſt of theſe lunations, will be within 28′ 12″ of a degree of a line of conjunction with the ſun and moon again, when the laſt of theſe lunations is completed. And therefore in that time there will be a regular period of eclipſes, or return of the ſame eclipſe, for many ages.—In this period, (which was firſt diſcovered by the Chaldeans), there are 18 Julian years 11 days 7 hours 43 minutes 20 ſeconds, when the laſt day of February in leap-years is four times included; but when it is five times included, the period conſiſts of only 18 years 10 days 7 hours 43 minutes 20 ſeconds. Conſequently, if to the mean time of any eclipſe, either of the ſun or moon, you add 18 Julian years 11 days 7 hours 43 minutes 20 ſeconds, when the laſt day in February in leap-years comes in four times, or a day leſs when it comes in five times, you will have the mean time of the return of the ſame eclipſe.

But the falling back of the line of conjunctions or oppo-

fitions of the sun and moon 28' 12" with respect to the line of the nodes in every period, will wear it out in process of time; and after that, it will not return again in less than 12,492 years.—These eclipses of the sun, which happen about the ascending node, and begin to come in at the north pole of the earth, will go a little southerly at each return, till they go quite off the earth at the south pole; and those which happen about the descending node, and begin to come in at the south pole of the earth, will go a little northerly at each return, till at last they quite leave the earth at the north pole.

In calculating eclipses, the things chiefly to be considered are, the magnitudes of the shadow and penumbra of the opaque body, and the ecliptical limits, which may thus be done for solar and lunar eclipses. First,

For Eclipses of the Moon.

Fig. 55. Let AB be the sun, CD the earth. Draw AC, BD, by the edges of the sun and earth, which will meet in a point V, because the sun is bigger than the earth. Through the centres of the sun and earth S and T, draw STV. Also draw BCE, ADF, touching the contrary sides of the sun and earth, intersecting in P; also draw SC and CT. If the whole figure be turned round, about the axis SV, the lines AV, BV, APF, BPE, will generate the two cones CVD, EPF; the cone CVD is the dark shadow of the earth, and EPF continued, is the penumbral cone. And beyond V, the section of the cone EPF, will be all in the penumbra.

Half the angle of the cone of the earth's shadow CVT, *is equal to the sun's apparent semidiameter, less his horizontal parallax.*

For in the triangle SCV, the external angle SCA = CVS + CST. And CST is the sun's parallax. Therefore CVT = SCA − CST.

Half the angle of the earth's penumbral cone CPT, *is equal to the sun's apparent semidiameter and his horizontal parallax.*

For in the triangle CSP, the external angle CPT = PCS + CST.

Hence, half the angle of the earth's penumbral cone CPT, *is equal to half the angle of the dark cone* CVT + *twice the sun's horizontal parallax* CST.

The apparent semidiameter of the earth's dark shadow IK, *upon the moon's orbit, is equal to the sum of the horizontal parallaxes of the sun and moon, less the sun's apparent semidiameter.*

For angle VCI = CIT − CVI = CIT − SCA + CST.

The apparent semidiameter of the earth's penumbra GI, *upon the moon's orbit, is equal to the sum of the horizontal parallaxes of the sun and moon + the sun's apparent semidiameter.*

For in the triangle PCI, the external angle ECI = CIT + CPT = CIT + PCS + CST.

Hence to find the length TV *of the earth's shadow. In the triangle* CTV *there is given the angle* V = *sun's apparent semidiameter − his parallax, and* CT *the earth's radius, to find* TV.

For the Shadow and Penumbra, in a Solar Eclipse.

Fig. 56. Let AB be the sun, KL the moon, CD the earth. Draw the tangents AK, BL, by the edges of the sun and moon, on the same side, to meet in V; and BKG, ALH to touch the contrary sides. Draw SK, IK; and through S and I the centres of the sun and moon, draw the axis SIV. Then if the whole figure AKVLB be turned about the axis SV, the sides AV, BV, and PH, PG, will generate two cones KVL, GPH. The cone KVL is the dark shadow of the moon, and the cone GPH is the moon's penumbral cone.

The angle of the cone of the moon's shadow KVL, *the angle of the penumbral cone* KPL, *the angles* GKV, *and* HLV, *are each equal to the sun's apparent diameter* AKB, *very near; and half the angle of either cone* P *or* V, *is equal to the sun's apparent semidiameter.*

For by reason of the great distance of the sun from T, in respect of TP, TV, TI; the apparent diameter of the sun, seen from any of the places V, T, I, P, K, will be the same; that is, the angles AVB or KVL, APB or KPL, AKB or GKV, ALB or VLH, are all equal; differing only by the angle KSI, which in the moon is insensible.

The height of the cone IP *is equal to the height of the cone* VI. *And* KPL, KVL, *are equal and similar.*

For the angles at P and V are equal; and KL is common.

The apparent semidiameter of the moon's dark shadow QO, *upon the earth at* O, *seen from the moon, is equal to the moon's apparent semidiameter − the sun's apparent semidiameter. And if the sun's apparent semidiameter be greater, the shadow does not reach the earth.*

For draw KO; then in the triangle KOV, VKO = KOS − KVS = KOI − AVS = KOI − ½ sun's ap. diam.

The apparent semidiameter of the moon's penumbra GO, *upon the surface of the earth, as seen from the moon, is equal to the sum of the apparent semidiameters of the sun and moon.*

Draw GI and TGR. Then in the triangle GPI, the external angle GIO = GPI + PGI = KPI + KGI = KPI + KOI = AKS + KOI.

Hence to find the length IV *of the moon's shadow. In the triangle* KVI, *there is given the angle* KVI = *half the sun's apparent diameter, and* KI *the earth's radius; whence* VI *will be had: and to find the arch* QN *of the earth, involved in the moon's dark shadow. In the triangle* QVT, *we have given* TV *the difference between the moon's distance from the earth, and the height of the shadow; and the angle* QVO = *the sun's apparent semidiameter, and* TQ *the radius of the earth; to find the angle* TQV, *to which add* QVT, *and the sum is the angle* QTO *or arch* QO; *and doubled gives the whole arch* QN.

To find the arch of the earth GH *involved in the penumbra: Say, As the earth's radius* GT: *to* S. *sun's apparent semidiameter* :: *so is* PT *the sum of the moon's distance and cone's height* : *to* S.TGP *or* RGK. *From this take the sun's apparent semidiameter, and there remains* GTO = GO, *and doubled gives* GH.

For in the triangle GPT, there is given the angle P = the sun's apparent semidiameter, and PT the moon's distance and height of the cone, and TG the earth's radius; to find the angle RGK = GPT + PTG. Therefore PTG or OTG = RGK − GPT = RGK − sun's apparent semidiameter.

To find the Ecliptic Limits, or the Distance from the Node; when an Eclipse of the Sun or Moon will happen.

Fig. 57. It is evident an eclipse of the moon can only happen, when the distance of the centres of the moon, and of the earth's penumbra, is less than the sum of their semidiameters. For if the distance is greater, the moon and penumbra cannot touch one another.

Also an eclipse of the sun cannot happen, unless the distance of the centres of the sun and moon, be less than the sum of their semidiameters; when seen from a certain place. But that it shall appear in no place, the moon's parallax must be added to the sum of the semidiameters.

Therefore in lunar eclipses, the moon's latitude must be less than the sum of the semidiameters of the moon and of the earth's penumbral shadow, taken at the moon's orbit. And in eclipses of the sun, the moon's latitude must be less than the sum of the sun's and moon's semidiameters, added to the moon's horizontal parallax; that the eclipse may be visible some way. Or without the parallax, to be visible in a certain place.

Therefore in the right angled spherical triangle ☊ SM, having the angle ☊, and the distance SM, the distance of the sun from the node ☊ S will be known, or the ecliptic limits. The mode of finding which may be seen from the following instance.

		′	″
The sun's mean apparent semidiameter	—	16	4
His parallax			12
Moon's mean apparent semidiameter	—	15	38
Her parallax		57	5
Inclination of her orbit		5 8	30

Hence will be had,

Semidiameter of earth's penumbra	—	1 13	21
Semidiameter moon and earth's shadows	-	56	51
Sun and moon's semidiameter	—	31	42
The same with the parallax		1 28	47

In the triangle ☊ SM for the moon's eclipse.

Here SM = 1° 13′ 21″ + 15′ 38″ = 1° 28′ 59″.

S. ☊ = 5 8½		8.952398
S. SM = 1 28 59		8.413067
Radius		10.
S. ☊ S = 16 47		9.460669

the limit for the moon's eclipse at a medium.

In the triangle ☊ SM for the sun's eclipse.

Here SM = 1° 28′ 47″.

S. ☊. = 5° 8′½		8.952398
S. SM = 1 28 47		8.412009
Radius		10.
S. ☊. S. = 16 45		9.459611

the limit for the sun's eclipse, in any place; about the same as for the moon.

But for a particular place, SM = 31 42; and S ☊ comes out only 5° 54′ for the limit.

Hence there will at least be 4 eclipses in a year, taking one year with another; two of the moon, and two of the sun.

For 16° 47′ + 10° 45′ = 33 32 or 33½. Therefore the sun stays above a month within the ecliptic limits, twice in the year. During which time the moon makes two revolutions, and therefore must cause two eclipses, either time; one of the moon, and another of the sun.

In a general way, half of the eclipses will be invisible at any given place. And consequently one year with another there can only be two visible eclipses in a year, one of the moon, and one of the sun.

For the sun and moon spend as much time below the horizon as above it.

By the same method the ecliptic limits may be found for total eclipses, as well as for partial ones.

That is, by taking SM = the difference of the semidiameters of the earth's dark shadow and of the moon, in lunar eclipses; or = the difference of the semidiameters of the moon and sun, in solar eclipses.

Eclipses do not happen always in the same places of the zodiac; but in places more and more westward.

For the eclipses being about the nodes, and the nodes regressive at the rate of 19 degrees in a year; the places of the eclipses are 19 degrees more west every succeeding year.

Having laid down these premises, it will be necessary for a particular eclipse to consider the angle that the moon's way makes with the sun at the time of an eclipse.

Fig. 58. Let ☊ S be the ecliptic, ☊ M the moon's orbit, ☊ the node. And let S be the sun, in the sun's eclipse; or the centre of the earth's shadow, in the moon's eclipse; and M the moon at the time of the syziges. Take ☊ A to ☊ S as the sun's horary motion, to the moon's, at that time; draw MA, then MAS is the angle required; and AM the moon's apparent orbit.

For by construction, in the time that the moon has been moving from ☊ to M (that is, through ☊ S reckoned in the ecliptic), the sun has moved through a space DS equal to ☊ A. Therefore the sun was in D, when the moon was in the node at ☊. Draw DB, MB parallel to SM, SD; and draw B ☊, which will be parallel to MA. Now since the moon makes the same latitude DB or SM, in the same time, whether the sun moves or stands still. And since SM is her latitude, when the sun is at S, DB (equal to SM) will be her latitude, supposing the sun had stood at D, without any motion towards S; and consequently ☊ B will be her apparent way, to an eye at D, through which she seems to move in the same time. Or, which is the same thing, AM will be her apparent way to an eye fixed at S. For the triangles AMS and ☊ BD are equal; and MAS is the angle of her way with the ecliptic. By the theory of relative motions, in bodies moving the same way, all the apparent motions are the same, as if one body stood still and the other moved forward, with the difference of their motions. And here ☊ D or A3 is the difference of their motions, supposing S to be fixed.

Hence, as the moon's horary motion : to the sun's horary motion : : S ☊ the distance from the node to A ☊. *Then* SA = S ☊ − A ☊.

As sine of SA : *rad* : : *tangent moon's latitude* SM : *tangent angle* A.

It is the apparent orbit AM *that must be made use of in calculating all the particulars of an eclipse.*

For an observer considers not S as moving; and therefore only the relative motions are concerned.

To calculate, therefore, an Eclipse of the Moon, the following Precepts will be found useful.

1. Find the true time of the opposition, when an eclipse is to happen; and let that be reduced to apparent time.

2. Find the true places of the sun and moon, when in opposition. As also the sun's mean anomaly, and the place of his apogee. Also the place of the moon's ascending node, and of her apogee, and her latitude.

3. Fig. 59. Let ☊ S be a part of the ecliptic; ☊ M the moon's orbit; S the centre of the earth's shadow, and M the moon, when in opposition. Take ☊ A, to ☊ S which is known by calculation; as the sun's horary motion, to the moon's. Which motions are known from the astronomical tables. Draw AM, for the way of the moon from the sun. Then in the right angled spherical triangle ASM, there is given AS (= ☊ S − ☊ A); and SM the moon's latitude found by calculation: to find the angle SMA.

4. Let fall SP perpendicular to AM. Then since the arches SM, MP, SP, are very small, they may be taken for right lines; and the triangle SMP for a plane triangle. Then having SM and angle SMP; MP and SP will be found. Where P is the place of the moon in the middle of the eclipse. Likewise the time of the moon's moving through MP will be known by her horary motion; and from thence the time when she is at P, or the middle of the eclipse.

5. From the astronomical tables, find the sun and moon's apparent semidiameters, for the time of opposition; and their horizontal parallaxes.

6. From any convenient scale of equal parts, with the centre P and radius PB, equal to the minutes contained in the moon's radius, describe the circle BC*o* for the moon. And with the radius SD (equal to the sum of the sun and moon's horizontal parallaxes − the sun's semidiameter, all in minutes), describe the circle DEB, from the centre S, then this circle will represent the earth's dark shadow. Likewise with the same centre S, and radius SF (equal to the sum of the sun and moon's parallaxes + the sun's semidiameter, in minutes), describe the circle FQG; and this will be the earth's penumbra.

7. These things being laid down, it will be easy to find all the requisites by scale and compass, by measuring them; or rather by calculation, in the several right-angled plain triangles, contained in the scheme. Thus, to find when the moon first touches the penumbra at L; in the right angled triangle SPK, there is given SP, and SK (the sum of the radii SL and PB), to find PK. Which being known, the time of the moon's passing through it will be known, by the moon's horary motion from the sun. Again, to find when the moon first enters the dark shadow of the earth in I. In the right angled triangle SPI, there is given SP, and SI (the sum of the radii SD, PB) to find PI; and consequently the time of half the duration in the shadow. Also to find the digits or 12th parts of the moon eclipsed. Here *no* the part eclipsed is $= Sn + Po - SP$; and $\frac{12no}{2Po}$ or $\frac{6no}{Po}$ is the number of digits eclipsed.

In total eclipses of the moon, the earth's shadow often reaches further than the moon. And then more than 12 digits are said to be eclipsed, supposing the moon's disk to be produced so far.

If the time was required when the moon wholly enters into the dark shadow BED, it will be found the same way, as when it entered into the penumbra GQF; as will be evident, by supposing GQL the dark shadow. In that case SI will be the difference of the semidiameters of the moon and dark shadow.

Now the times of passing through PI, PK, &c. being known, and the time of the middle of the eclipse at P; the beginning and ending will be known.

8. Hence, if the moon or circle CB*o* never touches the circle GQF, there will be no eclipse, not even by the penumbra. And if the same circle never touches the circle BDE, there will be no part of the moon totally eclipsed. And if the whole circle CB*o* enter into the circle BED, the whole moon will be totally eclipsed; and that is when SP is less than the difference of the semidiameters SD and PB. If the point S be in the node, then P falls upon S, and the eclipse is central. When only a part of the circle CB*o* goes into the circle BED, the eclipse is a partial one, as in this figure.

9. The time of the eclipse being known for any particular place, it is easy to know if it be visible at that place; by knowing if the moon be risen. Or the place will be known where the moon is vertical; and therefore it will be visible to all places, within a quadrant's distance from it.

10. It must be noted, that if the spectator lives in the place (or in the same longitude) which the tables are calculated for; he will see the eclipse at the time determined by the calculation. If not, he will see it an hour sooner for every 15 degrees difference of longitude, that he lives west from it. And so much later, if he lives eastward; that is, in the way of reckoning time. But in regard to absolute time, it is seen from all places at the same instant.

Example.

To find the Time of the Moon's Eclipse December 13, 1769; *its Duration and Digits eclipsed.*

1. The mean time of the syziges, by the tables, is found to be Dec. $12^d\ 19^h\ 27^m$, at which time the moon's horary motion from the sun is $35'\ 33''$. At this time, computing the true places of the sun and moon, the moon will appear to be 35 10 before the sun. And therefore the time is past the syziges, $59^m\ 12^s$. Therefore,

From	1^d	19^h	27^m	0^s
Take	0	0	59	12
True time	1	18	27	48

The places being computed again, the moon is only 7″ before the sun, which amounts to 12^s of time; therefore the time of opposition is $12^d\ 18^h\ 27^m\ 36^s$, which reduced to apparent time is Dec. $12^d\ 18^h\ 32^m\ 51^s$.

2. The sun's place is - $8^s\ 21^\circ\ 37'\ 35''$
The moon's place - 2 21 37 35
Place of the ascending node 8 14 46 13
Her latitude south - 37 58
The sun's horary motion 2 33
Moon's horary motion - 38 6

3. Hence the moon is $6^\circ\ 51'\ 22''$ past the descending node: that is, ☊ S is $6^\circ\ 51'\ 22''$. Therefore ☊ A $= 27'\ 32''$, and AS $= 6^\circ\ 23'\ 50''$. Therefore the angle SMA $= 84^\circ\ 22'\ 28''$.

4. Fig. 60. Hence drawing the ecliptic RS, and SM perpendicular to it, and equal to $37'\ 58''$ from a scale of minutes. And making the angle SMA $= 84^\circ\ 22'\frac{1}{2}$. You will find the perpendicular SP $= 37'\ 47''$, and MP $= 3'\ 43''$. And therefore, the horary motion of the moon from the sun being $35'\ 33''$, PM will be passed over in $6'\ 17''$. And since this is before the opposition at M, this time must be deducted from the time of opposition. And the time of the middle of the eclipse will be Dec. $12^d\ 18^h\ 26^m\ 34^s$.

5. The sun's apparent semidiameter - 16′ 20″
His horizontal parallax - 12
Moon's apparent semidiameter - 16 48
Her horizontal parallax - 61 7

6. Hence the radius BP $= 16'\ 48''$.
Radius SD $= 44\ 59$.
Radius SF $= 77\ 39$.

7. Hence also PK or P*k* $= 86'\ 34''$.
and PI or P*i* $= 48\ 53$.

and therefore the time of passing through PK is $2^h\ 26'\ 6''$, and through PI $= 1^h\ 22'\ 30''$. And the whole duration in the shadow from I to *i*, is $2^h\ 45^m$. And the digits eclipsed $8\frac{1}{2}$ on the upper side. Whence,

First entering the penumbra Dec.	13^d	4^h	$0^m\ 28^s$ morn.
Entering the dark shadow at	5	4	4
Middle	6	26	34
Opposition -	6	22	51
Leaving the shadow	7	49	4
Leaving the penumbra	8	52	40
Duration - -	2	45	0

Digits eclipsed $8\frac{1}{2}$.

All these things may be determined near enough by scale and compass, in a large draught; making use of a scale of minutes and sixtieth parts; or rather by making a scale of time answering thereto, by help of the horary motion of the moon from the sun. For by this scale, the several hours and minutes may be marked along the line A*k*, by which it will appear at what time the centre of the moon is at any given point. For the time is known when the moon is at M, and from thence the points at each hour and minute are easily found. And this construction, with only right lines and circles, will be exact enough in a large figure; for the best lunar tables give the times of the phases of an eclipse no nearer than to 4 or 5 minutes of time; and therefore such a construction is sufficient to answer the purpose. Hence it may be observed that no eclipse of the moon can last above $5\frac{1}{2}$ hours, from the moon's first touching the earth's penumbra, to its last leaving it.

For SK $= 94'\ 27'' = 94{\cdot}45$, and the horary motion is $35'\ 33'' = 35{\cdot}55$ $\frac{94{\cdot}45}{35{\cdot}55} = 2.66 = 2^h\ 39^m =$ semiduration; and no eclipse of the moon, by the earth's shadow, can last above $3\frac{3}{4}$ hours. Nor when total, above $1\frac{3}{4}$ hours.

For SI $= 61' 47'' = 61.78$, and $\frac{61.78}{35.55} = 1.745 =$ $1' 45'' =$ the semidurat. and SD $-$ SI $= 28' 11'' = 28.18$, and $\frac{28.18}{35.55} = .79 = 47^m$, the semiduration.

The refraction of the earth's atmosphere, in lunar eclipses, makes the shadow less; by bringing the rays, which terminate the shadow, sooner to a point. And hence comes that red colour of the moon, even in total eclipses. But that light must be very dim, by reason a great number of the rays are stopt and lost in the earth's atmosphere.

The circles terminating the shadow and the penumbra BED and GQF, cannot be distinguished. For the darkness from BED, diminishes by insensible degrees, to GQF, being darkest at E, and lightest at Q, where it vanishes insensibly. And therefore the moon does not appear to be eclipsed, till she is a good way within the penumbra. For that reason, there may happen eclipses of the moon which cannot be discovered as such.

It may be observed, that all lunar tables shew the moon's place in eclipses, more truly in the syziges than in the quadratures, or any other place. For the times of the syziges have been more accurately observed; and the moon's place more nicely observed in eclipses, than at any other time; and from thence the moon's theory has been deduced. Besides, many of the inequalities cease in the syziges, but have sensible effects in other places; becoming greater, as the moon is further from the syziges; being greatest in the quadratures. Whence the lunar tables do not determine the moon's place truly in the quadratures. And her place calculated from these tables is not so exact in the quadratures as in the syziges. Several inequalities depend on the aspect of the nodes and the sun; but these cease when the nodes are in the syziges. When the moon and the nodes are in the syziges; the moon's place, then wanting fewer equations, as being subject to fewer inequalities, will be more correct, than when she is in other places, where there are more and greater inequalities, and more equations; which equations have never been truly fixed. From hence more errors will happen out of the syziges, than in them.

To find the Way of the Moon from the Sun, in a Solar Eclipse, supposing the Observer at rest.

Fig. 61. Let HZO be the meridian of the place, HO the horizon, EC the equinoctial, EL the ecliptic, Z the zenith, P the pole, S and M the places of the sun and moon in conjunction, PSD the sun's meridian.

Having found the sun's distance from the node, ☊ S, and the moon's latitude SM, &c. take ☊ A to ☊ S, as the sun's horary motion, to the moon's horary motion; then SA is known. Draw MA; then in the spherical triangle ASM, right-angled at S, there is given SA, SM; to find the angle SMA; AM being the moon's way from the sun.

But because the eye of the observer is in motion, by the rotation of the earth; which gives an apparent motion to the moon, contrary to that of the observer; we must find the quantity and direction of that motion. In the first place, since the observer is carried eastward, that is towards the point C, the apparent motion in the moon caused thereby will be in the line CS. And to determine the position of CS in respect of AM or SM, several spherical triangles must be resolved, as follows.

In the right-angled triangle EDS, there is given ES and angle E to find DS and angle ESD or ASP; or these may be easier had from the astronomical tables. And in the triangle ZPS, there is given PS (the complement of DS), the angle ZPS (from the time of the day), and ZP the complement of latitude; to find ZS, and angles PZS and ZSP. Then ZSP and ASP being known, ZSA will be known. And MSA being a right angle, ZSM will be known. In the right angled triangle CFS, there is given CF, the measure of the angle FZC (the difference between the angle PZS and the right angle CZP), and SF the complement of ZS; to find CS, and the angle CSF or BSZ. Then BSZ and ZSM being known, BSM will be known. And SMA being known, its supplement SMB is known, and consequently the angle SBM.

To find the quantity of the motion. That along AM is already known; and to find the apparent motion along SB. The sine of 15 degrees (the horary motion of a point in the equinoctial) is .259 to the radius 1. And if h be the moon's horizontal parallax, then the radius of the earth appears at the moon under the angle h, and therefore 15 degrees of the equinoctial appears under the angle of $.259h$; this then is the horary motion of a point in the equinoctial, viewed directly from the moon. And the moon's apparent motion seen from that point in the equinoctial is the very same. But this motion is to be diminished upon two accounts. 1. Because it is less in a parallel circle, in proportion to the cosine of the latitude. And 2. Upon account of the obliquity of the motion, when not perpendicular to the rays of the sun; and this will be as the sine of CS, the sun's distance from the east or west point of the horizon. Therefore to find the quantity of this motion.

To the logarithm of $.259h$
Add the cosine latitude
And the sine of CS.

Then the sum, abating twice radius, is the logarithm of this apparent horary motion. Then this motion is to be compounded with the motion along AMB as follows.

Fig. 62. Let AS be a portion of the ecliptic, SB the way of the apparent motion, MA the moon's way from the sun. Draw NM parallel to SB; and let MN be the horary motion along SB or MN, and MI the horary motion of the moon from the sun. Then complete the parallelogram NMIQ; draw the diagonal MQR, which is the direction of the motion, compounded of the observers and the moon's motions, and MQ is the total apparent horary motion, supposing the observer at rest. Then in the plain triangle QMI, there is given MI, and IQ (or MN), and the angle MIQ $=$ MBS; to find the angle QMI, and side MQ or the absolute horary motion. And the angles QMI and IMS being known, QMS is known.

Here observe, if the sun be in the eastern hemisphere, in which case the concave side of the eastern hemisphere is here projected (in fig. 61), then the moon's motion from the sun is from M towards A, and the other apparent motion from S towards B or from M towards N. But if the sun is in the western hemisphere, this projection represents the convex side of the sphere; and then the moon moves from the sun, in direction AM, and the other apparent motion is from S toward C, being contrary.

The eclipses of the sun are more difficult to calculate, than those of the moon; the latter being clear of parallaxes, which the former are incumbered with, which gives a great deal of trouble.

But a great part of it may be avoided by using projections instead of calculations. The rules are,

1. Find the true time of the conjunction, and the places of the sun and moon at that time.

2. Having found the way of the moon from the sun by projection or calculation; find, by the astronomical tables, the moon's horizontal parallax, her apparent diameter, and horary motion; also the sun's apparent diameter, and horary motion.

And here, to avoid a great deal of calculation, if the sphere be projected by a large scale, it will give all the requisites with sufficient exactness, by measuring the several angles and sides, without any calculation, or very little. And here it is best to

project the concave side, and then every thing appears as it is in nature.

3. Find the moon's parallax of altitude, by making as rad : cos. altitude : : so the moon's horizontal parallax : to her parallax of altitude V*t* or M*m*. Then find her parallax of latitude M*n*, and longitude S*s*, or *mn*, and from thence her apparent latitude and longitude is known.

4. Draw the line ASL for the ecliptic, and from a large scale of minutes, erect SM perp. to AS, and equal to the apparent latitude; make the angle SMR, as found in the last prob. and draw & MR for the moon's apparent path. From S let fall SP perpendicular to MR, and SP will be the least distance of the centres of the sun and moon, or the middle of the eclipse. From the centre S with the radius equal to the minutes contained in the sun's semidiameter, describe the circle ABC for the sun. And from the centre P, with the radius equal to the moon's semidiameter, describe the circle AOCD for the moon. If these circles do not intersect, there will be no eclipse. But if they intersect, an eclipse must necessarily happen.

5. Then P is the place of the moon in the middle of the eclipse. Make SI and SK equal to the sum of the semidiameters of the sun and moon; and the moon's centre will be at I when the moon first touches the sun, or at the beginning of the eclipse. And K the place of the moon's centre, at the end of it. In the triangle PSI, there is given SI, SP; to find PI = PK, which reduced to time, by help of the moon's apparent horary motion, shews half the duration of the eclipse; and consequently we shall have the beginning and end.

6. And to find the quantity *no*, or the digits eclipsed; we have $no = Sn + Po - SP$, and $\frac{6no}{Po}$ = number of digits.

7. The time found being mean time, it must be reduced to the common or apparent time, by the equation of time. And if the given place be not that for which the tables are made, add so much time, if your place lie eastward to the time of conjunction, as answers to the difference of meridians; or subtract it, if you lie westward.

Example.

To find the Time of the Sun's Eclipse, June 4, 1769, *its Duration and Digits eclipsed, at London.*

1. By the tables the mean time of the conjunction is found to be June $3^d\ 20^h\ 41^m$. And hence the true time of conjunction is June $3^d\ 20^h\ 27^m\ 43''$. And their places are $2^s\ 13°\ 51'\ 25''$. And the moon's lat. 55 32 north. The moon's motion from the sun $35'\ 47''$.

2. Fig. 61, 62. The angle AMS = 84° 27′. ZSM = 35° 20′. CSF = 5° 18′. SBM = 43° 49′. SF = 42° 16′, CF = 3° 34′. CS = 42° 24′. The angle QMI = 8° 25′. SMQ = 92° 52′. MN or IQ = 6° 38′. MQ = 31° 20′. Also

The moon's horizontal parallax			60′	58″
her apparent diameter	—		33	32
her horary motion	—	—	38	10
the sun's diameter		—	31	41
his horary motion	—	—	2	23.

3. Fig. 63. The moon's parallax in altitude M*m*, is 45′ 09″; her parallax in latitude M*n*, 38′ 05″; her remaining latitude S*n*, 17′ 26″; her parallax in longitude S*s*, 24′ 13″; which is increased so much.

4. Fig. 64. Draw SL for the ecliptic; at any point S, erect the perp. MS equal to 17′ 26″, the moon's apparent latitude; through M draw the moon's way & MR, making the angle SMR = 92° 52′. Draw SP perp. MR, which here falls very near M. From the centre S, with the radius SA = 15′ 50″ describe the circle ABC for the sun. And with the radius MD = 16′ 46″, and centre P, describe the circle ADCO for the moon.

5. Hence PI or PK = 27′ 33″. And the time of moving through IP or PK, at the rate of 31′ 20″ an hour, is $52^m\ 45^s$, for the semiduration. By reason of the parallax (24′ 13″), she is past the apparent conjunction; the difference being what the parallax causes, which comes to $46^m\ 23^s$. Therefore the middle of the eclipse is so much sooner, being at $3^d\ 19^h\ 41^m\ 20^s$. This reduced to apparent time is $3^d\ 19^h\ 43^m\ 27^s$, for the middle.

6. The digits eclipsed are $5\frac{4}{10}$, nearly.

In this example, the concave side of the sphere is projected, which suits best to the appearance of the heavens. And the figures are drawn upon that supposition.

It appears from the process, that the moon is advancing to her descending node, and therefore has north latitude. And by the position of that part of the ecliptic, her parallax in longitude, advances her so much forward, viz. 24′ 13″. And therefore she is so much past the apparent conjunction. Hence we gain these several particulars.

The beginning of the eclipse, June 4^d			6^h	50^m	42^s morn.
middle	—	—	4	7	43 27
end of it		—	4	8	46 12
total duration		—		1	45 30

digits eclipsed $5\frac{1}{2}$, on the upper side of the sun, towards the left; as appears by the figure.

Hence the position of the horns at C *and* A, *are easily found in the middle of the eclipse.*

For they are in a position parallel to RI, the moon's way.

The middle of the eclipse will not be at the same time in all places of the same longitude.

For the parallax of longitude will be different in different places.

No eclipse of the sun can last above two hours.

For SI or SA + MD = 32′ 36″ = 32.6, and the horary motion = 34′ 47″ = 35.78. And $\frac{32.6}{35.78} = .91 = 54\frac{1}{2}$ minutes, for the semiduration.

If it was not for the parallax, eclipses of the sun were as easily calculated, as those of the moon. And in order to get the parallax, the angle ZSM and SF must be known, which occasions the resolving several spherical triangles before they can be had. Likewise it may be observed, that the apparent way of the moon is strictly a curve line, concave towards S, which arises from the parallel of latitude being a curve, and the moon being out of its plane. Likewise the moon's apparent velocity is something greater at the beginning than at the end.

To calculate a General Eclipse of the Sun; or an Eclipse of the Earth.

1. Fig. 65. The elements necessary for this are the following. The sun and moon's place, and likewise the time, at the true conjunction. The moon's latitude, horizontal parallax, diameter, and horary motion. The sun's declination, diameter, and horary motion. And the angle the moon's way makes with a circle of latitude.

2. From a large scale of minutes, take the moon's horizontal parallax in your compasses, and at any point C, in the right line BD (which represents the ecliptic), describe the circle ABED, for the earth's disk, or the earth's flat face as it appears at a distance, in a line drawn to the sun. Draw CM perpendicular to CD, and equal to the latitude of the moon upwards if north. Make the angle CMG equal to that which the moon's way makes with a circle of latitude; acute to the right hand, if she tend to the node; or obtuse, if she be past it; and drawing FMG, it will be the way of the centre of the moon's shadow upon the earth. From C let fall CH perp. to FG. Then at H will be the middle of the earth's eclipse. With the centre H, and radius HO, equal to the sum of the

ſemidiameters of the ſun and moon, deſcribe the circle QOR, which will be the moon's penumbra. Alſo deſcribe a ſmall circle round the centre H, whoſe radius is the difference of the ſun and moon's ſemidiameters, that little circle will be the dark ſhadow of the moon.

3. Then all the countries of the earth contained in the ſegment VAW will be ſucceſſively eclipſed, by the penumbra, as the ſhadow moves along the tract FG. Whilſt the other ſegment VEW ſuffers no eclipſe at all. Likewiſe all places in the line *st*, will be totally eclipſed, as the dark ſhadow, or the ſmall circle at H paſſes ſucceſſively over them. But this circle, or dark ſhadow, being very ſmall, a total eclipſe at any place continues but a ſmall time. Sometimes the ſun's ſemidiameter exceeds the moon's; and then there will be no dark circle, or total eclipſe, but a lucid ring will appear about the moon in theſe places; and this is called an *annular eclipſe*. The difference between the ſemidiameters of the ſun and moon is ſo little, that no total eclipſe laſts above 4 minutes.

4. Draw CF, CG = ſum of the ſemidiameters of the ſun and moon, and the moon's parallax; then the moon's ſhadow will touch the earth at L and K where the eclipſe begins and ends. In the triangle CFH, there is given CF, CH; to find FH = HG, which converted into time, gives half the duration, or half the time that the moon's ſhadow is upon the earth. Alſo NO meaſured, ſhews how far the eclipſe reaches. Or CO meaſured does the ſame. It may be ſufficient to meaſure all theſe by the ſcale without calculation.

5. To find the pole. Draw the arch AP, making the angle KAP equal to the ſun's longitude, and AP the diſtance of the poles of the equator and ecliptic, 23°½; then P is the pole. For AP is a part of the ſolſtitial colure, and paſſes through Cancer and Capricorn. And CAP is what the ſun wants of Cancer, therefore PAK is what it is paſt Aries. Through P draw CPT. And here we may ſuppoſe that the pole P is fixed, during the time of an eclipſe. Then in the right angled ſpherical triangle APT, there is given AP and angle A; to find AT or angle ACP. In this triangle PT is the ſun's declination, and APT or CPK his right aſcenſion from Cancer. Here note, that any place in the line CT is in the ſun's meridian. And C is the place where the ſun is vertical at the time of the eclipſe.

6. To find the ſituation of any given place, at a given hour. Make the angle CPX (with the ſun's meridian), equal to the time from noon; on the left hand, if it is before noon. And make PZ the complement of the latitude; then Z is the place required. And if it falls in the penumbra, it is eclipſed; or any where in the ſegment VAW; if its motion in the parallel circle do not carry it out, before the penumbra reaches it.

7. To find the place which is firſt or laſt touched by the penumbra, as K. Draw the arch PK. In the triangle CGH, there are given CG and CH, to find the angle GCH, from which ſubtract HCP which is known, gives the angle PCK or TK. Then in the right angled ſpherical triangle PTK, there is given TK, and PT the ſun's declination; to find PK the complement of the latitude of K, and TPK or CPK the difference of longitude of K, and the ſun. Therefore its longitude and latitude is had. And after the ſame manner you may find that of L. And by the ſame method the lat. and long. of the places *s* and *t* may be found, where the dark ſhadow firſt enters the earth's diſk, or quite leaves it.

Alſo there may be found the place which is in the line FH at any point of time; or if the place be given, what the time will be; and that by help of the horary motion, with ſeveral other particulars of like nature, which for brevity's ſake I omit.

8. The part of the ſun's diameter eclipſed by the moon, is known by the ſituation of the place within the penumbra, or its diſtance from the centre of the penumbra.

And the phaſis of the eclipſe, as ſeen from any place Z, upon the diſk, will be found thus, for any time. Find the centre of the ſhadow for that time, as ſuppoſe at H. Deſcribe about H, a circle whoſe radius is the moon's radius; and about Z, a circle with the ſun's radius. Then the part cut off the ſun's circle, will be the part obſcured.

SECT. XI. *The Method of finding the Longitude by the Eclipſes of Jupiter's Satellites; the amazing Velocity of Light demonſtrated by theſe Eclipſes; and of Cometary Eclipſes.*

ECLIPSES happen very frequently to the ſatellites of Jupiter; and as they are of great ſervice in determining the longitude of places on the earth, aſtronomers have been at great pains to calculate tables for the eclipſes of theſe ſatellites by their primary, for the ſatellites themſelves have never been obſerved to eclipſe one another. The conſtruction of ſuch tables is indeed much eaſier for theſe ſatellites than of any other celeſtial bodies, as their motions are much more regular.

The Engliſh tables are calculated for the meridian of Greenwich, and by theſe it is very eaſy to find how many degrees of longitude any place is diſtant either eaſt or weſt from Greenwich; for, let an obſerver, who has theſe tables, with a good teleſcope and a well-regulated clock at any other place of the earth, obſerve the beginning or ending of an eclipſe of one of Jupiter's ſatellites, and note the preciſe moment of time that he ſaw the ſatellite either immerge into, or emerge out of, the ſhadow, and compare that time with the time ſhown by the tables for Greenwich; then 15 degrees difference of longitude being allowed for every hour's difference of time, will give the longitude of that place from Greenwich; and if there be any odd minutes of time, for every minute a quarter of a degree, eaſt or weſt, muſt be allowed, as the time of obſervation is later or earlier than the time ſhown by the tables. Such eclipſes are very convenient for this purpoſe at land, becauſe they happen almoſt every day; but are of no uſe at ſea, becauſe the rolling of the ſhip hinders all nice teleſcopical obſervations.

It is found by obſervation, that when the earth is between the Sun and Jupiter, his ſatellites are eclipſed about 8 minutes ſooner than they ſhould be according to the tables; and when the earth is in the oppoſite part of its orbit, theſe eclipſes happen about 8 minutes later than the tables predict them. Hence it is certain, that the motion of light is not inſtantaneous, ſince it takes about 16½ minutes of time to go through a ſpace equal to the diameter of the earth's orbit, which is 180,000,000 of miles in length; and conſequently the particles of light fly almoſt 200,000 miles every ſecond of time. As light is 16½ minutes in travelling acroſs the earth's orbit, it muſt be 8¼ minutes in coming from the ſun to us: if the ſun were annihilated, we ſhould ſee him for 8¼ minutes after: and if he were again created, he would be 8¼ minutes old before we could ſee him.

The primary planets would eclipſe one another, were it not for their great diſtances; but as the comets are not ſubject to the ſame laws with the planets, it is poſſible they may ſometimes approach ſo near to the primary planets, as to cauſe an eclipſe of the ſun to thoſe planets; and as the body of a comet bears a much larger proportion to the bulk of a primary planet than any ſecondary, it is plain that a cometary eclipſe would both be of much longer continuance, and attended with much greater darkneſs, than that occaſioned by a ſecondary planet. If we ſuppoſe the primary planet and comet to be moving both the ſame way, the duration of ſuch an eclipſe would be prodigiouſly lengthened; and thus, inſtead of four minutes, the ſun might be totally darkened to the inhabitants of certain places for as many hours: and from this cauſe ſome account for that prodigious darkneſs which we ſometimes read of in hiſtory as

times when no eclipſe of the ſun by the moon could poſſibly happen.

SECT. XII. *A Deſcription of the Aſtronomical Machinery ſerving to explain and illuſtrate the foregoing Part of this Treatiſe.*

THE machine repreſented by fig. 66, is the GRAND ORRERY, firſt made in this kingdom by Mr. Rowley, for King George I. The frame of it, which contains the wheel-work, &c. and regulates the whole machine, is made of ebony, and about four feet in diameter. Above the frame is a broad ring ſupported with 12 pillars, which repreſents the plane of the ecliptic having two circles of degrees, and between theſe the names and characters of the 12 ſigns. Near the outſide is a circle of months and days, correſponding to the ſun's place at noon each day throughout the year. Above the ecliptic ſtand ſome of the principal circles of the ſphere, viz. No. 10, are the two colures, divided into degrees and half degrees; No. 11, is one-half of the equinoctial circle, making an angle of $23\frac{1}{2}$ degrees. The tropic of Cancer, and the arctic circle, are each fixed parallel at their proper diſtance from the equinoctial. On the northern half of the ecliptic is a braſs ſemicircle, moveable upon two points fixed in ♈ and ♎, repreſenting the moveable horizon to be put to any degree of latitude upon the north part of the meridian, and the whole machine may be ſet to any latitude without diſturbing any of the internal motions, by two ſtrong hinges (No. 13.) fixed to the bottom-frame upon which the inſtrument moves, and a ſtrong braſs arch, having holes at every degree, through which a ſtrong pin is put at every elevation. This arch and the two hinges ſupport the whole machine when it is lifted up according to any latitude; and the arch at other times lies conveniently under the bottom frame. When the machine is ſet to any latitude (which is eaſily done by two men, each taking hold of two handles conveniently fixed for the purpoſe,) ſet the moveable horizon to the ſame degree upon the meridian, and you may form an idea of the reſpective altitude or depreſſion of the planets both primary and ſecondary. The Sun (No. 1.) ſtands in the middle of the whole ſyſtem upon a wire, making an angle with the ecliptic of about 82 degrees. Next the Sun is a ſmall ball (2) repreſenting Mercury. Next to Mercury is Venus (3) repreſented by a larger ball. The Earth is repreſented (No. 4.) by an ivory ball, having ſome circles and a map ſketched upon it. The wire which ſupports the earth makes an angle with the ecliptic of $66\frac{1}{2}$ degrees, the inclination of the earth's axis to the ecliptic. Near the bottom of the earth's axis is a dial plate (No. 9.), having an index pointing to the hours of the day as the earth turns round its axis. Round the earth is a ring ſupported by two ſmall pillars, repreſenting the orbit of the moon; and the diviſions upon it anſwer to the moon's latitude. The motion of this ring repreſents the motion of the moon's orbit according to that of the nodes. Within this ring is the moon (No. 5.), having a black cap or caſe, by which its motion repreſents the phaſes of the moon according to her age. Without the orbits of the earth and moon is Mars (No. 6.) The next in order to Mars is Jupiter and his four moons (No. 7.) Each of theſe moons is ſupported by a wire fixed in a ſocket which turns about the pillar ſupporting Jupiter. Theſe ſatellites may be turned by the hand to any poſition, and yet when the machine is put into motion, they will all move in their proper times. The outermoſt of all is Saturn, his five moons, and his ring (No. 8.) Theſe moons are ſupported and contrived ſimilar to thoſe of Jupiter. The machine is put into motion by turning a ſmall winch (No. 14.); and the whole ſyſtem is alſo moved by this winch, and by pulling out and puſhing in a ſmall cylindrical pin above the handle. When it is puſhed in, all the planets, both primary and ſecondary, will move according to their reſpective periods by turning the handle. When it is drawn out, the motions of the ſatellites of Jupiter and Saturn will be ſtopped while all the reſt move without interruption. There is alſo a braſs lamp, having two convex glaſſes to be put in room of the ſun; and alſo a ſmaller earth and moon, made ſomewhat in proportion to their diſtance from each other, which may be put on at pleaſure. The lamp turns round at the ſame time with the earth, and the glaſſes of it caſt a ſtrong light upon her; and when the ſmaller earth and moon are placed on, it will be eaſy to ſhow when either of them will be eclipſed. When this machine is intended to be uſed, the planets muſt be duly placed by means of the ephemeris; and you may place a ſmall black patch or bit of wafer upon the middle of the Sun, Venus, Mars, and Jupiter. Put in the handle, and puſh in the pin which is above it. One turn of this handle anſwers to a revolution of the ball which repreſents the earth about its axis; and conſequently to 24 hours of time, as ſhown by the hour-index (9.), which is marked and placed at the foot of the wire on which the ball of the earth is fixed. Again, when the index has moved the ſpace of ten hours, Jupiter makes one revolution round its axis, and ſo of the reſt. By theſe means the revolutions of the planets, and their motions round their own axes, will be repreſented to the eye.

The ORRERY (fig. 67.) contrived by Ferguſon ſhows the motions of the Sun, Mercury, Venus, Earth, and Moon; and occaſionally the ſuperior planets, Mars, Jupiter, and Saturn, may be put on. Jupiter's four ſatellites are moved round him in their proper times by a ſmall winch; and Saturn has his five ſatellites, and his ring which keeps its parallelism round the ſun; and by a lamp put in the Sun's place, the ring ſhows all its various phaſes already deſcribed.

In the centre, No. 1, repreſents the Sun; No. 2, Mercury; No. 3, Venus; No. 4, the Earth; No. 6, is a ſidereal dial-plate under the Earth; and No. 7, a ſolar dial-plate on the cover of the machine. The index of the former ſhows ſidereal, and of the latter, ſolar time. The earth always keeps oppoſite to a moving index (No. 10), which ſhows the Sun's daily change of place, and alſo the days of the months.

The Earth is half covered with a black cap, for dividing the apparently enlightened half next the Sun from the other half, which, when turned away from him, is in the dark. The edge of the cap repreſents the circle bounding light and darkneſs, and ſhows at what time the Sun riſes and ſets to all places throughout the year. The earth's axis inclines $23\frac{1}{2}$ degrees from the axis of the ecliptic; by which means, the different lengths of days and nights, and the cauſe of the various ſeaſons, are demonſtrated to ſight.

There is a broad horizon, to the upper ſide of which is fixed a meridian ſemicircle in the north and ſouth points, graduated on both ſides from the horizon to 90 degrees in the zenith or vertical point. The edge of the horizon is graduated from the eaſt and weſt to the ſouth and north points, and within theſe diviſions are the points of the compaſs. From the lower ſide of this thin horizontal plate ſtand out four ſmall wires, to which is fixed a twilight-circle 18 degrees from the graduated ſide of the horizon all round. This horizon may be put upon the earth (when the cap is taken away), and rectified to the latitude of any place; and then by a ſmall wire called the *ſolar ray*, which may be put on ſo as to proceed directly from the ſun's centre towards the earth's, but to come no farther than almoſt to touch the horizon. The beginning of twilight, time of ſun riſing, with his amplitude, meridian altitude, time of ſetting, amplitude then, and end of twilight, are ſhown for every day of the year, at that place to which the horizon is rectified.

The Moon (No. 5) exhibits all the phaſes already deſcribed.

When the above-mentioned horizon is rectified to the latitude of any given place, the times of the moon's riſing and ſetting, together with her amplitude, are ſhown to that place as well as the ſun's; and all the various phænomena of the harveſt-moon are made obvious to ſight.

The moon's orbit (No. 9.) is inclined to the ecliptic (No. 11.), one half being above, and the other below it. The nodes, or points at ☊ and ☋, lie in the plane of the ecliptic, as before deſcribed, and ſhift backward through all its ſines and degrees in 18⅔ years. The degrees of the moon's latitude to the higheſt at NL (north latitude) and loweſt at SL (ſouth latitude), are engraven both ways from her nodes at ☊ and ☋; and as the moon riſes and falls in her orbit according to its inclination, her latitude and diſtance from her nodes are ſhown for every day, having firſt rectified her orbit ſo as to ſet the nodes to their proper places in the ecliptic; and then as they come about at different and almoſt oppoſite times of the year, and then point towards the ſun, all the eclipſes may be ſhown for hundreds of years (without any new rectification) by turning the machinery backward for time paſt, or forward for time to come. At 17 degrees diſtance from each node, on both ſides, is engraved a ſmall ſun; and at 12 degrees diſtance, a ſmall moon, which ſhow the limits of ſolar and lunar eclipſes; and when, at any change, the moon falls between either of theſe ſuns and the node, the ſun will be eclipſed on the day pointed to by the annual index (No. 10.); and as the moon has then north or ſouth latitude, one may eaſily judge whether that eclipſe will be viſible in the northern or ſouthern hemiſphere: eſpecially as the earth's axis inclines towards the ſun or from him at that time. And when at any full the moon falls between either of the little moons and node, ſhe will be eclipſed, and the annual index ſhows the day of that eclipſe. There is a circle of 29½ equal parts (No. 8.) on the cover of the machine, on which an index ſhows the days of the moon's age.

There is a jointed wire, of which one end being put into a hole in the upright ſtem that holds the earth's cap, and the wire laid into a ſmall forked piece which may be occaſionally put upon Venus or Mercury, ſhows the direct and retrograde motions of theſe two planets, with their ſtationary times and places as ſeen from the earth.

The whole machinery is turned by a winch or handle (No. 12.); and is ſo eaſily moved, that a clock might turn it without any danger of ſtopping.

The PLANETARIUM, (fig. 68.) contrived by Jones, repreſents in a general manner, by various parts of its machinery, all the motions and phænomena of the planetary ſyſtem. This machine conſiſts of, the Sun (in the centre), with the planets, Mercury, Venus, the Earth and Moon; Mars, Jupiter and his four moons, Saturn and his five moons; and to it is occaſionally applied an extra long arm for the planet Herſchel and his two moons. To the earth and moon is applied a frame CD, containing only four wheels and two pinions which ſerve to preſerve the earth's axis in its proper parallelism in its motion round the ſun, and to give the moon her due revolution about the earth at the ſame time. Theſe wheels are connected with the wheel-work in the round box below, and the whole is ſet in motion by the winch H. The arm M that carries round the moon, points out on the plate C her age and phaſes for any ſituation in her orbit, and which accordingly are engraved thereon. In the ſame manner the arm points out her place in the elliptic B, in ſigns and degrees, called her geocentric place. The moon's orbit is repreſented by the flat rim A; the two joints of which, and upon which it turns, denoting her nodes. This orbit is made to incline to any deſired angle. The earth of this inſtrument is uſually made of a three inch or 1½ globe, papered, &c. for the purpoſe; and by means of the terminating wire that goes over it, points out the changes of the ſeaſons, and the different lengths of days and nights more conſpicuouſly. This machine is alſo made to repreſent the Ptolemaic ſyſtem, or ſuch as is vulgarly received; which places the earth in the centre, and the planets and ſun revolving about it. (It is done by an auxiliary ſmall ſun and an earth, which change their places in the inſtrument.) At the ſame time, it affords a moſt manifeſt confutation of it: for by this conſtruction, (1.) the planets Mercury and Venus, being both within the orbit of the Sun, cannot at any time be ſeen to go behind it. (2.) As the planets move in circular orbits about the central earth, they appear at all times of the ſame magnitude. (3.) Any of the planets might be ſeen at all diſtances from the ſun in the heavens, or the motions of the planets ſhould always be regular and uniformly the ſame. (5.) The planets move all the ſame way. All which phænomena plainly prove this ſyſtem to be a falſe and abſurd hypotheſis.

As to the eclipſes of the ſun and moon, the true cauſes of them are here very clearly ſeen; for by placing the lamp (fig. 69.) upon the centre, in room of the braſs ball denoting the ſun, and turning the winch until the moon comes into a right line between the centres of the lamp (or ſun) and earth, the ſhadow of the moon will fall upon the earth, and all who live on that part over which the ſhadow paſſes will ſee the ſun eclipſed more or leſs. On the other ſide, the moon paſſes (in the aforeſaid caſe) through the ſhadow of the earth, and is by that means eclipſed. And the orbit A (fig. 68.) is ſo moveable on the two joints called nodes, that any perſon may eaſily repreſent the due poſition of the nodes and intermediate ſpaces of the moon's orbit; and thence ſhow when there will or will not be an eclipſe of either luminary, and what the quantity of each will be.

While the moon is continuing to move round the earth, the lamp on the centre will ſo illumine the moon, that you will eaſily ſee all her phaſes, as new, dichotomized, gibbous, full, waining, &c. juſt as they appear in the heavens. You will moreover obſerve all the ſame phaſes of the earth as they appear at the moon.

The ſatellites of Jupiter and Saturn are moveable only by the hand; yet may all their phænomena be eaſily repreſented, excepting the true relative motions and diſtances. Thus, if that gilt globe which before repreſented the ſun be made now to denote Jupiter, and four of the primary planets only be retained, then will the Jovian ſyſtem be repreſented; and by candle light only you will ſee (the machine being in motion) the immerſions and emerſions of the ſatellites into and out of Jupiter's ſhadow. You will ſee plainly the manner in which they tranſit his body, and their occultations behind it. You will obſerve the various ways in which one or more of theſe moons may at times diſappear. And if the machine be ſet by a white wall, &c. then by the projection of their ſhadows will be ſeen the reaſons why thoſe moons always appear on each ſide of Jupiter in a right line, why thoſe which are moſt remote may appear neareſt, and *è contrario*. And the ſame may be done for Saturn's five moons and his ring.

The Method of rectifying the Orrery, and the proper Manner of placing the Planets in their true Situations.

The method of ſhowing the places, and relative aſpects of the planets on any day of the year in the planetarium, muſt be done by the aſſiſtance of an *ephemeris* or *almanac*, which among other almanacs is publiſhed annually by the Stationers' Company.

This ephemeris contains a diary or daily account of the planets' places in the heavens, in ſigns, degrees, and minutes, both as they appear to the eye ſuppoſed to be at the ſun, and

at the earth, throughout the year. The firſt of theſe poſitions is called the *heliocentric place*, and the latter, the *geocentric place*. The heliocentric place is that made uſe of in orreries; the geocentric place, that in globes. As an example for finding their places, and ſetting them right in the orrery, we will ſuppoſe the ephemeris (by *White*, which for this purpoſe is conſidered the beſt) at hand, wherein at the bottom of the *left-hand* page for every month are the heliocentric longitudes (or places) of all the planets to every ſix days of the month; which is near enough for common uſe: A copy of one theſe tables for March 1784 is here inſerted.

Days	Day increaſ.	Helioc. long. ♄	Helioc. long. ♃	Helioc. long. ♂	Helioc. long. ⊕	Helioc. long. ♀	Helioc. long. ☿
1	3 11	16 ♑ 45	17 ♒ 11	1 ♋ 30	11 ♍ 37	0 ♐ 35	7 ♏ 58
7	3 35	16 56	17 43	4 23	17 37	10 7	25 23
13	3 59	17 7	18 15	7 15	23 36	19 38	11 ♐ 9
19	4 23	17 17	18 47	10 6	29 33	29 8	28 33
25	4 47	17 28	19 19	12 55	5 ♎ 30	8 ♑ 38	15 ♑ 49

Suppoſe, that in order to ſet the planets of the orrery, we want their heliocentric places for the 21ſt of this month. Looking into the table, we take the 19th day, which is the neareſt to the day wanted; then, accordingly we find the place of Saturn (♄) is in 17° 17′, or 17 degrees (rejecting the minutes, being in this caſe uſeleſs); of Capricornus (♑), of Jupiter (♃), in 18° of Aquarius (♒), Mars (♂), in 10° of Cancer (♋), the Earth (⊕), in 29° of Virgo (♍), Venus (♀) in 29° of Sagittarius (♐), Mercury (☿) in 28° of the ſame ſign. Now place Saturn againſt the 17° of Capricorn, on the ecliptic circle, conſtantly placed on or ſurrounding the inſtrument; and do the ſame for the other planets, they will have their proper heliocentric places for that day.

In this ſituation of the planets, if a perſon was placed on the earth, he would ſee Venus and Jupiter in the ſame line and place of the ecliptic, conſequently in the heavens they would appear together, or in conjunction; Mercury a little to the left or eaſtward of them, and nearer to the Sun; Saturn to the right, or the weſtward, farther from the Sun; Mars directly oppoſite to Saturn; ſo that when Saturn appears in the weſt, Mars appears in the eaſt, and *vice verſa*.

The Improved Celestial Globe, fig. 70. On the north pole of the axis, above the hour-circle, is fixed an arch MKH of 23½ degrees; and at the end H is fixed an upright pin HG, which ſtands directly over the north pole of the ecliptic, and perpendicular to that part of the ſurface of the globe. On this pin are two moveable collets at D and H, to which are fixed the quadrantile wires N and O, having two little balls on their ends for the ſun and moon, as in the figure. The collet D is fixed to the circular plate F, whereon the 29½ days of the moon's age are engraven, beginning juſt under the ſun's wire N; and as this wire is moved round the globe, the plate F turns round with it. Theſe wires are eaſily turned, if the ſcrew G be ſlackened: and when they are ſet to their proper places, the ſcrew ſerves to fix them there, ſo as in turning the ball of the globe, the wires with the ſun and moon go round with it; and theſe two little balls riſe and ſet at the ſame times, and on the ſame points of the horizon, for the day to which they are rectified, as the ſun and moon do in the heavens.

Becauſe the moon keeps not her courſe in the ecliptic (as the ſun appears to do), but has a declination of 5⅓ degrees on each ſide from it in every lunation, her ball may be ſcrewed as many degrees to either ſide of the ecliptic as her latitude or declination from the ecliptic amounts to at any given time.

The horizon is ſupported by two ſemicircular arches, becauſe pillars would ſtop the progreſs of the balls when they go below the horizon in an oblique ſphere.

To rectify this Globe. Elevate the pole to the latitude of the place; then bring the ſun's place in the ecliptic for the given day to the brazen meridian, and ſet the hour index at 12 at noon, that is, to the upper 12 on the hour circle; keeping the globe in that ſituation, ſlacken the ſcrew G, and ſet the ſun directly over his place on the meridian; which done, ſet the moon's wire under the number that expreſſes her age for that day on the Plate F, and ſhe will then ſtand over her place in the ecliptic, and ſhow what conſtellation ſhe is in. Laſtly, faſten the ſcrew G, and adjuſt the moon to her latitude, and the globe will be rectified.

Having thus rectified the globe, turn it round, and obſerve on what points of the horizon the ſun and moon balls riſe and ſet, for theſe agree with the points of the compaſs on which the ſun and moon riſe and ſet in the heavens on the given day: and the hour index ſhows the times of their riſing and ſetting: and likewiſe the time of the moon's paſſing over the meridian.

The Trajectorium Lunare, (fig. 71.) by delineating the paths of the earth and moon, ſhows what ſort of curves they make in the ethereal regions. S is the ſun, and E the earth, whoſe centres are 95 inches diſtant from each other; every inch anſwering to 1,000,000 of miles. M is the moon, whoſe centre is $\frac{24}{100}$ parts of an inch from the earth's in this machine, this being in juſt proportion to the moon's diſtance from the earth. AA is a bar of wood, to be moved by hand round the axis *g* which is fixed in the wheel Y. The circumference of this wheel is to the circumference of the ſmall wheel L (below the other end of the bar) as 365¼ days is to 29½, or as a year is to a lunation. The wheels are grooved round their edges, and in the grooves is the cat-gut ſtring GG croſſing between the wheels at X. On the axis of the wheel L is the index F, in which is fixed the moon's axis M for carrying her round the earth E (fixed on the axis of the wheel L in the time that the index goes round a circle of 29½ equal parts, which are the days of the moon's age. The wheel Y has the months and days of the year all round its limb; and in the bar AA is fixed the index *l*, which points out the days of the months anſwering the days of the moon's age, ſhown by the index F, in the circle of 29½ equal parts at the other end of the bar. On the axis of the wheel L is put the piece D, below the cock C, in which this axis turns round; and in D are put the pencils *e* and *m* directly under the earth E and moon M; ſo that *m* is carried round *e* as M is round E.

Lay the machine on an even floor, preſſing gently on the

wheel Y, to cauſe its ſpiked feet (of which two appear at P and P, the third being ſuppoſed to be hid from ſight by the wheel) enter a little into the floor to ſecure the wheel from turning. Then lay a paper about four feet long under the pencils *e* and *m*, croſswiſe to the bar; which done, move the bar ſlowly round the axis *g* of the wheel Y; and as the earth E goes round the ſun S, the moon M will go round the earth with a duly proportioned velocity; and the friction wheel W running on the floor, will keep the bar from bearing too heavily on the pencils *e* and *m*, which will delineate the paths of the earth and moon. As the index I points out the days of the months, the index F ſhows the moon's age on theſe days, in the circle of 29½ equal parts. And as this laſt index points to the different days in its circle, the like numeral figures may be ſet to thoſe parts of the curves of the earth's path and moon's, where the pencils *e* and *m* are at thoſe times reſpectively, to ſhow the places of the earth and moon. If the pencil *e* be puſhed a very little off, as if from the pencil *m*, to about $\frac{1}{30}$ part of their diſtance, and the pencil *m* puſhed as much towards *e*, to bring them to the ſame diſtances again, though not to the ſame points of ſpace; then, as *m* goes round *e*, *e* will go as it were round the centre of gravity between the earth *e* and moon *m*; but this motion will not ſenſibly alter the figure of the earth's path or the moon's.

If a pin, as *p*, be put through the pencil *m*, with its head towards that of the pin *q* in the pencil *e*, its head will always keep thereto as *m* goes round *e*, or as the ſame ſide of the moon is ſtill obverted to the earth. But the pin *p*, which may be conſidered as an equatorial diameter of the moon, will turn quite round the point *m*, making all poſſible angles with the line of its progreſs, or line of the moon's path. This is an ocular proof of the moon's turning round her axis.

SECT. XIII. *A Deſcription of the principal Aſtronomical Inſtruments by which Aſtronomers make the moſt accurate Obſervations.*

BY practical aſtronomy is implied the knowledge of obſerving the celeſtial bodies with reſpect to their poſition and time of the year, and of deducing from thoſe obſervations certain concluſions uſeful in calculating the time when any propoſed poſition of theſe bodies ſhall happen.

For this purpoſe, it is neceſſary to have a room or place conveniently ſituated, ſuitably contrived, and furniſhed with proper aſtronomical inſtruments. It ſhould have an uninterrupted view from the zenith down to (or even below) the horizon, at leaſt towards its cardinal points: and for this purpoſe, that part of the roof which lies in the direction of the meridian in particular, ſhould have moveable covers, which may eaſily be moved and put on again; by which means an inſtrument may be directed to any point of the heavens between the horizon and the zenith, as well to the northward as ſouthward.

This place, called an Obſervatory, ſhould contain ſome, if not all, of the following inſtruments.

A PENDULUM CLOCK, for ſhowing equal time. This ſhould ſhow time in hours, minutes, and ſeconds; and with which the obſerver, by hearing the beats of the pendulum, may count them by his ear, while his eye is employed on the motion of the celeſtial object he is obſerving. Juſt before the object arrives at the poſition deſcribed, the obſerver ſhould look on the clock and remark the time, ſuppoſe it 9 hours 15 minutes 25 ſeconds; then ſaying, 25, 26, 27, 28, &c. reſponſive to the beat of the pendulum, till he ſees through the inſtrument the object arrived at the poſition expected; which ſuppoſe to happen when he ſays 38, he then writes down 9 h. 15 min. 38 ſec. for the time of obſervation, annexing the year and the day of the month.

AN ACHROMATIC REFRACTING TELESCOPE, or a REFLECTING one, of two feet at leaſt in length, for obſerving particular phenomena. Theſe inſtruments are particularly deſcribed under OPTICS.

A MICROMETER, for meaſuring ſmall angular diſtances. See MICROMETER.

ASTRONOMICAL QUADRANTS, both mural and portable, for obſerving meridian and other altitudes of the celeſtial bodies.

1. The *Mural Quadrant* is in the form of a quarter of a circle, contained under two radii at right angles to one another, and an arch equal to one fourth part of the circumference of the circle. It is the moſt uſeful and valuable of all the aſtronomical inſtruments; and as it is ſometimes fixed to the ſide of a ſtone or brick wall, and the plane of it erected exactly in the plane of the meridian, it in this caſe receives the name of *mural quadrant* or *arch*.

Tycho Brahe was the firſt perſon who applied this arch to a wall; and Flamſtead, the firſt in England who with indefatigable pains fixed one up in the royal obſervatory at Greenwich.

Theſe inſtruments have uſually been made from five to eight feet radius. Fig. 72. repreſents the inſtrument as already fixed to the wall. The frame is formed of flat bars, and ſtrengthened by edge bars affixed underneath perpendicularly to them. The radii HB, HA, being divided each into four equal parts, ſerves to find out the points D and E, by which the quadrant is freely ſuſpended on its props or iron ſupports that are faſtened ſecurely in the wall.

One of the ſupports E is repreſented ſeparately in *e* on one ſide of the quadrant. It is moveable by means of a long ſlender rod EF or *ef*, which goes into a hollow ſcrew in order to reſtore the inſtrument to its ſituation when it is diſcovered to be a little deranged. This may be known by the very fine perpendicular thread HA, which ought always to coincide with the ſame point A of the limb, and carefully examined to be ſo by a ſmall magnifying teleſcope at every obſervation. In order to prevent the unſteadineſs of ſo great a machine, there ſhould be placed behind the limb four copper ears with double cocks I, K, I, K. There are others along the radii HA and HB. Each of theſe cocks contains two ſcrews, into which is faſtened the ears that are fixed behind the quadrant.

Over the wall or ſtone which ſupports the inſtrument, and at the ſame height as the centre, is placed horizontally the axis PO, which is perpendicular to the plane of the inſtrument, and which would paſs through the centre if it was continued. This axis turns on two pivots P. On this axis is fixed at right angles another branch ON, loaded at its extremity with a weight N capable of equipoiſing with its weight that of the teleſcope LM; whilſt the axis, by its extremity neareſt the quadrant, carries the wooden frame PRM, which is faſtened to the teleſcope in M. The counterpoiſe takes off from the obſerver the weight of the teleſcope when he raiſes it, and hinders him from either forcing or ſtraining the inſtrument.

The lower extremity (V) of the teleſcope is furniſhed with two ſmall wheels, which take the limb of the quadrant on its two ſides. The teleſcope hardly bears any more upon the limb than the ſmall friction of theſe two wheels; which renders its motion ſo extremely eaſy and pleaſant, that by giving it with the hand only a ſmall motion, the teleſcope will run of itſelf over a great part of the limb, balanced by the counterpoiſe N.

When the teleſcope is to be ſtopped at a certain poſition, the copper hand T is to be made uſe of, which embraces the limb and ſprings at the bottom. It is fixed by ſetting a ſcrew, which faſtens it to the limb. Then, in turning the regulating ſcrew, the teleſcope will be advanced; which is continued until the ſtar or other object whoſe altitude is obſerving be on the hori-

zontal fine thread in the telescope. Then on the plate X supporting the telescope, and carrying a vernier or nonius, will be seen the number of degrees and minutes, and even quarter of minutes, that the angular height of the object observed is equal to. The remainder is easily estimated within two or three seconds nearly.

There are several methods of subdividing the divisions of a mural quadrant, which are usually from five to ten minutes each; but that which is most commonly adopted is by the vernier or nonius, the contrivance of Peter Vernier a Frenchman. This vernier consists of a piece of copper or brass, CDAB (fig. 73.), which is a small portion of X (fig. 72.), represented separately. The length CD is divided into 20 equal parts, and placed contiguously on a portion of the division of the limb of the quadrant containing 21 divisions, and thereby dividing this length into 20 equal parts. Thus the first division of the vernier piece marked 15, beginning at the point D, is a little matter backward, or to the left of the first division of the limb, equal to 15″. The second division of the vernier is to the left of the second division of the limb double of the first difference, or 30″; and so on unto the twentieth and last division on the left of the vernier piece; where the 20 differences being accumulated each of the twentieth part of the division of the limb, this last division will be found to agree exactly with the 21st division on the limb of the quadrant.

The index must be pushed the 20th part of a division, or 15″, to the right; for to make the second division on the vernier coincide with one of the divisions of the limb, in like manner is moving two 20ths, or 30″, we must look at the second division of the index, and there will be a coincidence with a division of the limb. Thus may be conceived that the beginning D of the vernier, which is always the line of reckoning, has advanced two divisions, or 30″, to the right, when the second division, marked 30 on the vernier, is seen to correspond exactly with one of the lines of the quadrant.

On the side of the quadrant is placed the plate of copper which carries the telescope. This plate carries two verniers. The outer line CD divides five minutes into 20 parts, or 15″ each. The interior line AB answers to the parts of another division not having 90°, but 96 parts of the quadrant. It is usually adopted by English astronomers on account of the facility of its subdivisions. Each of the 96 portions of the quadrant is equivalent to 56′ 15″ of the usual divisions. It is divided on the limb into 16 parts, and the arch of the vernier AB contains 25 of these divisions; and being divided itself into 24, immediately gives parts, the value of each of which is 8″ 47$\frac{1}{3}$‴.

2. The *Portable Astronomical Quadrant*, is generally made from 12 to 23 inches. Fig. 74. is of brass, and strongly framed together by crossed perpendicular bars. The arch AC, and telescope EF, are divided and constructed in a similar manner to the mural quadrant, but generally without the division of 96 parts. The counterpoise to the telescope T is represented at P, and also another counterpoise to the quadrant itself at P. The quadrant is fixed to a long axis, which goes into the pillar KR. Upon this axis is fixed an index, which points to and subdivides by a vernier the divisions of the azimuth circle K. This azimuth circle is extremely useful for taking the azimuth of a celestial body at the same time its altitude is observed. The upper end of the axis is firmly connected with the adjusting frame GH; and the pillar is supported on the crossed feet at the bottom of the pillar KR with the adjusting screws *a*, *b*, *c*, *d*.

When this instrument is set up for use or observation, it is necessary that two adjustments be very accurately made: one, that the plane or surface of the instrument be truly perpendicular to the horizon; the other, that the line supposed to be drawn from the centre to the first line of the limb, be truly on a level or parallel with the horizon. The first of these particulars is done by means of the thread and plummet *p*; the thread of which is usually of very fine silver wire, and it is placed opposite to a mark made upon the end of the limb of the instrument. The four screws at the foot *a*, *b*, *c*, *d*, are to be turned until a perfect coincidence is observed of the thread upon the mark, which is accurately observed by means of a small telescope T, that fits to the limb. The other adjustment is effected by means of the spirit level L, which applies on the frame GH, and the small screws turned as before until the bubble of air in the level settles in the middle of the tube. The dotted tube EB is a kind of prover to the instrument: for by observing at what mark the centre of it appears against, or by putting up a mark against it, it will at any time discover if the instrument has been displaced. The screw S at the index, is the regulating or adjusting screw, to move the telescope and index, during the observation, with the utmost nicety.

Astronomical *or* Equatorial Sector, an instrument for finding the difference in right ascension and declination between two objects, the distance of which is too great to be observed by the micrometer, was invented by Graham. Let AB (fig. 79.) represent an arch of a circle containing 10 or 12 degrees well divided, having a strong plate CD for its radius, fixed to the middle of the arch at D: let this radius be applied to the side of an axis HFI, and be moveable about a joint fixed to it at F, so that the plane of the sector may be always parallel to the axis HI; which being parallel to the axis of the earth, the plane of the sector will always be parallel to the plane of some hour-circle. Let a telescope CE be moveable about the centre C of the arch AB, from one end of it to the other, by turning a screw at G; and let the line of sight be parallel to the plane of the sector. Now, by turning the whole instrument about the axis HI, till the plane of it be successively directed, first to one of the stars and then to another, it is easy to move the sector about the joint F, into such a position, that the arch AB, when fixed, shall take in both the stars in their passage, by the plane of it, provided the difference of their declinations does not exceed the arch AB. Then, having fixed the plane of the sector a little to the westward of both the stars, move the telescope CE by the screw G; and observe by a clock the time of each transit over the cross hairs, and also the degrees and minutes upon the arch AB, cut by the index at each transit; then in the difference of the arches, the difference of the declinations, and by the difference of the times, we have the difference of the right ascensions of the stars.

The dimensions of this instrument are these: The length of the telescope, or the radius of the sector, is 2$\frac{1}{2}$ feet; the breadth of the radius, near the end C, is 1$\frac{1}{2}$ inch; and at the end D two inches. The breadth of the limb AB is 1$\frac{1}{2}$ inch; and its length six inches, containing ten degrees divided into quarters and numbered from either end to the other. The telescope carries a nonius or subdividing plate, whose length, being equal to sixteen quarters of a degree, is divided into fifteen equal parts; which, in effect, divides the limb into minutes, and, by estimation, into smaller parts. The length of the square axis HIF is eighteen inches, and of the part HI twelve inches; and its thickness is about a quarter of an inch: the diameters of the circles are each five inches: the thickness of the plates, and the other measures, may be taken at the direction of a workman.

This instrument may be rectified, for making observations, in this manner: By placing the intersection of the cross hairs at the same distance from the plane of the sector, as the centre of the object-glass, the plane described by the line of sight during the circular motion of the telescope upon the limb, will

be ſufficiently true, or free from conical curvity; which may be examined by ſuſpending a long plumb-line at a convenient diſtance from the inſtrument; and by fixing the plane of the ſector in a vertical poſition, and then by obſerving, while the teleſcope is moved by the ſcrew along the limb, whether the croſs hairs appear to move along the plumb line.

The axis *h f o* may be elevated nearly parallel to the axis of the earth, by means of a ſmall common quadrant; and its error may be corrected, by making the line of ſight follow the circular motion of any of the circumpolar ſtars, while the whole inſtrument is moved about its axis *h f o*, the teleſcope being fixed to the limb: for this purpoſe, let the teleſcope *k l* be directed to the ſtar *a*, when it paſſes over the higheſt point of its diurnal circle, and let the diviſion cut by the nonius be then noted: then, after twelve hours, when the ſtar comes to the loweſt point of its circle, having turned the inſtrument half round its axis, to bring the teleſcope into the poſition *m n*; if the croſs hairs cover the ſame ſtar ſuppoſed at *b*, the elevation of the axis *h f o* is exactly right; but if it be neceſſary to move the teleſcope into the poſition *uv*, in order to point to this ſtar at *c*, the arch *m u*, which meaſures the angle *m f u* or *h f c*, will be known; and then the axis *h f o* muſt be depreſſed half the quantity of this given angle if the ſtar paſſed below *b*, or muſt be raiſed ſo much higher if above it; and then the trial muſt be repeated till the true elevation of the axis be obtained. By making the like obſervations upon the ſame ſtar on each ſide the pole, in the ſix-o'clock-hour-circle, the error of the axis, toward the eaſt or weſt, may alſo be found and corrected, till the croſs-hairs follow the ſtar quite round the pole: for ſuppoſing *a o p b c* to be an arch of the meridian (or in the ſecond practice of the ſix-o'clock-hour-circle), make the angle *a f p* equal to half the angle *a f c*, and the line *f p* will point to the pole; and the angle *o f p*, which is the error of the axis, will be equal to half the angle *b f c*, or *m f u*, found by the obſervation; becauſe the difference of the two angles *a f b*, *a f c*, is double the difference of their halves *a f o* and *a f p*. Unleſs the ſtar be very near the pole, allowance muſt be made for refractions.

TRANSIT Inſtrument.

1. *The Tranſit Inſtrument* uſed for obſerving objects as they paſs over the meridian, conſiſts of a teleſcope fixed at right angles to an horizontal axis, ſo ſupported that what is called the line of collimation, or line of ſight of the teleſcope, may move in the plane of the meridian.

The axis AB (fig. 75.), to which the middle of the teleſcope is fixed, is about 2½ feet long, tapering gradually toward its ends, which terminate in cylinders well turned and ſmoothed. The teleſcope CD, which is about four feet and 1½ inch diameter, is connected with the axis by means of a ſtrong cube or die G, and in which the two cones MQ, forming the axis, are fixed. This cube or ſtock G ſerves as the principal part of the whole machine. It not only keeps together the two cones, but holds the two ſockets KH, of 15 inches length, for the two teleſcopic tubes. Each of theſe ſockets has a ſquare baſe, and is fixed to the cube by four ſcrews. Theſe ſockets are cut down in the ſides about eight inches, to admit more eaſily the tube of the teleſcope; but when the tube is inſerted, it is kept in firm by ſcrewing up the tightening ſcrews at the end of the ſockets at K and H. Theſe two ſockets are very uſeful in keeping the teleſcope in its greateſt poſſible degree of ſteadineſs. They alſo afford a better opportunity of balancing the teleſcope and rectifying its vertical thread, than by any other means.

In order to direct the teleſcope to the given height that a ſtar would be obſerved at, there is fixed a ſemicircle AN on one of the ſupporters, of about 8½ inches diameter, and divided into degrees. The index is fixed on the axis, at the end of which is a vernier, which ſubdivides the degrees into 12 parts or five minutes. This index is moveable on the axis, and may be cloſely applied to the diviſions by means of a tightening ſcrew.

Two upright poſts of wood or ſtone YY, firmly fixed at a proper diſtance, are to ſuſtain the ſupporters of this inſtrument. Theſe ſupporters are two thick braſs plates RR, having well ſmoothed angular notches in their upper ends, to receive the cylindrical arms of the axis. Each of theſe notched plates is contrived to be moveable by a ſcrew, which ſlides them upon the ſurfaces of two other plates immoveably fixed upon the two upright pillars; one plate moving in an horizontal, and the other in a vertical direction; or, which is more ſimple, theſe two modes are ſometimes applied only on one ſide, as at V and P, the horizontal motion by the ſcrew P, and the vertical by the ſcrew V. Theſe two motions ſerve to adjuſt the teleſcope to the planes of the horizon and meridian: to the plane of the horizon by the ſpirit-level EF, hung by DC on the axis MQ, in a parallel direction; and to the plane of the meridian in the following manner:

Obſerve by the clock when a circumpolar ſtar ſeen through this inſtrument tranſits both above and below the pole; and if the times of deſcribing the eaſtern and weſtern parts of its circuit are equal, the teleſcope is then in the plane of the meridian: otherwiſe the ſcrew P muſt be gently turned that it may move the teleſcope ſo much that the time of the ſtar's revolution be biſected by both the upper and lower tranſits, taking care at the ſame time that the axis remains perfectly horizontal. When the teleſcope is thus adjuſted, a mark muſt be ſet at a conſiderable diſtance (the greater the better) in the horizontal direction of the interſection of the croſs wires, and in a place where it can be illuminated in the night-time by a lanthorn hanging near it; which mark being on a fixed object, will ſerve at all times afterwards to examine the poſition of the teleſcope by, the axis of the inſtrument being firſt adjuſted by means of the level.

To adjuſt the Clock by the Sun's Tranſit over the Meridian. Note the times by the clock when the preceding and following edges of the ſun's limb touch the croſs wires. The difference between the middle time and 12 hours, ſhows how much the mean, or time by the clock, is faſter or ſlower than the apparent, or ſolar time, for that day; to which the equation of time being applied, will ſhow the time of mean noon for that day, by which the clock may be adjuſted.

Beſides the above may be mentioned,

The EQUATORIAL *or* PORTABLE OBSERVATORY; an inſtrument deſigned to anſwer a number of uſeful purpoſes in practical aſtronomy, independent of any particular obſervatory, may be made uſe of in any ſteady room or place, and performs moſt of the uſeful problems in the ſcience.

The principal parts of this inſtrument (fig. 76.) are, 1. The azimuth or horizontal circle A, which repreſents the horizon of the place, and moves on a long axis B, called the *vertical axis*. 2. The equatorial or hour circle C, repreſenting the equator, placed at right angles to the polar axis D, or the axis of the earth, upon which it moves. 3. The ſemicircle of declination E, on which the teleſcope is placed, and moving on the axis of declination, or the axis of motion of the line of collimation F. Theſe circles are meaſured and divided as in the following table:

Meaſures of the ſeveral circles, and diviſions on them.	Radius. In dec.	Limb divided to	Nonius of 30 gives ſeconds.	Divided on limb into parts of inc.	Divided by Nonius into parts of inc.
Azimuth or horizontal circle	5 1	15′	30″	45th	1350th
Equatorial or hour circle	5 1	15′ / 1′ in time	30′ / 2″	45th	1350th
Vertical ſemicircle for declination or latitude	5 5	15′	30″	42d	1260th

4. The teleſcope in this equatorial may be brought parallel to the polar axis, as in the figure, ſo as to point to the pole ſtar in any part of its diurnal revolution; and thus it has been obſerved near noon, when the ſun has ſhone very bright. 5. The apparatus for correcting the error in altitude occaſioned by refraction, which is applied to the eye-end of the teleſcope, and conſiſts of a ſlide G moving in a groove or dovetail, and carrying the ſeveral eye tubes of the teleſcope, on which ſlide there is an index correſponding to five ſmall diviſions engraved on the dovetail; a very ſmall circle, called the refraction circle H, moveable by a finger-ſcrew at the extremity of the eye-end of the teleſcope; which circle is divided into half minutes, one entire revolution of it being equal to 3′ 18″, and by its motion raiſes the centre of the croſs hairs on a circle of altitude; and likewiſe a quadrant I of 1½ inch radius, with diviſions on each ſide, one expreſſing the degree of altitude of the object viewed, and the other expreſſing the minutes and ſeconds of error occaſioned by refraction, correſponding to that degree of altitude: to this quadrant is joined a ſmall round level K, which is adjuſted partly by the pinion that turns the whole of this apparatus, and partly by the index of the quadrant; for which purpoſe the refraction circle is ſet to the ſame minute, &c. which the index points to on the limb of the quadrant; and if the minute, &c. given by the quadrant exceed the 3′ 18″ contained in one entire revolution of the refraction circle, this muſt be ſet to the exceſs above one or more of its entire revolutions; then the centre of the croſs hairs will appear to be raiſed on a circle of altitude to the additional height which the error of refraction will occaſion at that altitude.

The principal adjuſtment in this inſtrument is that of making the line of collimation to deſcribe a portion of an hour-circle in the heavens; in order to which, the azimuth circle muſt be truly level, the line of collimation or ſome correſponding line repreſented by the ſmall braſs rod M parallel to it, muſt be perpendicular to the axis of its own proper motion; and this laſt axis muſt be perpendicular to the polar axis; on the braſs rod M there is occaſionally placed a hanging level N, the uſe of which will appear in the following adjuſtments:

The azimuth-circle may be made level by turning the inſtrument till one of the levels is parallel to an imaginary line joining two of the feet ſcrews; then adjuſt that level with theſe two feet ſcrews; turn the circle half round, *i. e.* 180°; and if the bubble be not then right, correct half the error by the ſcrew belonging to the level, and the other half error by the two feet ſcrews; repeat this till the bubble comes right; then turn the circle 90° from the two former poſitions, and ſet the bubble right, if it be wrong, by the foot ſcrew at the end of the level; when this is done, adjuſt the other level by its own ſcrew, and the azimuth circle will be truly level. The hanging level muſt then be fixed to the braſs rod by two hooks of equal length, and made truly parallel to it: for this purpoſe make the polar axis perpendicular or nearly perpendicular to the horizon; then adjuſt the level by the pinion of the declination-ſemicircle; reverſe the level, and, if it be wrong, correct half the error by a ſmall ſteel ſcrew that lies under one end of the level, and the other half error by the pinion of the declination-ſemicircle; repeat this till the bubble be right in both poſitions. In order to make the braſs rod on which the level is ſuſpended at right angles to the axis of motion of the teleſcope or line of collimation, make the polar axis horizontal, or nearly ſo: ſet the declination-ſemicircle to 0°, turn the hour circle till the bubble comes right; then turn the declination-circle to 90°; adjuſt the bubble by raiſing or depreſſing the polar axis (firſt by hand till it be nearly right, afterwards tighten with an ivory key the ſocket which runs on the arch with the polar axis, and then apply the ſame ivory key to the adjuſting ſcrew at the end of the ſaid arch till the bubble comes quite right); then turn the declination-circle to the oppoſite 90°; if the level be not then right, correct half the error by the aforeſaid adjuſting ſcrew at the end of the arch, and the other half error by the two ſcrews which raiſe or depreſs the end of the braſs rod. The polar axis remaining nearly horizontal as before, and the declination-ſemicircle at 0°, adjuſt the bubble by the hour-circle; then turn the declination-ſemicircle to 90°, and adjuſt the bubble by raiſing or depreſſing the polar axis; then turn the hour-circle 12 hours; and if the bubble be wrong, correct half the error by the polar axis, and the other half error by the two pair of capſtan ſcrews at the feet of the two ſupports on one ſide of the axis of motion of the teleſcope; and thus this axis will be at right angles to the polar axis. The next adjuſtment is to make the centre of croſs hairs remain on the ſame object, while you turn the eye-tube quite round by the pinion of the refraction apparatus: for this adjuſtment, ſet the index on the ſlide to the firſt diviſion on the dovetail; and ſet the diviſion marked 18″ on the refraction circle to its index; then look through the teleſcope, and with the pinion turn the eye-tube quite round; and if the centre of the hairs does not remain on the ſame ſpot during that revolution, it muſt be corrected by the four ſmall ſcrews, two and two at a time (which you will find upon unſcrewing the neareſt end of the eye tube that contains the firſt eye-glaſs); repeat this correction till the centre of the hairs remains on the ſpot you are looking at during an entire revolution. In order to make the line of collimation parallel to the braſs rod on which the level hangs, ſet the polar axis horizontal, and the declination-circle to 90°; adjuſt the level by the polar axis; look through the teleſcope on ſome diſtant horizontal object, covered by the centre of the croſs hairs; then invert the teleſcope, which is done by turning the hour-circle half round; and if the centre of the croſs hairs does not cover the ſame object as before, correct half the error by the uppermoſt and lowermoſt of the four ſmall ſcrews at the eye-end of the large tube of the teleſcope: this correction will give a ſecond object now covered by the centre of the hairs, which muſt be adopted inſtead of the firſt object: then invert the teleſcope as before; and if the ſecond object be not covered by the centre of the hairs, correct half the error by the ſame two ſcrews which were uſed before: this correction

will give a third object, now covered by the centre of the hairs, which muſt be adopted inſtead of the ſecond object; repeat this operation till no error remains; then ſet the hour-circle exactly to 12 hours (the declination circle remaining at 90° as before); and if the centre of the croſs hairs does not cover the laſt object fixed on, ſet it to that object by the two remaining ſmall ſcrews at the eye-end of the large tube, and then the line of collimation will be parallel to the braſs rod. For rectifying the nonius of the declination and equatorial circles, lower the teleſcope as many degrees, minutes, and ſeconds, below 0° or Æ on the declination ſemicircle as are equal to the complement of the latitude; then elevate the polar axis till the bubble be horizontal, and thus the equatorial circle will be elevated to the co-latitude of the place; ſet this circle to 6 hours; adjuſt the level by the pinion of the declination circle; then turn the equatorial circle exactly 12 hours from the laſt poſition; and if the level be not right, correct one half of the error by the equatorial circle, and the other half by the declination circle; then turn the equatorial circle back again exactly 12 hours from the laſt poſition; and if the level be ſtill wrong, repeat the correction as before till it be right, when turned to either poſition; that being done, ſet the nonius of the equatorial circle exactly to 6 hours, and the nonius of the declination circle exactly to 0°.

The principal uſes of this equatorial are,

1. To find your meridian by one obſervation only: for this purpoſe, elevate the equatorial circle to the co-latitude of the place, and ſet the declination-ſemicircle to the ſun's declination for the day and hour of the day required; then move the azimuth and hour circles both at the ſame time, either in the ſame or contrary direction, till you bring the centre of the croſs hairs in the teleſcope exactly to cover the centre of the ſun; when that is done, the index of the hour-circle will give the apparent or ſolar time at the inſtant of obſervation; and thus the time is gained, though the ſun be at a diſtance from the meridian; then turn the hour-circle till the index points preciſely at 12 o'clock, and lower the teleſcope to the horizon, in order to obſerve ſome point there in the centre of your glaſs, and that point is your meridian mark found by one obſervation only; the beſt time for this operation is three hours before or three hours after 12 at noon.

2. To point the teleſcope on a ſtar, though not on the meridian, in full day-light. Having elevated the equatorial circle to the co-latitude of the place, and ſet the declination-ſemicircle to the ſtar's declination, move the index of the hour-circle till it ſhall point to the preciſe time at which the ſtar is then diſtant from the meridian, found in tables of the right aſcenſion of the ſtars, and the ſtar will then appear in the glaſs. Beſides theſe uſes peculiar to this inſtrument, it is alſo applicable to all the purpoſes to which the principal aſtronomical inſtruments, viz. a tranſit, a quadrant, and an equal altitude inſtrument, are applied.

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ASTROSCOPE, a kind of aſtronomical inſtrument, compoſed of two cones, on whoſe ſurface the conſtellations, with their ſtars, are delineated, ſo that the ſtars may be eaſily known by it. The aſtroſcope is the invention of William Shuckhard, formerly profeſſor of mathematics at Tubingen, who publiſhed a treatiſe expreſsly on it in 1698.

ASTRUC (John), a celebrated phyſician, born in the year 1684, at the little town of Savoy, in the late province of Languedoc in France. In January 1703 he was created doctor of phyſic; and in the year 1717 he was appointed to teach medicine at Montpelier; which he did with ſuch perſpicuity and eloquence, that it was univerſally ſaid he had been born to be a profeſſor. Upon the death of the celebrated Geoffroy, in the year 1731, he was appointed Regius Profeſſor of medicine at Paris. After having tranſmitted to poſterity many valuable monuments of his medical erudition, he died, univerſally regretted, on the 15th of May 1766, in the 82d year of his age.

ASTURIA, anciently a kingdom of Spain, ſubdued by Auguſtus emperor of Rome; but now a principality of modern Spain, bounded by Biſcay on the E. Galicia on the W. Caſtile and Old Leon on the S. and the ſea on the N. Its greateſt length is about 110 miles, and its breadth 54. The hereditary prince of Spain is ſtyled *Prince of the Aſturias*.

ASTYNOMI, in Grecian antiquity, magiſtrates in Athens, correſponding to the ædiles of the Romans; they were ten in number. See ÆDILE.

ASYLUM, a ſanctuary, or place of refuge, where criminals ſhelter themſelves from the hands of juſtice. The word is compounded of the privative particle α, and συλαω *I hurt*; becauſe no perſon could be taken out of an aſylum without ſacrilege. The aſyla of altars and temples were very ancient; and likewiſe thoſe of tombs, ſtatues, and other monuments of conſiderable perſonages. The Jews alſo had their aſyla; the

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moſt remarkable of which were, the ſix cities of refuge, the temple, and the altar of burnt-offerings. It was cuſtomary among the heathens to allow refuge and impunity even to the vileſt and moſt flagrant offenders; ſome out of ſuperſtition, and others for the ſake of peopling their cities; and it was by this means, and with ſuch inhabitants, that Thebes, Athens, and Rome, were firſt ſtocked. The emperors Honorius and Theodoſius granting the like immunities to churches, the biſhops and monks laid hold of a certain tract or territory, without which they fixed the bounds of the ſecular juriſdiction: and ſo well did they manage their privileges, that convents in a little time became next akin to fortreſſes; where the moſt notorious villains were in ſafety, and braved the power of the magiſtrate. Theſe privileges at length were extended not only to the churches and church-yards, but alſo to the biſhops' houſes; whence the criminal could not be removed without a legal aſſurance of life, and an entire remiſſion of the crime. But at length theſe aſyla or ſanctuaries were alſo ſtripped of moſt of their immunities, becauſe they ſerved only to embolden guilt. In England, particularly, they were entirely aboliſhed. See SANCTUARY.

ASYMMETRY, the want of proportion between the parts of any thing; being the contrary of *ſymmetry*.

ASYMPTOTE, in geometry, a line which continually approaches nearer to another; but, though continued infinitely, will never meet with it: of theſe are many kinds. In ſtrictneſs, however, the term *aſymptotes* is appropriated to right lines, which approach nearer and nearer to ſome curves of which they are ſaid to be *aſymptotes*; but if they and their curves are indefinitely continued, they will never meet. See *Conic Sections*.

ASYNDETON, in grammar, a figure which omits the conjunctions in a ſentence: as in *veni, vidi, vici*, where ET is left out: or in that of Cicero concerning Catiline, *abiit, exceſſit,*

vaſit, erupit: or in that verſe of Virgil, *Ferte citi flammas, date vela, impellite remos.* Aſyndeton ſtands oppoſed to polyſyndeton, where the copulatives are multiplied.

ATABULUS, in phyſiology, a provincial wind in Apulia, of a dry pinching quality, and very noxious in its effects. The ancient naturaliſts ſpeak of the Atabulus in terms of horror, on account of the ravage it made among the fruits of the earth, which it ſcorched or withered up.

ATALANTA, an iſland in the Euripus of Eubœa, near the Locri Opuntii, ſaid to have been originally a city of the Locri, but torn from the continent in the time of an earthquake, and during an eruption of Mount Ætna, in the 4th year of the 93d Olympiad.

ATALANTIS, Atlantica, or Atlantis. See Atlantis.

ATARAXY, a term uſed by the ſtoics and ſceptics, to denote that calmneſs of mind which ſecures us from all emotions ariſing from vanity and ſelf-conceit.

ATARGATIS fanum, the temple of a goddeſs worſhipped by the Syrians and Parthians, having the face of a woman and tail of a fiſh, and called *Derceto* by the Greeks. Her temple, which was extremely rich, ſtood in the city of Bambyce, called afterwards *Hierapolis*.

ATARNEA, an ancient town of Myſia, ſituated between Adrymittium and Pitane, remarkable for the marriage of Ariſtotle with the ſiſter or concubine of the tyrant Hermias; alſo for the dotage of that philoſopher.

ATAXY, in a general ſenſe, the want of order. With phyſicians, it ſignifies irregularity in the criſes and paroxyſms of fevers.

ATCHE, in commerce, a ſmall ſilver coin uſed in Turkey, and worth only one third of the Engliſh penny.

ATCHIEVEMENT, or Achievement, in heraldry, denotes the arms of a perſon or family, together with all the exterior ornaments of the ſhield; as helmet, mantle, creſt, ſcrolls, and motto, together with ſuch quarterings as may have been acquired by alliances, all marſhalled in regular order.

ATE, in the Pagan theology, the goddeſs of miſchief.

ATEGUA, or Attegua, now *Tebala Vieja*, or *Teivela*, an ancient town of Spain, placed by ſome in the road from Antequera to Seville; by others near Alcala Real.

ATELLA, an ancient town of Campania in Italy, between Capua and Neapolis. The ruins of this town are ſtill to be ſeen about 11 miles from the modern Averſa, which was built out of its materials.

A TEMPO giusto, in muſic, ſignifies to ſing or play in an equal, true, and juſt time.

ATERGATIS, in mythology, a goddeſs of the Syrians, ſuppoſed to be the mother of Semiramis. She was repreſented with the face and breaſts of a woman, but the reſt of her body reſembled a fiſh.

ATHAMADULET, the prime miniſter of the Perſian empire, as the grand vizier is of the Turkiſh empire. He is great chancellor of the kingdom, preſident of the council, ſuperintendant of the finances, and is charged with all foreign affairs.

ATHAMANTA, spignel; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is oblong and ſtriated; and the petals are inflected and emarginated. Of this genus Linnæus enumerates nine ſpecies; but none of them merit particular notice, except the cretenſis, otherwiſe called *daucus creticus*, which grows wild in the Levant and the warmer parts of Europe. The leaves are irregularly diſpoſed, and formed like thoſe of fennel. The flower-ſtalk riſes about two feet high, ſending out many branches, terminated at the top by compound umbels, compoſed of near 20 ſmall ones. Theſe have white flowers with five petals, which are ſucceeded by oblong, hairy, channelled fruit, divided into two parts, containing one oblong hairy ſeed. The ſeeds have a warm biting taſte, and an agreeable aromatic ſmell. The plant may be propagated from ſeeds.

ATHANASIA, goldilocks; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The receptacle is chaffy; the pappus is chaffy, and very ſhort; and the calyx is imbricated. There are 20 ſpecies, all tender plants except one; and none of them poſſeſſed of beauty, or any remarkable property.

ATHANASIAN creed; a formulary, or confeſſion of faith, long ſuppoſed to have been drawn up by Athanaſius biſhop of Alexandria, in the fourth century, to juſtify himſelf againſt the calumnies of his Arian enemies. But it is now generally allowed among the learned not to have been his; and Dr. Waterland aſcribes it to Hilary biſhop of Arles. This creed was received in France in the time of Hincmar, or about 850; in Spain about 100 years later than in France, and in Germany much about the ſame time. As to our own country, we have clear proofs of this creed being ſung alternately in our churches in the tenth century. As to the matter of it, it is given as a ſummary of the true orthodox faith, and a condemnation of all hereſies ancient and modern. Unhappily, however, it has proved a fruitful ſource of unprofitable controverſy and unchriſtian animoſity even down to the preſent time.

ATHANATI, in Perſian antiquity, a body of cavalry, conſiſting of 10,000 men, always complete. They were called *athanati* (a word originally Greek, and ſignifying *immortal*), becauſe, when one of them happened to die, another was immediately appointed to ſucceed him.

ATHANOR. Chemiſts have diſtinguiſhed by this name a furnace ſuppoſed to have been ſo conſtructed as always to maintain an equal heat for a long time without the addition of freſh fuel. The body of the athanor has nothing in it particular, and is conſtructed like ordinary furnaces. But at one of its ſides, or its middle, there is an upright hollow tower, which communicates with the fire-place by one or more ſloping openings. This tower ought to have a lid which exactly cloſes its upper opening. When the athanor is to be uſed, as much lighted coal is put in the fire-place as is judged neceſſary, and the tower is filled to the top with unlighted fuel. The tower is then to be exactly cloſed with its lid. As faſt as the coal in the fire-place is conſumed, that in the tower falls down and ſupplies its place. As the coal contained in the tower has no free communication with the external air, it cannot burn till it falls into the fire-place; but the fact is, that the fuel in the tower is apt to ſtick there, or elſe fall down at once in too great quantity, and on this account modern chemiſts have rejected it.

ATHEIST, a perſon who does not believe the exiſtence of a Deity. Many people, both ancient and modern, have pretended to atheiſm, or have been reckoned atheiſts by the world; but it is juſtly queſtioned whether any man ſeriouſly adopted ſuch a principle. Theſe pretenſions, therefore, muſt be founded on pride or affectation.

Cicero repreſents it as a probable opinion, that they who apply themſelves to the ſtudy of philoſophy believe there are no gods. This muſt, doubtleſs, be meant of the academic philoſophy, to which Cicero himſelf was attached, and which doubted of every thing. On the contrary, the Newtonian philoſophers are continually recurring to a Deity, whom they always find at the end of their chain of natural cauſes. Some foreigners have even charged them with making too much uſe of the notion of a God in philoſophy, contrary to the rule of Horace: *Nec Deus interſit, niſi dignus vindice nodus.* Among us, the philoſophers have been the principal advocates for the

exiſtence of a Deity. Witneſs the writings of Sir Iſaac Newton, Boyle, Ray, Cheyne, Nieuwentyt, &c. To which may be added many others, who, though of the clergy (as was alſo Ray), yet have diſtinguiſhed themſelves by their philoſophical pieces in behalf of the exiſtence of a God; *e. gr.* Derham, Bentley, Whiſton, Samuel and John Clarke, Fenelon, &c. So true is that ſaying of Lord Bacon, that though a ſmattering of philoſophy may lead a man into atheiſm, a deep draught will certainly bring him back again to the belief of a God and Providence.

ATHELING, Adeling, Edling, Ethling, or Etheling, among the Anglo-Saxons, was a title of honour, properly belonging to the heir-apparent, or preſumptive, to the crown. This honourable appellation was firſt conferred by Edward the Confeſſor on Edgar, to whom he was great uncle, when, being without any iſſue of his own, he intended to make him his heir.

ATHELSTAN, a Saxon king of England, natural ſon of Edward the elder, and grandſon of the great Alfred. He ſucceeded to the crown in 925.

ATHENÆA, in antiquity, a feaſt celebrated by the ancient Greeks in honour of Minerva, who was called Αθηνη.

ATHENÆUM, in antiquity, a public place wherein the profeſſors of the liberal arts held their aſſemblies, the rhetoricians declaimed, and the poets rehearſed their performances. Theſe places, of which there were a great number at Athens, were built in the manner of amphitheatres, encompaſſed with ſeats, called *cunei*. The three moſt celebrated Athenæa were thoſe at Athens, at Rome, and at Lyons, the ſecond of which was built by the emperor Adrian.

ATHENREE, a town of Ireland in the county of Galway, and province of Connaught. W. long. 8. 5. N. lat. 53. 14.

ATHENS, a town of Greece, celebrated for the learned men it has produced, it having been the principal academy of the Roman empire. It is now called Setines, and is an archbiſhop's ſee; though at preſent inconſiderable. It contains about 15,000 inhabitants, who are of the Greek church, and ſpeak a corrupt ſort of Greek. It has undergone various revolutions, and was taken by the Venetians in 1464 and 1687; but they were obliged to abandon it, and it is now under the dominion of the Turks. The citadel, formerly called Acropolis, is built on a craggy rock, and has no entrance but on the W. ſide. There are ſtill many magnificent ruins, which ſufficiently teſtify its former grandeur. It is the capital of Livadia, and ſituated on the gulf of Engia, 100 miles N. E. of Lacedemon, and 320 S. by W. of Conſtantinople. Lon. 23. 57. E. lat. 38. 5. N.

ATHERINA, in ichthyology, a genus of fiſhes of the order of abdominales. The characters of this genus are theſe: The upper jaw is plain: the rays of the branchioſtege membrane are ſix; and the ſide-belt or line ſhines like ſilver. The ſpecies are two, viz. 1. The hepſetus, with about 12 rays in the fin next the anus. It is found in the Mediterranean. It is alſo very common in the ſea near Southampton, where it is called a *ſmelt*. The higheſt ſeaſon is from March to the latter end of May, or beginning of June; in which month it ſpawns. It never deſerts the place; and is conſtantly taken except in hard froſt. It is alſo found on other coaſts of our iſland. The length is above 4½ inches, and the tail is much forked. The fiſh is ſemipellucid, covered with ſcales; the colour ſilvery, tinged with yellow: beneath the ſide-line is a row of ſmall black ſpots. 2. The menidea, with 24 rays in the fin next the anus. This is a very ſmall pellucid fiſh, with many black points interſperſed; it has many teeth in the lips, but none in the tongue or jaws. It is found in the freſh waters of Carolina, and ſpawns in April.

ATHEROMA, in ſurgery, a tumour without pain or diſcoloration of the ſkin, containing, in a membranous bag, matter reſembling pap, intermixed with hard irregular particles. Theſe tumours are uſually cured by inciſion.

ATHERTON, or Atherston, a town of Warwickſhire in England, ſituated on the river Stour, in W. long. 1. 30. N. lat. 52. 40.

ATHLETÆ, in antiquity, perſons of ſtrength and agility, diſciplined to perform in the public games. The word is originally Greek, αθλητης: formed from αθλος *certamen*, combat; whence alſo αθλον, the prize or reward adjudged the victor.—Under Athletæ were comprehended wreſtlers, boxers, runners, leapers, throwers of the diſk, and thoſe practiſed in other exerciſes exhibited in the Olympic, Pythian, and other ſolemn ſports, for the conquerors wherein there were eſtabliſhed prizes.

ATHLETIC habit, denotes a ſtrong hale conſtitution of body. Anciently it ſignified a full fleſhy corpulent ſtate, ſuch as the Athletæ endeavoured to arrive at. The athletic habit is eſteemed the higheſt pitch of health; yet it is dangerous, ſince diſeaſes are known to ariſe from too much ſtrength as well as from debility; and ſince, when the body is no longer capable of being improved, the next alteration muſt be for the worſe. Milo the Crotonian is ſaid by Pauſanias to have carried a bull on his back a conſiderable way, and then to have knocked him down with a blow of his fiſt.

ATHLONE, a town of Weſtmeath in Ireland, lying in W. long. 8. 0. N. lat. 53. 20. It is ſituated on both ſides of the Shannon.

ATHOL, the moſt northern diſtrict of Perthſhire in Scotland, extending in length 43 miles, and in breadth 30. It is wild and mountainous, and contains ſome fine lakes.

ATHOS, or Monte-Santo, a high mountain of Greece, in a peninſula to the S. of the gulf of Conteſſa. It is inhabited by a great number of Greek monks, who have many fortified monaſteries upon it. Here they cultivate the olive and vineyards; and are carpenters, maſons, &c. leading a very auſtere life, and living to a great age. It is 70 miles E. of Salonichi. Lon. 26. 20. E. lat. 40. 30. N.

ATHWART, in navigation, is ſynonymous with acroſs the line of the courſe. Athwart *the Fore-foot*, is a phraſe that denotes the flight of a cannon-ball from one ſhip acroſs the courſe of another, to intercept the latter, and oblige her to ſhorten ſail, that the former may come near enough to examine her. Athwart-*Hauſe*, expreſſes the ſituation of a ſhip, when ſhe is driven by wind or tide, or any other accident, acroſs the fore-part of another. Athwart-*Ships*, reaching acroſs ſhips from one ſide to the other.

ATHY, a town of Ireland in the county of Kildare, not far from the borders of Queen's county. W. long. 7. 0. N. lat. 53. 0. It is ſituated on the river Barrow.

ATIBAR, the name by which the inhabitants of the kingdom of Gago in Africa call gold duſt; from which word, Europeans, and eſpecially the French, have compoſed the word *tiber*, which alſo ſignifies gold-duſt among thoſe who trade in that commodity.

ATLANTIC ocean, that bounded by Europe and Africa on the eaſt, and by America on the weſt.

ATLANTICA. See Atlantis.

ATLANTIDES, in aſtronomy, a denomination given to the Pleiades, or ſeven ſtars, ſometimes alſo called *Virgiliæ*. They are thus called, as being ſuppoſed by the poets to have been the daughters either of Atlas or his brother Heſperus, who were tranſlated into heaven.

ATLANTIS, Atalantis, or Atlantica, an iſland mentioned by Plato and ſome others of the ancients, concerning the real exiſtence of which many diſputes have been raiſed. By Kircher it is ſuppoſed to have been an iſland extending

from the Canaries quite to the Azores; and that it was really ſwallowed up by the ocean, as Plato aſſerts.

Atlantis (New), is the name of a fictitious philoſophical commonwealth, of which a deſcription has been given by Lord Bacon. Its chief deſign is to exhibit a model of a college, inſtituted for the interpretation of nature and the production of great and marvellous works, for the benefit of men, under the name of *Solomon's Houſe*, or, "the college of the ſix days work." Thus much, at leaſt, is finiſhed; and with great beauty and magnificence. The author propoſed alſo a frame of laws, or of the beſt ſtate or mould of a commonwealth. But this part is not executed.

ATLAS, in *Geography*, a celebrated mountain in Africa, which is ſo high, that it ſeems to bear the heavens. Hence the fable, in which *Atlas*, the king of this country, is ſaid to bear the heavens on his ſhoulders; as he is repreſented in the famous ſtatue at the Farneſe palace at Rome.

Atlas, in *Anatomy*, the name of the firſt *vertebra* of the neck, which ſupports the head. The *atlas* has no ſpinal *apophyſes*; becauſe the motions of the head do not turn on this *vertebra*, but on the ſecond. As it is obliged to turn about as often as the head moves round, had there been any ſpinal *apophyſes*, it would have incommoded the motion of the muſcles in the extenſion of the head.

Atlas, in matters of literature, denotes a book of univerſal geography, containing maps of all the known parts of the world.

Atlas, in commerce, a ſilk-ſatin, manufactured in the Eaſt Indies. There are ſome plain, ſome ſtriped, and ſome flowered, the flowers of which are either gold or only ſilk. There are atlaſes of all colours, but moſt of them falſe, eſpecially the red and the crimſon. The manufacture of them is admirable; the gold and ſilk being worked together after ſuch a manner as no workmen in Europe can imitate; yet they are very far from having that fine gloſs and luſtre which the French know how to give to their ſilk ſtuffs. In the Chineſe manufactures of this ſort, they gild paper on one ſide with leaf-gold; then cut it in long ſlips, and weave it into their ſilks; which makes them, with very little coſt, look very rich and fine. The ſame long ſlips are twiſted or turned about ſilk threads, ſo artificially, as to look finer than gold thread, though it be of no greater value.

ATMOSPHERE, a term uſed to ſignify the whole of the fluid maſs conſiſting of air, aqueous and other vapours, electric fluids, &c. which ſurrounds the earth to a conſiderable height, and partakes of all its motions, both annual and diurnal.

It appears from accurate experiments, that the air we uſually breathe, is compoſed of ſcarce one-fourth part of pure or dephlogiſticated air; the other three parts, or more, conſiſting of what Dr. Prieſtley calls *phlogiſticated*, and M. Lavoiſier *mephitic air*. Beſides theſe ſorts of air, it is obvious that the whole atmoſphere contains a great deal of water, together with a vaſt heterogeneous collection of particles raiſed from all bodies of matter on the ſurface of the earth, by effluvia, exhalations, &c. ſo that it may be conſidered as a chaos of volatile particles confuſedly mingled together, and ſpontaneouſly undergoing a variety of chemical changes and decompoſitions.

There is, however, one ſubſtance, namely, the electrical fluid, which is very diſtinguiſhable in the compoſition of our atmoſphere. To meaſure the abſolute quantity of it is perhaps impoſſible; yet we know that it pervades the atmoſphere univerſally, and that it appears to be more abundant in the ſuperior than the inferior regions. It ſeems alſo to be the immediate bond of connection between the atmoſphere and the water which is ſuſpended in it; and by its various operations, the phænomena of hail, rain, ſnow, lightning, and the other kinds of meteors are occaſioned.

The Uſes of the Atmosphere are ſo many and great, that it ſeems indeed abſolutely neceſſary, not only to the comfort and convenience of men, but even to the exiſtence of all animal and vegetable life, and to the very conſtitution of all kinds of matter whatever, and without which they would not be what they are: for by it we live, breathe, and have our being; and by inſinuating itſelf into all the vacuities of bodies, it becomes the great ſpring of moſt of the mutations here below; as generation, corruption, diſſolution, &c. and without which none of theſe operations could be carried on. By the mechanical force of the atmoſphere too, as well as its chemical properties, many important purpoſes are anſwered. We employ it in giving motion and direction to ſhips, turning mills, and other ſimilar uſes: and it is one of the great diſcoveries of the modern philoſophers, that the ſeveral motions attributed by the ancients to a *fuga vacui* are really owing to the preſſure of the atmoſphere.

Salubrity of the Atmosphere. On the tops of mountains the air is generally more ſalubrious than in pits or very deep places. Indeed denſe air is always more proper for reſpiration, as to the mere quality of denſity only, than that which is rarer. But then the air on mountains, though rarer, is freer from phlogiſtic vapours than that of pits; and hence it has been found that people can live very well on the tops of mountains, even when the air is but about half the denſity of that below. But it would ſeem that at ſome intermediate height between the two extremes, the air is the moſt ſalubrious and proper for animal life; and this height, according to M. Sauſſure, is about 500 or 600 yards above the level of the ſea.

Beſides the changes ariſing from the mere difference of altitude, the ſalubrity of the atmoſphere is greatly affected by many other circumſtances. The air, when confined or ſtagnant, is commonly more impure than when agitated and ſhifted: thus, all cloſe places are unhealthy, and even the air in a bedchamber is leſs ſalubrious in a morning, after it has been ſlept in, than in the evening. Dr. White, Philoſ. Tranſ. in vol. lxviii. gives an account of experiments on this quality of the air, and remarks one inſtance when the air was particularly impure, viz. September 13, 1777; when the barometer ſtood at 30·30, the thermometer at 69°; the air being then dry and ſultry, and no rain having fallen for more than two weeks. A ſlight ſhock of an earthquake was perceived that day. In vol. lxx. of the ſame Tranſactions, Dr. Ingenhouſz gives an account of ſome experiments on this head, made in various places and ſituations: he finds, "That the air at ſea, and cloſe to it, is in general purer, and fitter for animal life, than the air on the land:" but the Doctor did not find much difference between the air of the towns and of the country, nor between one town and another. The Abbé Fontana made nearly the ſame concluſions from accurate experiments, aſſerting, "that the difference between the air of one country and that of another, at different times, is much leſs than what is commonly believed; and yet that this difference in the purity of the air at different times, is much greater than the difference between the air of the different places obſerved by him." Finally, M. Fontana concludes in theſe words, "Nature is not ſo partial as we commonly believe. She has not only given us an air almoſt equally good every where at every time, but has allowed us a certain latitude, or a power of living and being in health in qualities of air which differ to a certain degree. By this I do not mean to deny the exiſtence of certain kinds of noxious air in ſome particular places; but only ſay, that in general the air is good every where, and that the ſmall differences are not to be feared ſo much as ſome people would make us believe. Nor do I mean to ſpeak here of thoſe vapours and other bodies which are accidentally joined to the common air in particular places, but do not change its nature and intrinſical property. This

ſtate of the air cannot be known by the teſt of nitrous air; and thoſe vapours are to be conſidered in the ſame manner as we ſhould conſider ſo many particles of arſenic ſwimming in the atmoſphere. In this caſe it is the arſenic, and not the degenerated air, that would kill the animals who ventured to breathe it."

Figure of the ATMOSPHERE. As the atmoſphere envelops all parts of the ſurface of our globe, if they both continued at reſt, and were not endowed with a diurnal motion about their common axis, then the atmoſphere would be exactly globular, acording to the laws of gravity; for all the parts of the ſurface of a fluid in a ſtate of reſt, muſt be equally removed from its centre. But as the earth and the ambient parts of the atmoſphere revolve uniformly together about their axis, the different parts of both have a centrifugal force, the tendency of which is more conſiderable, and that of the centripetal leſs, as the parts are more remote from the axis; and hence the figure of the atmoſphere muſt become an oblate ſpheroid; ſince the parts that correſpond to the equator are farther removed from the axis, than the parts which correſpond to the poles. In the Tranſactions of the Royal Iriſh Academy for 1788, Mr. Kirwan has obſerved, that, in the natural ſtate of the atmoſphere, viz. when the barometer would every where, at the level of the ſea, ſtand at 30 inches, the weight of the atmoſphere, at the ſurface of the ſea, muſt be equal all over the globe; and in order to produce this equality, as the weight proceeds from its denſity and height, it muſt be loweſt where the denſity is greateſt, and higheſt where the denſity is leaſt; that is, higheſt at the equator, and loweſt at the poles, with ſeveral intermediate gradations. Though the equatorial air however be leſs denſe to a certain height than the polar, yet at ſome greater heights it muſt be more denſe: for ſince an equatorial and polar column are equal in total weight or maſs, the lower part of the equatorial column, being more expanded by heat, &c. than that of the polar, muſt have leſs maſs, and therefore a proportionably greater part of its maſs muſt be found in its ſuperior ſection; ſo that the lower extremity of the ſuperior ſection of the equatorial column is more compreſſed, and conſequently denſer, than the correſponding part of the polar column. The ſame thing is to be underſtood alſo of the extra-tropical columns with reſpect to each other where differences of heat prevail.

Hence, in the higheſt regions of the atmoſphere, the denſer equatorial air, not being ſupported by the collateral extra-tropical columns, gradually flows over, and rolls down to the north and ſouth. Theſe ſuperior tides conſiſt chiefly of inflammable air, as it is much lighter than any other, and is generated in great plenty between the tropics; it furniſhes the matter of the aurora borealis and auſtralis, by whoſe combuſtion it is deſtroyed, elſe its quantity would in time become too great, and the weight of the atmoſphere annually increaſed; but its combuſtion is the primary ſource of the greateſt perturbations of the atmoſphere.

Preſſure or Weight of the ATMOSPHERE. It is evident that the maſs of the atmoſphere, in common with all other matter, muſt be endowed with weight and preſſure; and this principle was aſſerted by almoſt all philoſophers, both ancient and modern. But it was only by means of the experiments made with pumps and the barometrical tube, by Galileo and Torricelli, that we came to the proof, not only that the atmoſphere is endued with a preſſure, but alſo what the meaſure and quantity of that preſſure is. Thus, it is found that the preſſure of the atmoſphere ſuſtains a column of quickſilver, in the tube of the barometer, of about 30 inches in height; it therefore follows, that the whole preſſure of the atmoſphere is equal to the weight of a column of quickſilver, of an equal baſe, and 30 inches in height: and becauſe a cubical inch of quickſilver is found to weigh nearly half a pound averdupois, therefore the whole 30 inches, or the weight of the atmoſphere on every ſquare inch of ſurface, is equal to 15 pounds. Again, it has been found that the preſſure of the atmoſphere balances, in the caſe of pumps, &c. a column of water of about $34\frac{1}{2}$ feet high; and the cubical foot of water weighing juſt 1000 ounces, or $62\frac{1}{2}$ pounds, $34\frac{1}{2}$ times $62\frac{1}{2}$, or 2158 lbs. will be the weight of the column of water, or of the atmoſphere on a baſe of a ſquare foot; and conſequently the 144th part of this, or 15lb. is the weight of the atmoſphere on a ſquare inch; the ſame as before. Hence Mr. Cotes computed, that the preſſure of this ambient fluid on the whole ſurface of the earth is equivalent to that of a globe of lead of 60 miles in diameter. And hence alſo it appears, that the preſſure upon the human body muſt be very conſiderable; for as every ſquare inch of ſurface ſuſtains a preſſure of 15 pounds, every ſquare foot will ſuſtain 144 times as much, or 2160 pounds: then, if the whole ſurface of a man's body be ſuppoſed to contain 15 ſquare feet, which is pretty near the truth, he muſt ſuſtain 15 times 2160, or 32400 pounds, that is nearly $14\frac{1}{2}$ tons weight, for his ordinary load. By this enormous preſſure we ſhould undoubtedly be cruſhed in a moment, if all parts of our bodies were not filled either with air or ſome other elaſtic fluid, the ſpring of which is juſt ſufficient to counterbalance the weight of the atmoſphere. But whatever this fluid may be, it is certain that it is juſt able to counteract the weight of the atmoſphere, and no more: for, if any conſiderable preſſure be ſuperadded to that of the air, as by going into deep water, or the like, it is always ſeverely felt let it be ever ſo equable, at leaſt when the change is made ſuddenly; and if, on the other hand, the preſſure of the atmoſphere be taken off from any part of the human body, as the hand for inſtance, when put over an open receiver, from whence the air is afterwards extracted, the weight of the external atmoſphere then prevails, and we imagine the hand ſtrongly ſucked down into the glaſs.

The difference in the weight of the air which our bodies ſuſtain at one time more than another, is alſo very conſiderable, from the natural changes in the ſtate of the atmoſphere. This change takes place chiefly in countries at ſome diſtance from the equator; and as the barometer varies at times from 28 to 31 inches, or about one tenth of the whole quantity, it follows that this difference amounts to about a ton and a half on the whole body of a man, which he therefore ſuſtains at one time more than at another. On the increaſe of this natural weight, the weather is commonly fine, and we feel ourſelves what we call braced, and more alert and active; but, on the contrary, when the height of the air diminiſhes, the weather is bad, and people feel a liſtleſſneſs and inactivity about them, eſpecially when theſe changes take place very ſuddenly; for it is to this circumſtance chiefly that a ſenſation of uneaſineſs and indiſpoſition is to be attributed. Thus, in going up to the tops of mountains, where the preſſure of the atmoſphere is diminiſhed two or three times more than on the plain below, little or no inconvenience is felt from the rarity of the air, if it is not mixed with other noxious vapours, &c.; becauſe that, in the aſcent, the body has had ſufficient time to accommodate itſelf gradually to the ſlow variation in the ſtate of the atmoſphere: but, when a perſon aſcends with a balloon, very rapidly, to a great height in the atmoſphere, he feels a difficulty in breathing and an uneaſineſs of body; and the ſame is ſoon felt by an animal when incloſed in a receiver, and the air ſuddenly drawn or pumped out of it. So alſo, on the condenſation of the air, we feel little or no alteration in ourſelves, except when the change happens ſuddenly, as in very rapid changes in the weather, and in deſcending to great depths in a diving bell, &c.

It is not eaſy to aſſign the true reaſon for the variations that happen in the gravity of the atmoſphere in the ſame place.

One cauſe of it, however, either immediate or otherwiſe, it ſeems, is the heat of the ſun; for where this is uniform, the changes are ſmall and regular: thus between the tropics, it ſeems, the change depends on the heat of the ſun, as the barometer conſtantly ſinks about half an inch every day, and riſes again to its former ſtation in the night time. But in the temperate zones the barometer ranges from 28 to near 31 inches, ſhewing, by its various altitudes, the changes that are about to take place in the weather. If we could know, therefore, the cauſes by which the weather is influenced; we ſhould alſo know thoſe by which the gravity of the atmoſphere is affected. Theſe may perhaps be reduced to immediate ones, viz. an emiſſion of latent heat from the vapour contained in the atmoſphere, or of electric fluid from the ſame, or from the earth; as it is obſerved that they both produce the ſame effect with the ſolar heat in the tropical climates, viz. to rarefy the air, by mixing with it, or ſetting looſe a lighter fluid, which did not before act in ſuch large proportion in any particular place.

With regard to the alteration of heat and cold in the atmoſphere, many hypotheſes have been given, and many experiments made; as may be ſeen by conſulting authors upon this ſubject, viz. M. Bouguer's obſervations in Peru, Lambert, De Luc, Sauſſure's journeys on the Alps, Sex's and Darwin's experiments in vol. lxxviii. of the Philoſophical Tranſactions. Notwithſtanding all the explanations, however, that have been attempted by philoſophers, very conſiderable difficulties remain with regard to the heat and cold of the atmoſphere. That warm air ſhould always aſcend; and thus, when the ſource of heat is taken away by the abſence of the ſun, that the ſtratum of atmoſphere lying immediately next to the earth ſhould be ſomewhat colder than that which lies a little farther up, is not much to be wondered at. We have an example ſomewhat ſimilar to this in the potter's kiln; where, after the veſſels have been intenſely heated for ſome time, and the fire is then withdrawn, the cooling always begins at bottom, and thoſe which ſtand lowermoſt will often be quite black, while all the upper part of the furnace and the veſſels next to it are of a bright red. It doth not, however, appear why ſuch degrees of cold ſhould take place at the ſurface of the earth as we ſometimes meet with. It is, beſides, no uncommon thing to meet with large ſtrata in the upper regions of the atmoſphere, remarkable for their cold, while others are warmer than thoſe at the ſurface; as aerial navigators have aſſerted. It is alſo difficult to conceive why the air which has once aſcended, and become rarefied to an extreme degree, ſhould afterwards deſcend among a denſer fluid of ſuperior gravity, though indeed the atmoſpherical currents by which this fluid is continually agitated may have conſiderable effect in this way.

Height and Denſity of the Atmosphere. Various attempts have been made to aſcertain the height to which the atmoſphere is extended all round the earth. Theſe commenced ſoon after it was diſcovered by means of the Torricellian tube, that air is endued with weight and preſſure. And had not the air an elaſtic power, but were it every where of the ſame denſity, from the ſurface of the earth to the extreme limit of the atmoſphere, like water, which is equally denſe at all depths, it would be a very eaſy matter to determine its height from its denſity and the column of mercury which it would counterbalance in the barometer tube: for, it having been obſerved that the weight of the atmoſphere is equivalent to a column of 30 inches or $2\frac{1}{2}$ feet of quickſilver, and the denſity of the former to that of the latter, as 1 to 11040; therefore the height of the uniform atmoſphere would be 11040 times $2\frac{1}{2}$ feet; that is, 27600 feet, or little more than 5 miles and a quarter. But the air, by its elaſtic quality, expands and contracts; and it being found by repeated experiments in moſt nations of Europe, that the ſpaces it occupies, when compreſſed by different weights, are reciprocally proportional to thoſe weights themſelves; or, that the more the air is preſſed, ſo much the leſs ſpace it takes up; it follows that the air in the upper regions of the atmoſphere muſt grow continually more and more rare, as it aſcends higher; and indeed that, according to that law, it muſt neceſſarily be extended to an indefinite height. Now, if we ſuppoſe the height of the whole divided into innumerable equal parts; the quantity of each part will be as its denſity; and the weight of the whole incumbent atmoſphere being alſo as its denſity; it follows, that the weight of the incumbent air is every where as the quantity contained in the ſubjacent part; which cauſes a difference between the weights of each two contiguous parts of air. But, by a theorem in arithmetic, when a magnitude is continually diminiſhed by the like part of itſelf, and the remainders the ſame, theſe will be a ſeries of continued quantities decreaſing in geometrical progreſſion: therefore if, according to the ſuppoſition, the altitude of the air, by the addition of new parts into which it is divided, do continually increaſe in arithmetical progreſſion, its denſity will be diminiſhed, or, which is the ſame thing, its gravity decreaſed, in continued geometrical proportion. And hence, again, it appears that, according to the hypotheſis of the denſity being always proportional to the compreſſing force, the height of the atmoſphere muſt neceſſarily be extended indefinitely. And, farther, as an arithmetical ſeries adapted to a geometrical one, is analogous to the logarithms of the ſaid geometrical one; it follows therefore that the altitudes are proportional to the logarithms of the denſities, or weights of air; and that any height taken from the earth's ſurface, which is the difference of two altitudes to the top of the atmoſphere, is proportional to the difference of the logarithms of the two denſities there, or to the logarithm of the ratio of thoſe denſities, or their correſponding compreſſing forces, as meaſured by the two heights of the barometer there. This law was firſt obſerved and demonſtrated by Dr. Halley, from the nature of the hyperbola; and afterwards by Dr. Gregory, by means of the logarithmic curve. See Philoſ. Tranſ. No. clxxxi. and Greg. Aſtron. lib. v. prop. 3.

It is now eaſy, from the foregoing property, and two or three experiments, or barometrical obſervations, made at known altitudes, to deduce a general rule to determine the abſolute height anſwering to any denſity, or the denſity anſwering to any given altitude above the earth. Accordingly, calculations were made upon this plan by many philoſophers, particularly by the French; but it having been found that the barometrical obſervations did not correſpond with the altitudes as meaſured in a geometrical manner, it was ſuſpected that the upper parts of the atmoſpherical regions were not ſubject to the ſame laws with the lower ones, in regard to the denſity and elaſticity. And indeed, when it is conſidered that the atmoſphere is a heterogeneous maſs of particles of all ſorts of matter, ſome elaſtic, and others not, it is not improbable but this may be the caſe, at leaſt in the regions very high in the atmoſphere, which it is likely may more copiouſly abound with the electrical fluid. Be this however as it may, it has lately been diſcovered that the law above given holds very well for all ſuch altitudes as are within our reach, or as far as to the tops of the higheſt mountains on the earth, when a correction is made for the difference of the heat or temperature of the air only, as was fully evinced by M. De Luc, in a long ſeries of obſervations, in which he determined the altitudes of hills both by the barometer, and by geometrical meaſurement, from which he deduced a practical rule to allow for the difference of temperature. (See his Treatiſe on the Modifications of the Atmoſphere.) Similar rules have alſo been deduced from accurate experiments, by Sir George Shuckburgh and General Roy, both concurring to ſhew, that ſuch a rule for the altitudes and

denſities holds true for all heights that are acceſſible to us, when the elaſticity of the air is corrected on account of its denſity: and the reſult of their experiments ſhewed, that the difference of the logarithms of the heights of the mercury in the barometer, at two ſtations, when multiplied by 10000, is equal to the altitude in Engliſh fathoms of the one place above the other; that is, when the temperature of the air is about 31 or 32 degrees of Fahrenheit's thermometer; and a certain quantity more or leſs, according as the actual temperature is different from that degree.

But it may here be ſhewn, that the ſame rule may be deduced independent of ſuch a train of experiments as thoſe above, merely by the denſity of the air at the ſurface of the earth alone. Thus, let D denote the denſity of the air at one place, and d the denſity at the other; both meaſured by the column of mercury in the barometrical tube: then the difference of altitude between the two places will be proportional to the log. of D — the log. of d, or to the log. of $\frac{D}{d}$. But as this formula expreſſes only the relation between different altitudes, and not the abſolute quantity of them, aſſume ſome indeterminate, but conſtant quantity h, which multiplying the expreſſion log. $\frac{D}{d}$, may be equal to the real difference of altitude a, that is, $a = h \times$ log. of $\frac{D}{d}$. Then, to determine the value of the general quantity h, let us take a caſe in which we know the altitude a which correſponds to a known denſity d; as for inſtance, taking $a = 1$ foot, or 1 inch, or ſome ſuch ſmall altitude: then becauſe the denſity D may be meaſured by the preſſure of the whole atmoſphere, or the uniform column of 27600 feet, when the temperature is 55°; therefore 27600 feet will denote the denſity D at the lower place, and 27599 the leſs denſity d at 1 foot above it; conſequently $1 = h \times$ log. of $\frac{27600}{27599}$, which, by the nature of logarithms, is nearly $= h \times \frac{.43429448}{27600}$ or $\frac{1}{63551}$ nearly; and hence we find $h = 63551$ feet; which gives us this formula for any altitude a in general, viz. $a = 63551 \times$ log. of $\frac{D}{d}$, or $a = 63551 \times$ log. of $\frac{M}{m}$ feet, or $10592 \times$ log. of $\frac{M}{m}$ fathoms; where M denotes the column of mercury in the tube at the lower place, and m that at the upper. This formula is adapted to the mean temperature of air 55°: but it has been found, by the experiments of Sir Geo. Shuckburgh and General Roy, that for every degree of the thermometer, different from 55°, the altitude a will vary by its 435th part: hence, if we would change the factor h from 10592 to 10000, becauſe the difference 592 is the 18th part of the whole factor 10592, and becauſe 18 is the 24th part of 435; therefore the change of temperature, anſwering to the change of the factor h, is 24°, which reduces the 55° to 31°. So that, $a = 10000 \times$ log. of $\frac{M}{m}$ fathoms, is the eaſieſt expreſſion for the altitude, and anſwers to the temperature of 31°, or very nearly the freezing point: and for every degree above that, the reſult muſt be increaſed by ſo many times its 435th part, and diminiſhed when below it.

From this theorem it follows, that at the height of $3\frac{1}{2}$ miles, the denſity of the atmoſphere is nearly 2 times rarer than it is at the ſurface of the earth; at the height of 7 miles, 4 times rarer; and ſo on, according to the following table.

Height in miles.	Number of times rarer.
$3\frac{1}{2}$	2
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576

And, by purſuing the calculations in this table, it might be eaſily ſhewn, that a cubic inch of the air we breathe would be ſo much rarefied at the height of 500 miles, that it would fill a ſphere equal in diameter to the orbit of Saturn.

Hence we may perceive how very ſoon the air becomes ſo extremely rare and light, as to be utterly imperceptible to all experience; and that hence, if all the planets have ſuch atmoſpheres as our earth, they will, at the diſtances of the planets from one another, be ſo extremely attenuated, as to give no ſenſible reſiſtance to the planets in their motion round the ſun for many, perhaps hundreds or thouſands of ages to come. Even at the height of about 50 miles, it is ſo rare as to have no ſenſible effect on the rays of light: for it was found by Kepler, and De la Hire after him, who computed the height of the ſenſible atmoſphere from the duration of twilight, and from the magnitude of the terreſtrial ſhadow in lunar eclipſes, that the effect of the atmoſphere to reflect and intercept the light of the ſun, is only ſenſible to the altitude of between 40 and 50 miles; and at that altitude we may collect, from what has been already ſaid, that the air is above 10000 times rarer than at the ſurface of the earth. It is well known that the twilight begins and ends when the centre of the ſun is about 18 degrees below the horizon, or only 17° 27′, by ſubtracting 33′ for refraction, which raiſes the ſun ſo much higher than he would be. And a ray coming from the ſun in that poſition, and entering the earth's atmoſphere, is refracted and bent into a curve line in paſſing through it to the eye. M. de la Hire took great pains to demonſtrate, that, ſuppoſing the denſity of the atmoſphere proportional to its weight, this curve is a cycloid: he alſo ſays, that if the ray be a tangent to the atmoſphere, the diameter of its generating circle will be the height of the atmoſphere; and that this diameter increaſes, till at laſt, when the rays are perpendicular, it becomes infinite, or the circle degenerates into a right line. This reaſoning ſuppoſes that the refracting ſurface of the atmoſphere is a plane; but ſince it is in reality a curve, he obſerves that theſe cycloids become in fact epicycloids. But Herman detected the error of M. de la Hire, and ſhewed that this curve is infinitely extended, and has an aſymptote. And it is obſerved by Dr. Brook Taylor, in his Methodus Increm. p. 168, &c. that this curve is one of the moſt intricate and perplexed that can well be propoſed. The ſame ingenious author computes, that the refractive power of the air is to the force of gravity at the ſurface of the earth, as 320 millions to 1.

Conſidering the extreme rarity of the atmoſphere at only 40 or 50 miles in height, it ſeems to be ſurpriſing that ſome meteors ſhould be enflamed at ſuch great heights as they have been obſerved at. A very remarkable one of this kind was obſerved by Dr. Halley in the month of March 1719, the altitude of which he computed at between 69 and $73\frac{1}{2}$ Engliſh miles; its diameter 2800 yards, or more than a mile and a half; and its velocity about 350 miles in a minute. Others, apparently of the ſame kind, but whoſe altitude and velocity were ſtill greater, have been obſerved; particularly that very remark-

able one, of Auguſt 18th 1783, whoſe diſtance from the earth could not be leſs than 90 miles, its diameter at leaſt as large as the former, while its velocity was certainly not leſs than 1000 miles in a minute. Now, from analogy of reaſoning, it ſeems very probable, that the meteors which appear at ſuch great heights in the air, are not eſſentially different from thoſe which are ſeen on or near the ſurface of the earth. The difficulty with regard to the former is, that at the great heights above mentioned, the atmoſphere ought not to have any denſity ſufficient to ſupport flame, or to propagate ſound; and yet ſuch meteors are commonly ſucceeded by one exploſion or more, and it is ſaid are even ſometimes accompanied with a hiſſing noiſe as they paſs over our heads. The meteor of 1719 was not only very bright, ſeeming for a ſhort time to turn night into day, but was attended with an exploſion heard over all the iſland of Britain, cauſing a violent concuſſion in the atmoſphere, and ſeeming to ſhake the earth itſelf: and yet, in the regions in which this meteor moved, the air ought to have been 300 thouſand times rarer than the air we breathe, or 1000 times rarer than the vacuum commonly made by a good air-pump. Dr. Halley offers a conjecture, indeed, that the vaſt magnitude of ſuch bodies might compenſate for the thinneſs of the medium in which they moved. But appearances of this kind are, by ſome others, attributed to electricity; though the circumſtances of them cannot be reconciled to that cauſe; for the meteors move with all different degrees of velocity; and though the electrical fire eaſily pervades the vacuum of an air-pump, yet it does not in that caſe appear in bright well-defined ſparks, as in the open air, but rather in long ſtreams reſembling the aurora borealis; and from ſome late experiments it has been concluded that the electric fluid cannot even penetrate a perfect vacuum.

Refractive and Reflective Power of the ATMOSPHERE. It has been obſerved, that the atmoſphere has a refractive power, by which the rays of light are bent from the right lined direction, as in the caſe of the twilight; and many other experiments manifeſt the ſame virtue, which is the cauſe of many phænomena. Alhazen, the Arabian, who lived about the year 1100, it ſeems, was more inquiſitive into the nature of refraction than former writers. But neither Alhazen, nor his follower Vitello, knew any thing of its juſt quantity, which was not known, to any tolerable degree of exactneſs, till Tycho Brahe, with great diligence, ſettled it. But neither did Tycho nor Kepler diſcover in what manner the rays of light were refracted by the atmoſphere. Tycho thought the refraction was chiefly cauſed by denſe vapours, very near the earth's ſurface: while Kepler placed the cauſe wholly at the top of the atmoſphere, which he thought was uniformly denſe; and thence he determined its altitude to be little more than that of the higheſt mountains. But the true conſtitution of the denſity of the atmoſphere, deduced afterwards from the Torricellian experiment, afforded a juſter idea of theſe refractions, eſpecially after it appeared, by a repetition of Mr. Lowthorp's experiment, that the refractive power of the air is proportional to its denſity. By this variation in the denſity and refractive power of the air, a ray of light, in paſſing through the atmoſphere, is continually refracted at every point, and thereby made to deſcribe a curve, and not ſtraight line, as it would have done were there no atmoſphere, or were its denſity uniform.

The atmoſphere, or air, has alſo a *reflective* power; and this power is the means by which objects are enlightened ſo uniformly on all ſides. The want of this power would occaſion a ſtrange alteration in the appearance of things; the ſhadows of which would be ſo very dark, and their ſides enlightened by the ſun ſo very bright, that probably we could ſee no more of them than their bright halves; ſo that for a view of the other halves, we muſt turn them half round, or, if immoveable, muſt wait till the ſun could come round upon them. Such a pellucid unreflective atmoſphere would indeed have been very commodious for aſtronomical obſervations on the courſe of the ſun and planets among the fixed ſtars, viſible by day as well as by night; but then ſuch a ſudden tranſition from darkneſs to light, and from light to darkneſs, immediately upon the riſing and ſetting of the ſun, without any twilight, and even upon turning to or from the ſun at noon day, would have been very inconvenient and offenſive to our eyes. However, though the atmoſphere be greatly aſſiſtant in the illumination of objects, yet it muſt alſo be obſerved that it ſtops a great deal of light. By M. Bouguer's experiments, it ſeems that the light of the moon is often 2000 times weaker in the horizon, than at the altitude of 66 degrees; and that the proportion of her light at the altitudes of 66 and 19 degrees, is about 3 to 2; and the lights of the ſun muſt bear the ſame proportion to each other at thoſe heights, which Bouguer made choice of, as being the meridian heights of the ſun, at the ſummer and winter ſolſtices, in the latitude of Croiſic in France. Smith's Optics, Rem. 95.

ATOCK, the capital of a province of the ſame name in the dominions of the Great Mogul. E. long. 72. 18. N. lat. 20. 32.

ATOM, in philoſophy, a particle of matter, ſo minute, as to admit of no diviſion. Atoms are the *minima naturæ*, and are conceived as the firſt principles or component parts of all phyſical magnitude.

ATOMICAL PHILOSOPHY, or the doctrine of atoms, a ſyſtem which, from the hypotheſis that atoms are endued with gravity and motion, accounted for the origin and formation of things. This philoſophy was firſt broached by Moſchus, ſome time before the Trojan war; but was much cultivated and improved by Epicurus; whence it is denominated the *Epicurean philoſophy*.

ATONEMENT. See EXPIATION.

ATONY, in medicine, a defect of tone or tenſion, or a laxity or debility of the ſolids of the body.

ATOOI, one of the Sandwich Iſlands, diſcovered by Captain Cook in his laſt voyage. It is ten leagues in length, and affords a ſupply of fiſh and fowl ſufficient for its inhabitants, whom Captain Cook ſuppoſed to amount to 30,000. The land does not reſemble, in its general appearance, any of the iſlands diſcovered within the tropic of Capricorn. Though it preſents not to the view the delightful borders of Otaheite, or the luxuriant plains of Tongataboo, covered with trees, which at once afford a ſhelter from the ſcorching rays of the ſun, a beautiful proſpect to the eye, and food for the natives; yet its poſſeſſing a great portion of gently riſing land, renders it, in ſome degree, ſuperior to thoſe favourite iſlands, as being more capable of improvement. The natives are cannibals, and eat their enemies. This iſland is ſituated in W. long. 160. 20. N. lat. 21. 57.

ATRA BILIS, BLACK BILE, or MELANCHOLY. According to the ancients, this was a fruitful ſource of diſeaſe, and ſuppoſed to have a twofold origin: 1ſt, from the groſſer parts of the blood, which they called the *melancholy humour*; 2dly, from yellow bile being highly concocted. Dr. Percival ſuggeſts, that it is the gall rendered acrid by a ſtagnation in the gall-bladder, and rendered viſcid by the abſorption of its fluid parts. Bile in this ſtate diſcharged into the duodenum, occaſions violent vomiting, or purging, or both. Previous to this the pulſe is quick, the head aches, a delirium comes on, with a hiccough, intenſe thirſt, inward heat, and a fœtid breath. He recommends the *infuſ. ſennæ limoniat.* warmed with the *tinct. columb.* as the beſt means of checking theſe vomitings.

ATRA DIES, in antiquity, denotes *a fatal day* whereon the Romans received ſome memorable defeat. The word literally imports *a black day*; a denomination taken from the colour; which is the emblem of death and mourning. Whence the

Thracians had a cuſtom of marking all their happy days with white ſtones or calculi, and their unhappy days with black ones; which they caſt, at the cloſe of each day, into an urn. At the perſon's death the ſtones were taken out; and from a compariſon of the numbers of each complexion, a judgment was made of the felicity or infelicity of his courſe of life. The *dies atræ*, or *atri*, were afterwards denominated *nefaſti*, and *poſteri*. Such in particular was the day when the tribunes were defeated by the Gauls at the river Allia, and loſt the city; alſo that whereon the battle of Cannæ was fought; and ſeveral others marked in the Roman calendar, as *atræ* or unfortunate.

ATRACTYLIS, DISTAFF THISTLE; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-capitatæ*. The corolla is radiated; and each of the little corollæ of the radius has five teeth. The *ſpecies* are, 1. The cancellata, an annual plant riſing about nine inches, with a ſlender ſtem, garniſhed with hoary leaves, having ſpines on their edges. At the top of theſe branches are ſent out two or three ſlender ſtalks, each terminated by a head of flowers like thoſe of the thiſtle. The empalement contains many florets of a purpliſh colour; each ſucceeded by a ſingle downy ſeed, which in cold years do not ripen in this country. 2. The humilis, or purple prickly cnicus, riſes about a foot high, with indented leaves, having ſmall ſpines on their edges. The upper part of the ſtalk is divided into two or three ſlender branches, each ſupporting a head of purple flowers, having rays incloſed in a ſcaly empalement. The flowers appear in June; but the ſeeds will ſcarcely ripen in this country. 3. The gummifera, or prickly gum-bearing cnicus, known in medicine by the name of *carline thiſtle*. This ſends out many narrow leaves, which are deeply ſerrated, and armed with ſpines on their edges. Theſe lie cloſe on the ground; and between them the flower is ſituated, without a ſtalk, and having many florets incloſed in a prickly empalement. All theſe plants are natives of the warm parts of Europe, from whence their ſeeds muſt be procured. They muſt be ſown upon an open bed of light earth, where the plants are to remain; and when the plants come up, they ſhould be thinned, ſo as to leave them three or four inches aſunder. The roots of the ſecond will laſt two or three years, and the third is a perennial plant.

ATRÆTI, in pathology, infants having no perforation in the anus; or perſons imperforated in the vagina or urethra, or obſtructed in thoſe parts by the growth of any ſubſtance or tumour.

ATRAGENE, in botany; a genus of the polyandria order, belonging to the polygamia claſs of plants. The calyx has four leaves; the petals are 12; and the ſeeds are caudated. There are three ſpecies, all natives of the eaſt.

ATRAPHAXIS; a genus of the digynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx has two leaves; the petals are two, and ſinuated; and there is but one ſeed. There are two ſpecies, both natives of warm countries, but meriting no particular deſcription.

ATREBATII, one of thoſe Belgic colonies which came out of Gaul into Britain, and there retained their ancient name. They originally inhabited the country which is now called Artois, and are mentioned by Cæſar among the nations which compoſed the Belgic confederacy againſt him. Calliva Atrebatum, mentioned in the 7th, 12th, 13th, and 14th itinera of Antoninus, and called by Ptolemy *Calcua*, ſeems to have been the capital of the Atrebatii; though our antiquaries differ in their ſentiments about the ſituation of this ancient city, ſome placing it at Wallingford, and others at Ilcheſter.

ATRI, a town of Italy, in the farther Abruzzo in the kingdom of Naples. E. long. 13. 8. N. lat. 42. 45.

ATRIENSES, in antiquity, a kind of ſervants or officers in the great families at Rome, who had the care and inſpection of the *atria*, and the things lodged therein. Theſe are otherwiſe called *atriarii*, though ſome make a diſtinction between *atrienſes* and *atriarii*; ſuggeſting that the latter were an inferior order of ſervants. The atrienſes are repreſented as ſervants of authority and command over the reſt: they acted as procurators, or agents, of their maſter, in ſelling his goods, &c. To their care were committed the ſtatues and images of the maſter's anceſtors, &c. which were placed round the atrium; and which they carried in proceſſion at funerals, &c. In the villas, or country-houſes, the atrienſes had the care of the other furniture and utenſils, particularly thoſe of metal. They were clothed in a ſhort white linen habit, to diſtinguiſh them, and prevent their loitering from home.

ATRIP, in nautical language, is applied either to the anchor or ſails. The anchor is atrip, when it is drawn out of the ground in a perpendicular direction, either by the cable or buoy-rope. The top-ſails are atrip, when they are hoiſted up to the maſt-head, or to their utmoſt extent.

ATRIPLEX, ORACH, or ARACH; a genus of the monœcia order, belonging to the polygamia claſs of plants; and, in the natural method, ranking under the 12th order, *Holoraceæ*. The calyx of the hermaphrodite flower has five leaves; there is no corolla; the ſtamina are five, and the ſtylus is bifid; the ſeed is one, and depreſſed. The *ſpecies* are, 1. The hortenſis, or garden orach, formerly cultivated in gardens, and uſed as a ſubſtitute for ſpinage. There are ſome varieties of this plant, whoſe only difference is their colour. 2. The halimus, or broad-leaved orach, formerly cultivated in gardens as a ſhrub, and by ſome formed into hedges. 3. The petulacoides, or ſhrubby ſea-orach, grows wild by the ſea-ſide in many places of Britain. It is a low under-ſhrub, ſeldom riſing above two feet and an half, or at moſt three feet high; but becomes very buſhy. This, among other low ſhrubs, in a garden, makes a pretty diverſity. Beſides theſe, which are the moſt remarkable, nine other ſpecies are enumerated by botanical writers. The firſt ſort is annual, and muſt be propagated by ſeeds, ſown at Michaelmas. The ſecond ſort may be propagated by cuttings, planted in any of the ſummer months, in a ſhady border; where they will be fit againſt the following Michaelmas to tranſplant into thoſe places where they are to remain. The third ſort requires very little culture.

ATRIUM, in eccleſiaſtical antiquity, denotes an open place or court before a church, making part of what was called the *narthex* or *ante-temple*. The atrium in the ancient churches was a large area or ſquare plot of ground, ſurrounded with a portico or cloyſter, ſituate between the porch or veſtibule of the church and the body of the church. Some have miſtakenly confounded the atrium with the porch or veſtibule, from which it was diſtinct; others with the narthex, of which it was only a part. The atrium was the manſion of thoſe who were not ſuffered to enter farther into the church. More particularly, it was the place where the firſt claſs of penitents ſtood to beg the prayers of the faithful as they went into the church.

ATRIUM is alſo uſed in the canon-law, for the cemetery or church-yard. In this ſenſe we find a law prohibiting buildings to be raiſed *in atrio eccleſiæ*, except for the clergy; which the gloſſary explains thus, *id eſt in cemeterio*, which includes the ſpace of forty paces around a large church, or thirty round a little church or chapel.

ATROPA, DEADLY NIGHT-SHADE; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 25th order, *Luridæ*. The corolla is campanulated; the ſtamina are diſtant; the berry is globular, and conſiſts of two cells. The ſpecies are

five; of which the three following are the moſt remarkable. 1. The *belladonna* grows wild in many parts of Britain. It has a perennial root, which ſends out ſtrong herbaceous ſtalks of a purpliſh colour, which riſe to the height of four or five feet, garniſhed with entire oblong leaves, which towards autumn change to a purpliſh colour. The flowers are large, and come out ſingly between the leaves, upon long foot-ſtalks; bell-ſhaped, and of a duſky colour on the outſide, but purpliſh within. After the flower is paſt, the germen turns to a large round berry a little flatted at the top. It is firſt green; but when ripe turns to a ſhining black, ſits cloſe upon the empalement, and contains a purple juice of a naufeous ſweet taſte, and full of ſmall kidney-ſhaped ſeeds. 2. The *frutescens* is a native of Spain, and riſes with a ſhrubby ſtem to the height of ſix or eight feet, dividing into many branches garniſhed with round leaves, in ſhape like thoſe of the ſtorax tree: theſe are placed alternately on the branches. The flowers come out between the leaves on ſhort foot-ſtalks, ſhaped like thoſe of the former, but much leſs; of a dirty yelloviſh colour, with a few brown ſtripes; but theſe are never ſucceeded by berries in Britain. 3. The *herbacea*, with an herbaceous ſtalk, is a native of Campeachy. This has a perennial root, which puts forth ſeveral channelled herbaceous ſtalks riſing about two feet; and towards the top they divide into two or three ſmall branches garniſhed with oval leaves four inches long and three broad, having ſeveral prominent tranſverſe ribs on their under ſide. The flowers come out from between the leaves on ſhort foot-ſtalks; they are white, and ſhaped like thoſe of the common ſort, but ſmaller. It flowers in July and Auguſt, but ſeldom ripens its fruit in Britain. 3. The *mandragora*, or mandrake, which has been diſtinguiſhed into the male and female. The male mandrake has a very large, long, and thick root; it is largeſt at the top or head, and from thence gradually grows ſmaller. Sometimes it is ſingle and undivided to the bottom; but more frequently it is divided into two or more parts. When only parted into two, it is pretended that it reſembles the body and thighs of a man. From this root there ariſe a number of very long leaves, broadeſt in the middle, narrow towards the baſe, and obtuſely pointed at the end; they are of a foot or more in length, and five inches or thereabouts in breadth; they are of a duſky and diſagreeable green colour, and of a very fœtid ſmell. The female mandrake perfectly reſembles the other in its manner of growth; but the leaves are longer and narrower, and of a darker colour, as are alſo the ſeeds and roots. It grows naturally in Spain, Portugal, Italy, and the Levant. The firſt ſpecies, on account of its poiſonous qualities, is very ſeldom admitted into gardens. The other kinds are propagated by ſeeds, and require to be placed in a ſtove. The poiſonous effects of the firſt ſpecies reſemble thoſe of other very powerful narcotics, which occaſion ſtupor, delirium, and convulſions; for all which it has been fooliſhly pretended that vinegar is a remedy. Children are often killed by eating berries of a fine black colour, and about the ſize of a ſmall cherry, which are no other than thoſe of the belladonna: and unfortunately we are as yet ignorant of an antidote for this poiſon on which we can rely.

The third ſpecies has been recommended in caſes of barrenneſs, but without foundation. Its freſh root is a violent purge, the doſe being from ten grains to twenty in ſubſtance, and from half a dram to a dram in infuſion. It has been found to do ſervice in hyſteric complaints; but muſt be uſed with great caution, otherwiſe it will bring on convulſions, and many other miſchievous ſymptoms. It has alſo a narcotic quality. At preſent only the freſh leaves are uſed in anodyne and emollient cataplaſms and fomentations. It uſed to be an ingredient in one of the old officinal unguents; but both that and the plant itſelf are now rejected from our pharmacopœias. It ſtill however retains a place in the foreign ones, and may perhaps deſerve farther attention. Naturaliſts tell ſtrange ſtories of this plant; but ſetting aſide its ſoporiferous virtue, modern botaniſts will ſcarcely warrant any of them, eſpecially ſince the diſcovery of the artifice of charletans in faſhioning it, to ſurpriſe the credulity of the people. The figure given in Plate 29, however, was taken from a genuine root.

ATROPHY, in medicine, a diſeaſe, wherein the body, or ſome of its parts, does not receive the neceſſary nutriment, but waſtes and decays inceſſantly.

ATROPOS, in fabulous hiſtory, the name of the third of the Parcæ, or Fates, whoſe buſineſs it was to cut the thread of life.

ATTACHMENT, in the law of England, implies the taking or apprehending a perſon by virtue of a writ or precept. It is diſtinguiſhed from an *arreſt*, by proceeding out of a higher court by precept or writ; whereas the latter proceeds out of an inferior court by precept only. An arreſt lies only on the body of a man; whereas an attachment lies often on the goods only, and ſometimes on the body and goods. An attachment by writ differs from *diſtreſs*, in not extending to lands, as the latter does: nor does a diſtreſs touch the body, as an attachment does.

ATTACHMENT *out of the Chancery*, is obtained upon an affidavit made, that the defendant was ſerved with a ſubpœna, and made no appearance; or it iſſues upon not performing ſome order or decree. Upon the return of this attachment by the ſheriff, *quod non eſt inventus in balliva ſua*, another attachment, with a proclamation, iſſues; and if he ſtill refuſes to appear, a commiſſion of rebellion.

ATTACHMENT *of the Foreſt*, is one of the three courts held in the foreſt. The loweſt court is called the *court of attachment*, or *wood-mote court*; the middle, *ſwan-mote*; and the higheſt, the *juſtice in eyre's ſeat*. The court of attachments has its name from the verdurers of the foreſt having no other authority in it, but to receive the attachments of offenders againſt vert and veniſon taken by the foreſters, and to enroll them, that they may be preſented or puniſhed at the next juſtice in eyre's ſeat. This attachment is by three means: by goods and chattels; by body, pledges, or main-prize; or by the body only. This court is held every 40 days throughout the year; and is thence called *forty-days court*.

Foreign ATTACHMENT is an attachment of money or goods found within a liberty or city, to ſatisfy ſome creditor within ſuch liberty or city. By the cuſtom of London, and ſeveral other places, a man can attach money or goods in the hands of a ſtranger, to ſatisfy himſelf.

ATTACK, in the military art, an effort made to force a poſt, break a body of troops, &c.

ATTACK *of a Siege*, is a furious aſſault made by the beſiegers with trenches, covers, mines, &c. in order to make themſelves maſters of a fortreſs, by ſtorming one of its ſides. If there are two or three attacks made at the ſame time, there ſhould be a communication betwixt them.

ATTACOTTI, an ancient people of Britain, mentioned by Ammianus Marcellinus and St. Jerome, as well as in the *Notitia Imperii*. They are repreſented as allies and confederates of the Scots and Picts, and therefore probably their neighbours: though their preciſe ſituation has not been determined by antiquaries.

ATTAINDER, in law. When ſentence of death, the moſt terrible and higheſt judgment in our laws, is pronounced, the immediate inſeparable conſequence by the common law is attainder. For when it is now clear beyond all diſpute, that the criminal is no longer fit to live upon the earth, but is to be exterminated as a bane to human ſociety, the law ſets a note of infamy upon him, puts him out of its protection, and takes

no farther care of him than barely to ſee him executed. He is then called *attaint*, *attinctus*, *ſtained*, or *blackened*. He is no longer of any credit or reputation; he cannot be a witneſs in any court; neither is he capable of performing the functions of another man: for, by an anticipation of his puniſhment, he is already dead in law. This is after judgment: for there is great difference between a man *convicted* and *attainted*; though they are frequently through inaccuracy confounded together. After conviction only, a man is liable to none of theſe diſabilities: for there is ſtill in contemplation of law a poſſibility of his innocence. Something may be offered in arreſt of judgment: the indictment may be erroneous, which will render his guilt uncertain, and thereupon the preſent conviction may be quaſhed: he may obtain a pardon, or be allowed the benefit of clergy; both which ſuppoſe ſome latent ſparks of merit, which plead in extenuation of his fault. But when judgment is once pronounced, both law and fact conſpire to prove him completely guilty; and there is not the remoteſt poſſibility left of any thing to be ſaid in his favour. Upon judgment, therefore, of death, and not before, the attainder of a criminal commences: or upon ſuch circumſtances as are equivalent to judgment of death; as judgment of outlawry on a capital crime, pronounced for abſconding or fleeing from juſtice, which tacitly confeſſes the guilt: and therefore, upon judgment either of outlawry, or of death, for treaſon or felony, a man ſhall be ſaid to be attainted.

A perſon attainted of high treaſon forfeits all his lands, tenements, and hereditaments; his blood is corrupted, and he and his poſterity rendered baſe; and this corruption of blood cannot be taken off but by act of parliament.

Attainders may be reverſed or falſified (i. e. proved to be falſe) by writ of error, or by plea. If by writ of error, it muſt be by the king's leave, &c. and when by plea, it may be by denying the treaſon, pleading a pardon by act of parliament, &c.

Perſons may be attainted by act of parliament. Acts of attainder of criminals have been paſſed in ſeveral reigns, on the diſcovery of plots and rebellions, from the reign of king Charles II. when an act was made for the attainder of ſeveral perſons guilty of the murder of king Charles I. Among acts of this nature, that for attainting Sir John Fenwick, for conſpiring againſt king William, is the moſt remarkable; it being made to attaint and convict him of high treaſon on the oath of one witneſs, juſt after a law had been enacted, "That no perſon ſhould be tried or attainted of high treaſon, where corruption of blood is incurred, but by the oath of two lawful witneſſes, unleſs the party confeſs, ſtand mute, &c." Stat. 7 and 8 W. III. cap. 3. But in the caſe of Sir John Fenwick there was ſomething extraordinary; for he was indicted of treaſon on the oaths of two witneſſes, though but only one could be produced againſt him on his trial.

ATTAINT, is a writ that lies after judgment againſt a jury of twelve men that have given falſe verdict in any court of record, in an action real or perſonal, where the debt or damages amount to above 40s. Stat. 5 and 34 Ed. III. c. 7. It is called *attaint*, becauſe the party that obtains it endeavours thereby to ſtain or taint the credit of the jury with perjury, by whoſe verdict he is grieved.

The jury who are to try this falſe verdict muſt be twenty-four, and are called *the grand jury*; for the law wills not that the oath of one jury of twelve men ſhould be attainted or ſet aſide by an equal number, nor by leſs indeed than double the former. And he that brings the attaint can give no other evidence to the grand jury, than what was originally given to the petit. For as their verdict is now trying, and the queſtion is whether or no they did right upon the evidence that appeared to them, the law adjudged it the higheſt abſurdity to produce any ſubſequent proof upon ſuch trial, and to condemn the prior juriſdiction for not believing evidence which they never knew. But thoſe againſt whom it is brought are allowed, in the affirmance of the firſt verdict, to produce new matter: becauſe the petit jury may have formed their verdict upon evidence of their own knowledge, which never appeared in court; and becauſe very terrible was the judgment which the common law inflicted upon them, if the grand jury found their verdict a falſe one. The judgment pronounced on conviction being exceedingly ſevere, had its uſual effect, in preventing the law from being executed: therefore, by the ſtatute 11 Hen. VII. c. 24. revived by 23 Hen. VIII. c. 3. and made perpetual by 13 Eliz. c. 25. it is allowed to be brought after the death of the party, and a more moderate puniſhment was inflicted upon attainted jurors; viz. perpetual infamy; and if the cauſe of action were above 40l. value, a forfeiture of 20l. a-piece by the jurors; or, if under 40l. then 5l. a-piece; to be divided between the king and the party injured. So that a man may now bring an attaint either upon the ſtatute or at common law, at his election; and in both of them may reverſe the former judgment. But the practice of ſetting aſide verdicts upon motion, and granting new trials, has ſo ſuperſeded the uſe of both ſorts of attaints, that there is hardly any inſtance of an attaint later than the 16th century.

ATTAINT, among farriers, a bruiſe or hurt on a horſe's leg, proceeding either from a blow with another horſe's foot, or from an over-reach in froſty weather, when a horſe, being rough ſhod, or having ſhoes with long caulkers, ſtrikes his hinder foot againſt his fore-leg.

ATTAINTED, in law, is a term applied to a perſon's being under attainder. See ATTAINDER.

ATTALICÆ VESTES, in antiquity, garments made of a kind of cloth of gold. They took the denomination from Attalus, ſurnamed Philometer, a wealthy king of Pergamus, who was the firſt, according to Pliny, who procured gold to be wove into cloth.

ATTELABUS, in zoology, a genus of inſects belonging to the order of coleoptera or beetle-kind. It has four wings, of which the ſuperior are cruſtaceous, and ſerve as a ſheath or cover to the inferior, which are membranous. See Plate 29. The head tapers behind, and is inclined; the feelers turn thicker towards the apex. The ſpecies are 13; viz. 1. The coryli, which is black, with red elytra or cruſtaceous wings. 2. The avellana, black, with the breaſt, feet, and elytra red. 3. The curculionoides, black, with red elytra and breaſt. The above three ſpecies frequent the leaves of the hazel and filbert nut trees. 4. The ſurinamenſis has a double indentation (or two teeth) in the top of the elytra. It is a native of Surinam. 5. The penſilvanicus is black, with red elytra, a black belt round the middle, and another towards the apex of the elytra. It is a native of Philadelphia. 6. The melanurus is black, with teſtaceous elytra, black at the apex. It is a native of Sweden. 7. The betula has ſaltatory or ſpringy legs, and the whole body is of a dark-red colour. It frequents the leaves of the birch-tree. 8. The formicarius is black, with red elytra, and a double white belt towards the baſe. It is a native of Europe. 9. The ſipylus is green, with a hairy breaſt, and a double yellow belt upon the elytra. 10. The apiarius is blueiſh, with red elytra, and three black belts. It is a native of Germany. 11. The mollis is yellowiſh and hairy, with pale elytra, and three belts. It is a native of Europe. 12. The ceramboides is of a blackiſh red colour, and the elytra is furrowed. It frequents the ſpongy boletus, a ſpecies of muſhroom. 13. The bupreſtoides is of a dark red colour, with a globular breaſt, and nervous elytra. It is a native of Europe.

ATTENTION, from *ad* to, and *tendo* I ſtretch, a due application of the ear, the eye, or the mind, to any thing ſaid or done, in order to acquire a knowledge thereof. Attention

of mind is not properly an act of the understanding; but rather of the will, by which it calls the understanding from the consideration of other objects, and directs it to the thing in hand. Nevertheless, our attention is not always voluntary: an interesting object seizes and fixes it beyond the power of controul. Attention, in respect of hearing, is the stretching or straining of the *membrana tympani*, so as to make it more susceptible of sounds, and better prepared to catch even a feeble agitation of the air. Or it is the adjusting the tension of that membrane to the degree of loudness or lowness of the sound to which we are attentive.

According to the degree of attention, objects make a stronger or weaker impression. Attention is requisite even to the simple act of seeing: the eye can take in a considerable field at one look; but no object in the field is seen distinctly but that singly which fixes the attention: in a profound reverie that totally occupies the attention, we scarce see what is directly before us. In a train of perceptions, no particular object makes such a figure as it would do singly and apart; for when the attention is divided among many objects, no particular object is entitled to a large share. Hence the stillness of night contributes to terror, there being nothing to divert the attention. In matters of slight importance, attention is mostly directed by will; and for that reason, it is our own fault if trifling objects make any deep impression. Had we power equally to with-hold our attention from matters of importance, we might be proof against any deep impression. But our power fails us here: an interesting object seizes and fixes the attention beyond the possibility of controul; and while our attention is thus forcibly attached to one object, others in vain solicit admittance. Thus it is that a small misfortune is scarcely felt under the pressure of a greater.

ATTENUANTS, or ATTENUATING *Medicines:* such as are supposed to subtilize and break the humours into finer parts; and thus dispose them for motion, circulation, excretion, &c. But the most eminent of our modern teachers have expressed doubts as to the possibility of effecting this by medicine. According to Hoffman, the dissolving and attenuating of viscid crudities in the stomach and *primæ viæ*, is well answered by the roots of arum, acorus, pepper, ginger, and the like; also by sal ammoniac, vitriolated tartar, the fixed alkaline salts, and the simple or dulcified spirit of salt.

ATTENUATION, among alchemists, was sometimes used for pulverization, or the act of reducing a body into an impalpable powder, by grinding or pounding.

ATTERBURY (Dr. Francis), son of Dr. Lewis Atterbury, was born at Milton in Buckinghamshire, in 1662. He was distinguished for his fine genius and turn for polite literature, which were displayed in a variety of controversial publications from the year 1687, when he took the degree of M. A. at Oxford, to the termination of his political career, when he fell a victim to the intrigues of his enemies, who, under pretence of his having engaged in a plot in favour of the Pretender, were the means of driving him into exile in the year 1723. His learned friend Bishop Smalridge, in the speech he made when he presented him to the Upper House of Convocation, as prolocutor, styles him *Vir in nullo literarum genere hospes, in plerisque artibus et studiis diu et feliciter exercitatus, in maxime perfectis literarum disciplinis perfectissimus.* He was the friend of Pope, Swift, and other wits of his time. In his controversial writings, he was sometimes too severe upon his adversary, and dealt rather too much in satire and invective. He died at Paris Feb. 15, 1731-2; and his body being brought over to England, was interred in Westminster-Abbey, but without any memorial being placed over him.

ATTESTATION, the act of affirming or witnessing the truth of something, more especially in writing.

ATTIC, any thing relating to Attica, or to the city of Athens: thus Attic salt, in philology, is a delicate poignant sort of wit and humour peculiar to the Athenian writers; Attic witness, a witness incapable of corruption, &c.

ATTIC *Order*; a kind of little order, after the manner of a pedestal, raised on another larger order, by way of a finish to the building. An *Attic* is sometimes also used for the convenience of having a wardrobe, or the like; and instead of regular columns, has only pilasters of a particular form; and sometimes no pilasters at all. There are also *Attics* used for high altars. The order takes its name from Athens, where it was first practised.

ATTIC *Base*, a peculiar kind of base used by the ancient architects in the Ionic order; and by Palladio, and some others, in the Doric.

ATTIC *Story*, in architecture; a story in the upper part of a house, where the windows are usually square.

ATTICA, an ancient kingdom of Greece, situated along the north coast of the gulph of Saron, bounded on the west by Megara, mount Cithæron, and part of Bœotia; on the north by the gulph of Euripus, now *Stretto di negro ponte*, and the rest of Bœotia; and on the east by the Europius. Its extent in length from N. W. to S. E. was about 60 miles; its breadth from N. to S. 56, decreasing as it approached the sea. The chief cities in the kingdom of Attica were Athens the capital; next to it Eleusis, situated on the same gulph, near the coasts of Megara; and next to that Rhamnus, famed for the temple of Amphiaraus and the statue of the goddess Nemesis.

ATTIRE, in hunting, signifies the head or horns of a deer. The attire of a stag, if perfect, consists of bur, pearls, beam, gutters, antler, sur-antler, royal, sur-royal, and croaches; of a buck, of the bur, beam, brow-antler, advancer, palm, and spellers.

ATTITUDE, in painting and sculpture, the gesture of a figure or statue; or it is such a disposition of their parts as serves to express the action and sentiments of the person represented.

ATTLEBURY, a town in the county of Norfolk in England. E. long. 0. 40. N. lat. 52. 23.

ATTOLLENS, in anatomy, an appellation given to several muscles, otherwise called *levatores* and *elevatores*. See ANATOMY; *Table of the Muscles*.

ATTORNEY AT LAW, answers to the Procurator, or Proctor of the civilians and canonists: and he is one who is put in the place, stead, or turn, of another, to manage his matters of law. Formerly every suitor was obliged to appear in person, to prosecute or defend his suit (according to the old Gothic constitution), unless by special licence under the king's letters patent. This is still the law in criminal cases; and an idiot cannot to this day appear by attorney, but in person; for he hath not discretion to enable him to appoint a proper substitute: and upon his being brought before the court in so defenceless a condition, the judges are bound to take care of his interests, and they shall admit the best plea in his behalf that any one present can suggest. But, as in the Roman law, *cum olim in usu fuisset, alterius nomine agi non posse, sed, quia hoc non minimam incommoditatem habebat, cæperunt homines per procuratores litigare;* so, with us, on the same principle of convenience, it is now permitted in general, by divers ancient statutes, whereof the first is statute West. 2. c. 10. that attorneys may be made to prosecute or defend any action in the absence of the parties to the suit. These attorneys are now formed into a regular corps; they are admitted to the execution of their office by the superior courts of Westminster-hall; and are in all points officers of the respective courts in which they are admitted; and as they have many privileges on account of their

attendance there, ſo they are peculiarly ſubject to the cenſure and animadverſion of the judges. No man can practiſe as an attorney in any of thoſe courts, but ſuch as is admitted and ſworn an attorney of that particular court: an attorney of the court of king's bench cannot practiſe in the court of common pleas; nor *vice verſa*. To practiſe in the court of chancery, it is alſo neceſſary to be admitted a ſolicitor therein: and by the ſtatute 22 Geo. II. c. 46. no perſon ſhall act as an attorney at the court of quarter-ſeſſions, but ſuch as has been regularly admitted in ſome ſuperior court of record. So early as the ſtatute 4 Hen. IV. c. 18, it was enacted, that attorneys ſhould be examined by the judges, and none admitted but ſuch as were virtuous, learned, and ſworn to do their duty. And many ſubſequent ſtatutes have laid them under farther regulations.

Letter of attorney pays by different acts, 6s. By 25 Geo. III. c. 80. the following duties are to be paid by every ſolicitor, attorney, notary, proctor, agent, or procurator, viz. for every warrant to proſecute for a debt of 40s. or to defend, a ſtamp duty of 2s. 6d. And they are to take out certificates annually; and if reſident in London, Weſtminſter, the bills of mortality, or Edinburgh, they are now obliged to pay 5l. for the ſame; and in every other part of Great Britain, 3l. The duties are under the management of the commiſſioners of ſtamps: and every acting ſolicitor, and other perſon as above, ſhall annually deliver in a note of his name and reſidence, to the proper officer of the court in which he practiſes; the entering officers are to certify notes delivered, and iſſue annual certificates, ſtamped as above, which muſt be renewed ten days before the expiration. Refuſing to iſſue, or improperly iſſuing certificates, is a penalty of 50l. and damages to the party aggrieved. Acting without a certificate, or giving in a falſe place of reſidence, is a penalty of 50l. and incapacity to ſue for fees due. A ſtamped memorandum ſhall be given to the proper officer, of the names of the parties in every action; and in ſuch caſes as uſed to require precipes. Officers who receive ſtamped memorandums, are to file the ſame, on penalty of 50l. and perſons not acting conformable to this act forfeit 5l.

By the 34 of Geo. III. relative to *Attorneys Clerks*, it is enacted, that within the bills of mortality, from Feb. 5, and in every other part of England and in Wales, from Feb. 10, 1794, there ſhall be paid for every contract in writing made after the ſaid days, whereby any perſon ſhall become bound to ſerve as a clerk, in order to his admiſſion as a ſolicitor or attorney, the additional duties following, viz. For every piece of vellum, parchment, or paper, upon which ſhall be written any ſuch contract whereby any perſon ſhall become bound to ſerve as a clerk as aforeſaid, in order to his admiſſion as a ſolicitor or attorney in any of the courts at Weſtminſter, there ſhall be charged a ſtamp duty of 100l. and in order to his admiſſion as a ſolicitor or attorney in any of the courts of Great Seſſions in Wales, or in the Counties Palatine of Cheſter, Lancaſter, or Durham, or in any Court of Record in England, holding pleas to the amount of 40s. and not in any of the ſaid courts at Weſtminſter, there ſhall be charged a ſtamp duty of 50l.

And no perſon bound to ſerve as a clerk ſhall be admitted into any court, unleſs the contract, ſtamped according to this act, ſhall be inrolled with the proper officer of the court, to be appointed for that purpoſe, together with an affidavit of the time of the execution of the contract; and in caſe the ſame ſhall not be ſo inrolled within ſix months after execution, then the ſervice of ſuch clerk ſhall be deemed to commence from the time of enrollment only.

And every perſon to be admitted a ſolicitor or attorney, by virtue of any ſuch contract as aforeſaid, before he ſhall be permitted to practiſe, or to be inrolled, ſhall make an affidavit of the due payment of the duty, ſpecifying certain particulars in the act directed, and ſhall cauſe the ſame to be filed in the court in which he purpoſes to be admitted, which affidavit ſhall be produced and read in court before he ſhall be enrolled.

And in caſe any perſon, other than ſuch who ſhall have been admitted an attorney or ſolicitor in one of the courts of Great Seſſions, in the Counties Palatine, or other courts of Record where attornies have been accuſtomarily admitted, by virtue of a contract made before the 5th and 10th of Feb. 1794, ſhall, in his own name, or in the name of any other, ſue out any proceſs, or proſecute, or defend any ſuit, in any of the courts at Weſtminſter, without being admitted and enrolled an attorney or ſolicitor in one of the ſaid courts, he ſhall forfeit 100l. one moiety thereof to the king, and the other, with coſts, to the informer; which perſon ſhall alſo be incapable to maintain any action for any diſburſements on account of any ſuch proceeding.

But any perſon who ſhall be admitted in any court at Weſtminſter, and ſhall have duly paid the duty of 100l. may be admitted in all or any of the courts before mentioned, without payment of any further duty.

Alſo any perſon who ſhall be admitted in any of the courts of Great Seſſions, or Counties Palatine, or in any inferior court, by virtue of ſuch contract, and who ſhall have paid the duty of 50l. may be admitted in any of the courts aforeſaid (except the ſaid courts at Weſtminſter) without payment of any further duty.

And any perſon admitted in any of the courts aforeſaid, *by virtue of any contract* bona fide *made, and of his ſervice under the ſame, actually commenced before the 5th and 10th days of Feb.* 1794, may be admitted in all or any other of the courts aforeſaid, without payment of any duty impoſed by this act, as he might before paſſing this act.

If any perſon, having been articled, and paid the duty, ſhall on the death of his maſter, or on any other event, before the expiration of the term of five years, enter into any ſubſequent contract with any other attorney or ſolicitor to ſerve him for the reſidue of the term, he ſhall not be ſubject to the duties impoſed by this act.

All vellum, parchment, and paper, liable to the duties, ſhall, before the ſame ſhall be ingroſſed, printed, or written upon, be brought to the office and duly ſtamped. But where ſuch contract ſhall be made by indentures of different parts, it ſhall be ſufficient to ſtamp one part only; and the commiſſioners may provide one other ſtamp to be put upon the other part, and may cauſe the ſame to be ſtamped, on payment of the duties, at any time after the execution, which ſtamp is to be diſtinguiſhable from any other ſtamp uſed by virtue of this or any other act. The uſual allowance is to be made on preſent payment of the ſaid duties.

Attorney *General*, a great officer under the king, made by letters patent. It is his place to exhibit informations, and proſecute for the crown, in matters criminal; and to file bills in the exchequer, for any thing concerning the king in inheritance or profits; and others may bring bills againſt the king's attorney. His proper place in court, upon any ſpecial matters of a criminal nature, wherein his attendance is required, is under the judges on the left hand of the clerk of the crown: but this is only upon ſolemn and extraordinary occaſions; for uſually he does not ſit there, but within the bar in the face of the court.

ATTOURNMENT, or Attornment, in law, a transfer from one lord to another, of the homage and ſervice a tenant makes; or that acknowledgment of duty to a new lord.

ATTRACTION, in natural philoſophy, a general term uſed to denote the cauſe by which bodies tend towards each other, and cohere till ſeparated by ſome other power.

The firſt in this country who adopted the notion of at-

traction was Dr. Gilbert, in his book *De Magnete*; and the next was the celebrated Lord Bacon. But till Sir Iſaac Newton appeared, this principle was very imperfectly defined and applied. Yet though this great author makes uſe of the word attraction, in common with the ſchool philoſophers; he very ſtudiouſly diſtinguiſhes his ideas from theirs. Accordingly, in his *Philoſoph. Nat. Prin. Math.* he obſerves, "that he uſes the words *attraction*, *impulſe*, and *propenſion* to the centre, indifferently; and cautions the reader not to imagine that by attraction he expreſſes the modus of the action, or the efficient cauſe thereof, as if there were any proper powers in the centres, which in reality are only mathematical points; or as if centres could attract." Lib. i. p. 5. So he "conſiders centripetal powers as attractions, though, phyſically ſpeaking, it were perhaps more juſt to call them impulſes." Ib. p. 147. He adds, "that what he calls attraction may poſſibly be effected by impulſe, though not a common or corporeal impulſe, or after ſome other manner unknown to us." *Optic.* p. 322.

Attraction, if conſidered as a quality ariſing from the ſpecific forms of bodies, ought, together with ſympathy, antipathy, and the whole tribe of occult qualities, to be exploded. But when we have ſet theſe aſide, there will remain innumerable phænomena of nature, and particularly the gravity or weight of bodies, or their tendency to a centre, which argue a principle of action ſeemingly diſtinct from impulſe, where at leaſt there is no ſenſible impulſion concerned. Nay, what is more, this action in ſome reſpects differs from all impulſion we know of; impulſe being always found to act in proportion to the ſurfaces of bodies, whereas gravity acts according to their ſolid content, and conſequently muſt ariſe from ſome cauſe that penetrates or pervades the whole ſubſtance thereof. This unknown principle, unknown we mean in reſpect of its cauſe, for its phænomena and effects are moſt obvious, with all the ſpecies and modifications thereof, we call *attraction*; which is a general name, under which all mutual tendencies, where no phyſical impulſe appears, and which cannot therefore be accounted for from any known laws of nature, may be ranged. And hence ariſe divers particular kinds of attraction; as, *Gravity*, *Magnetiſm*, *Electricity*, &c. which are ſo many different principles acting by different laws, and only agreeing in this, that we do not ſee any phyſical cauſes thereof; but that, as to our ſenſes, they may really ariſe from ſome power or efficacy in ſuch bodies, whereby they are enabled to act even upon diſtant bodies, though our reaſon abſolutely diſallows of any ſuch action.

Attraction may be divided, with reſpect to the law it obſerves, into two kinds.

1. That which extends to a ſenſible diſtance. Such are the attraction of gravity, found in all bodies; and the attraction of magnetiſm and electricity found in particular bodies. The ſeveral laws and phænomena of each, ſee under their reſpective articles.

The attraction of gravity, called alſo among mathematicians the *centripetal force*, is one of the greateſt and moſt univerſal principles in all nature. We ſee and feel it operate on bodies near the earth, and find by obſervation that the ſame power (*i. e.* a power which acts in the ſame manner, and by the ſame rules, viz. always proportionably to the quantities of matter, and as the ſquares of the diſtances reciprocally) does alſo obtain in the moon, and the other planets primary and ſecondary, as well as in the comets; and even that this is the very power whereby they are all retained in their orbits, &c. And hence, as gravity is found in all the bodies which come under our obſervation, it is eaſily inferred, by one of the ſettled rules of philoſophizing, that it obtains in all others: and as it is found to be as the quantity of matter in each body, it muſt be in every particle thereof; and hence every particle in nature is proved to attract every other particle, &c. From this attraction ariſes all the motion, and conſequently all the mutation, in the great world. By this heavy bodies deſcend, and light ones aſcend; by this projectiles are directed, vapours and exhalations riſe, and rains, &c. fall. By this rivers glide, the air preſſes, the ocean ſwells, &c. In effect, the motions ariſing from this principle make the ſubject of that extenſive branch of mathematics, called *mechanics* or *ſtatics*, with the parts or appendages thereof, hydroſtatics, pneumatics, &c.

2. That which does not extend to ſenſible diſtances. Such is found to obtain in the minute particles whereof bodies are compoſed, which attract each other at or extremely near the point of contact, with a force much ſuperior to that of gravity, but which at any diſtance from it decreaſes much faſter than the power of gravity. This power an ingenious author chooſes to call the *attraction of coheſion*, as being that whereby the atoms or inſenſible particles of bodies are united into ſenſible maſſes.

This latter kind of attraction owns Sir Iſaac Newton for its diſcoverer; as the former does for its improver. The laws of motion, percuſſion, &c. in ſenſible bodies under various circumſtances, as falling, projected, &c. aſcertained by the later philoſophers, do not reach to thoſe more remote, inteſtine motions of the component particles of the ſame bodies, whereon the changes of the texture, colour, properties, &c. of bodies depend; ſo that our philoſophy, if it were only founded on the principle of gravitation, and carried ſo far as that would lead us, would neceſſarily be very deficient.

But beſides the common laws of ſenſible maſſes, the minute parts they are compoſed of are found ſubject to ſome others, which have been but lately taken notice of, and are even yet imperfectly known. Sir Iſaac Newton, to whoſe happy penetration we owe the hint, contents himſelf with eſtabliſhing that there are ſuch motions in the *minima naturæ*, and that they flow from certain powers or forces, not reducible to any of thoſe in the great world. In virtue of theſe powers, he ſhows, "That the ſmall particles act on one another even at a diſtance; and that many of the phænomena of nature are the reſult. Senſible bodies, we have already obſerved, act on one another in various ways; and as we thus perceive the tenor and courſe of nature, it appears highly probable, that there may be other powers of the like kind; nature being very uniform and conſiſtent with herſelf. Thoſe juſt mentioned reach to ſenſible diſtances; but there may be others which reach to ſuch ſmall diſtances as have hitherto eſcaped obſervation; and it is probable electricity may reach to ſuch diſtances, even without being excited by friction.

The great author juſt mentioned proceeds to confirm the reality of theſe conjectures from a great number of phænomena and experiments, which plainly argue ſuch powers and actions between the particles, *e. g.* of ſalts and water, vitriolic acid and water, nitrous acid and iron, &c. He alſo ſhows, that theſe powers, &c. are unequally ſtrong between different bodies; ſtronger, *e. g.* between the particles of ſalt of tartar and thoſe of nitrous acid than thoſe of ſilver, between nitrous acid and lapis calaminaris than iron, between iron than copper, copper than ſilver or mercury. So vitriolic acid acts on water, but more on iron or copper, &c. The other experiments which countenance the exiſtence of ſuch a principle of attraction in the particles of matter are innumerable.

Theſe actions, in virtue whereof the particles of the bodies abovementioned tend towards each other, the author calls by the general indefinite name of *attraction*; which is equally applicable to all actions whereby diſtant bodies tend towards one another, whether by impulſe or by any other more latent power: and from hence he accounts for an infinity of phænomena, otherwiſe inexplicable, to which the principle of gravity

is inadequate. "Thus (adds our author) will nature be found very conformable to herſelf and very ſimple; performing all the great motions of the heavenly bodies by the attraction of gravity, which intercedes thoſe bodies, and almoſt all the ſmall ones of their parts, by ſome other attractive power diffuſed through their particles. Without ſuch principles, there never would have been any motion in the world; and without the continuance of it, motion would ſoon periſh, there being otherwiſe a great decreaſe or diminution of it, which is only ſupplied by theſe active principles."

We need not ſay how unjuſt it is in the generality of foreign philoſophers to declare againſt a principle which furniſhes ſo beautiful a view, for no other reaſon but becauſe they cannot conceive how one body ſhould act on another at a diſtance. It is certain, philoſophy allows of no action but what is by immediate contact and impulſion; for how can a body exert any active power where it does not exiſt? Yet we ſee effects without ſeeing any ſuch impulſe; and where there are effects, we can eaſily infer there are cauſes whether we ſee them or no. But a man may conſider ſuch effects without entering into the conſideration of the cauſes, as indeed it ſeems the buſineſs of a philoſopher to do: for to exclude a number of phænomena which we do ſee, will be to leave a great chaſm in the hiſtory of nature; and to argue about actions which we do not ſee, will be to build caſtles in the air. It follows, therefore, that the phænomena of attraction are matter of phyſical conſideration, and as ſuch entitled to a ſhare in the ſyſtem of phyſics; but that the cauſes thereof will only become ſo when they become ſenſible, *i. e.* when they appear to be the effect of ſome other higher cauſes; for a cauſe is no otherwiſe ſeen than as itſelf is an effect, ſo that the firſt cauſe muſt needs be always inviſible: we are therefore at liberty to ſuppoſe the cauſes of attraction what we pleaſe, without any injury to the effects. The illuſtrious author himſelf ſeems a little irreſolute as to the cauſes; inclining ſometimes to attribute gravity to the action of an immaterial cauſe (*Optics*, p. 343, &c.), and ſometimes to that of a material one. (Ib. p. 325.)

In his philoſophy, the reſearch into cauſes is the laſt thing, and never comes under conſideration till the laws and phænomena of the effect are ſettled; it being to theſe phænomena that the cauſe is to be accommodated. The cauſe even of any the groſſeſt and moſt ſenſible action, is not adequately known. How impulſe or percuſſion itſelf produces its effects, *i. e.* how motion is communicated by body to body, confounds the deepeſt philoſophers; yet is impulſe received not only into philoſophy, but into mathematics: and accordingly the laws and phænomena of its effects make the greateſt part of common mechanics.

The other ſpecies of attraction, therefore, in which no impulſe is remarkable, when their phænomena are ſufficiently aſcertained, have the ſame title to be promoted from phyſical to mathematical conſideration; and this without any previous inquiry into their cauſes, which our conceptions may not be proportionate to: let their cauſes be occult, as all cauſes ſtrictly ſpeaking are, ſo that their effects, which alone immediately concern us, be but apparent.

Our great philoſopher, then, far from adulterating ſcience with any thing foreign or metaphyſical, as many have reproached him with doing, has the glory of having thrown every thing of this kind out of his ſyſtem, and of having opened a new ſource of ſublimer mechanics, which duly cultivated might be of infinitely greater extent than all the mechanics yet known. It is hence alone we muſt expect to learn the manner of the changes, productions, generations, corruptions, &c. of natural things; with all that ſcene of wonders opened to us by the operations of chemiſtry.

Some of our own countrymen have proſecuted the diſcovery with laudable zeal. Dr. Keil particularly has endeavoured to deduce ſome of the laws of this new action, and applied them to ſolve divers of the more general phænomena of bodies, as coheſion, fluidity, claſticity, ſoftneſs, fermentation, coagulation, &c.; and Dr. Freind, ſeconding him, has made a further application of the ſame principles, to account at once for almoſt all the phænomena that chemiſtry preſents. ſo that ſome philoſophers are inclined to think that the new mechanics ſhould ſeem already raiſed to a complete ſcience, and that nothing now can occur but what we have an immediate ſolution of from the attractive force.

But this ſeems a little too precipitate: a principle ſo fertile ſhould have been further explored; its particular laws, limits, &c. more induſtriouſly detected and laid down, before we had proceeded to the application. Attraction in the groſs is ſo complex a thing, that it may ſolve a thouſand different phænomena alike. The notion is but one degree more ſimple and preciſe than action itſelf; and, till more of its properties are aſcertained, it were better to apply it leſs and ſtudy it more. It may be added, that ſome of Sir Iſaac Newton's followers have been charged with falling into that error which he induſtriouſly avoided, viz. of conſidering attraction as a cauſe or active property in bodies, not merely as a phænomenon or effect.

ATTRACTION *of Mountains*. See MOUNTAINS.

Elective ATTRACTION. See CHEMISTRY.

ATTREBATII. See ATREBATII.

ATTRIBUTE, in a general ſenſe, that which agrees with ſome perſon or thing; or a quality determining ſomething to be after a certain manner. Thus underſtanding is an attribute of mind, and extenſion an attribute of body. That attribute which the mind conceives as the foundation of all the reſt, is called its *eſſential attribute*: thus extenſion is by ſome, and ſolidity by others, eſteemed the eſſential attributes of body or matter.

ATTRIBUTES, in theology, the ſeveral qualities or perfections of the Divine nature.

ATTRIBUTES, in logic, are the predicates of any ſubject, or what may be affirmed or denied of any thing.

ATTRIBUTES, in painting and ſculpture, are ſymbols added to ſeveral figures, to intimate their particular office and character. Thus the eagle is an attribute of Jupiter; a peacock, of Juno; a caduce, of Mercury; a club, of Hercules; and a palm, of Victory.

ATTRIBUTIVES, in grammar, are words which are ſignificant of attributes; and thus include adjectives, verbs, and particles, which are attributes of ſubſtances; and adverbs, which denote the attributes only of attributes. Mr. Harris, who has introduced this diſtribution of words, denominates the former *attributives of the firſt order*, and the latter *attributives of the ſecond order*.

ATTRITION, the rubbing or ſtriking of bodies one againſt another, ſo as to throw off ſome of their ſuperficial particles; ſuch as the grinding and poliſhing of bodies. Or ſimply the act of rubbing; as when amber and other electric ſubſtances are rubbed, to make them attract, or emit their electric powers.

AVA, a kingdom of Aſia, in the peninſula beyond the Ganges. The metropolis of the kingdom which bears the ſame name, is ſituated in E. long. 96. 30. N. lat. 21. 0.

AVA AVA, a plant ſo called by the inhabitants of Otaheite, in the South-Sea, from the leaves of which they expreſs an intoxicating juice. It is drank very freely by the chiefs and other conſiderable perſons, who vie with each other in drinking the greateſt number of draughts, each draught being about a pint; but it is carefully kept from their women.

AVADOUTAS, a ſect of Indian Bramins, who in auſterity ſurpaſs all the reſt. The other ſects retain earthen veſſels for holding their proviſions, and a ſtick to lean on: but none of theſe are uſed by the Avadoutas; they only cover their nakedneſs with a piece of cloth; and ſome of them lay even that aſide, and go ſtark naked, beſmearing their bodies with cow dung. When hungry, ſome go into houſes, and, without ſpeaking, hold out their hand; eating on the ſpot whatever is given them. Others retire to the ſides of holy rivers, and there expect the peaſants to bring them proviſions, which they generally do very liberally.

AVALANCHES, a name given to prodigious ſnow-balls that frequently roll down the mountains in Savoy, particularly Mount Blanc, to the extreme danger of ſuch adventurous travellers as attempt to aſcend thoſe ſtupendous heights. Some of the avalanches are about 200 feet diameter; being fragments of the ice-rocks which break by their own weight from the tops of the precipices.

AVALON, an ancient town of France in the department of Yonne and late province of Burgundy. E. long. 3. 5. N. lat. 47. 38.

AVANIA, in the Turkiſh legiſlature, a fine for crimes and on deaths, paid to the governor of the place. In the places wherein ſeveral nations live together under a Turkiſh governor, he takes this profitable method of puniſhing all crimes among the Chriſtians or Jews, unleſs it be the murder of a Turk.

AVAST, in the ſea-language, a term requiring to ſtop or to ſtay.

AVAUNCHERS, among hunters, the ſecond branches of a deer's horns.

AUBAGNE, a town of the late province of Provence in France, on the road from Marſeilles to Toulon: E. long. 5. 52. N. lat. 43. 17.

AUBAINE, in the cuſtoms of France before the eſtabliſhment of the republic, a right veſted in the king of being heir to a foreigner that died within his dominions, notwithſtanding any teſtament the deceaſed might leave. Ambaſſadors were not ſubject to the right of aubaine; neither were the Swiſs, Savoyards, Scots, or Portugueſe, thoſe being deemed natives and regnicoles.

AUBENAS, a town in the department of Ardeche, and late province of Dauphiny in France, ſituated on the river Ardeche. E. long. 4. 32. N. lat 44. 40.

AUBIGNY, a town in the department of Cher and late province of Berry in France, ſituated on the river Nerre. E. long. 2. 20. N. lat. 47. 29. Before the abolition of nobility in France this was a dukedom belonging to the dukes of Richmond in England; confirmed to the preſent duke, and regiſtered in the parliament of Paris in 1777.

AUBIN DU CORMIER, a town in the department of Ille and Vilaine, and late province of Bretagne in France. Long. 1. 23. lat. 48. 15.

AUBIN, in horſemanſhip, a broken kind of gait, between an amble and a gallop, accounted a defect.

AUBONNE, a town of Switzerland, in the canton of Bern. E. long. 5. 54. N. lat. 48. 30. It is ſituated near a river of the ſame name, ſeven miles north of the lake of Geneva.

AUBURN, a market-town in Wiltſhire, in England. W. long. 1. 20. N. lat. 53. 20.

AUBUSSON, a ſmall town of France, in the department of Creuſe and late territory of Marche.

AUCAUGREL, the capital of the kingdom of Adel in Africa. E. long. 44. 25. N. lat. 9. 10.

AUCH, a town in France, in the department of Gers, late the capital of Gaſcony. E. long. 0. 40. N. lat. 43. 40.

AUCTION, a kind of public ſale, very much in uſe for houſehold goods, books, plate, &c. By this method of ſale the higheſt bidder is always the buyer. This was originally a kind of ſale among the ancient Romans, performed by the public crier *ſub haſta*, *i. e.* under a ſpear ſtuck up on that occaſion, and by ſome magiſtrate, who made good the ſale by delivery of the goods.

AUDEANISM, the ſame with anthropomorphiſm. Audeus, the chief of the Audeans, obtained the name of an heretic, and the puniſhment of baniſhment, for celebrating Eaſter in the manner of the Jews, and attributing an human form to the Deity. He died in the country of the Goths, about the year 370. See ANTHROPOMORPHITES.

AUDIENCE given to ambaſſadors, a ceremony obſerved in courts on the admiſſion of ambaſſadors or public miniſters to a hearing. In England, audience is given to ambaſſadors in the preſence chamber; to envoys and reſidents, in a gallery, cloſet, or in any place where the king happens to be. Upon being admitted, as is the cuſtom of all courts, they make three bows; after which they cover and ſit down; but not before the king is covered and ſeated, and has given them the ſign to put on their hats. When the king does not care to have them covered, and ſit, he himſelf ſtands uncovered; which is taken as a ſlight. At Conſtantinople, miniſters uſually have audience of the prime vizier.

AUDIENCE is alſo the name of a court of juſtice eſtabliſhed in the Weſt-Indies by the Spaniards, anſwering in effect to the late parliament in France. Theſe courts take in ſeveral provinces, called alſo *audiences*, from the names of the tribunal to which they belong.

AUDIENCE is alſo the name of an eccleſiaſtical court held by the archbiſhop of Canterbury, wherein differences upon elections, conſecrations, inſtitutions, marriages, &c. are heard.

AUDIENDO & TERMINANDO, a writ, or rather a commiſſion to certain perſons, when any inſurrection or great riot is committed in any place, for the appeaſing and puniſhment of it.

AUDIENTES, or AUDITORS, in church-hiſtory, an order of catechumens; conſiſting of thoſe newly inſtructed in the myſteries of the Chriſtian religion, and not yet admitted to baptiſm.

AUDIT, a regular hearing and examination of an account by ſome proper officers, appointed for that purpoſe.

AUDITOR, an officer of the king, or ſome other great perſon, who, by examining yearly the accounts of the under officers, makes up a general book, with the difference between their receipts and charges, and their allowances to allocations.

AUDITOR *of the Receipts*, is an officer of the exchequer who files the tellers' bills, makes an entry of them, and gives the lord treaſurer a certificate of the money received the week before. He alſo makes debentures to every teller, before they receive any money, and takes their accounts. He keeps the black book of receipts, and the treaſurer's key of the treaſury, and ſees every teller's money locked up in the new treaſury.

AUDITORS *of the Revenue*, or of the exchequer, officers who take the accounts of thoſe who collect the revenues and taxes raiſed by parliament, and take the accounts of the ſheriffs, eſcheators, collectors, tenants, and cuſtomers, and ſet them down in a book, and correct them.

AUDITORS *of the Preſt and Impreſt*, officers of the exchequer, who take and make up the accounts of Ireland, Berwick, the mint, and of any money impreſſed to any man for the king's ſervice. They received poundage on all accounts paſſed by them, which amounted to a prodigious ſum, eſpecially in time of war. But the office is now aboliſhed, and 7000l. a year given to the incumbents.

AUDITORS *Collegiate, Conventual*, &c. officers formerly appointed in colleges, &c. to examine and paſs their accounts.

AUDITORES, in church-hiſtory. (See AUDIENTES.) The auditores formed one branch of the Manichean ſect, which was divided into *elect* and *auditors*; correſponding, according to ſome writers, to *clergy* and *laity*; and according to others, to the *faithful* and *catechumens* among the Catholics. By the Manichean rule, a different courſe of life was preſcribed to the elect from that of the auditors. The latter might eat fleſh, drink wine, bathe, marry, traffic, poſſeſs eſtates, bear magiſtracy, and the like; all which things were forbidden to the elect. The auditors were obliged to maintain the elect, and kneeled down to aſk their bleſſing. Beauſobre obſerves, that the elect were eccleſiaſtics, and in general ſuch as made profeſſion of obſerving certain counſels, called *evangelic*; ſuch as the clergy and monks; and they were called the *perfect* by Theodoret. The auditors were the laity, and ſo denominated, becauſe they heard in the church whilſt others taught and inſtructed.

AUDITORIUM, in the ancient churches, was that part of the church where the audientes ſtood to hear and be inſtructed. The auditorium was that part now called *navis eccleſiæ*. (See NAVE.) In the primitive times, the church was ſo ſtrict in keeping the people together in that place, that the perſon who went from thence in ſermon time was ordered by the council of Carthage to be excommunicated.

AUDITORY, or AUDIENCE, an aſſembly of people who attend to hear a perſon who ſpeaks in public.

AUDITORY is alſo uſed for the bench whereon a magiſtrate or judge hears cauſes.

AUDITORY, in ancient churches. See AUDITORIUM.

AUDITORY *Paſſage, (meatus auditorius)*, in anatomy; the entrance of the ear. See ANATOMY, p. 211.

AUDITORY *Nerves*. See ANATOMY, p. 205.

AVEIRO, a conſiderable city of Portugal, ſeated near the mouth of the river Vouga. W. long. 9. 8. N. lat. 40. 30.

AVELLANE, in heraldry, a croſs, the quarters of which ſomewhat reſemble a filbert-nut. Sylvanus Morgan ſays, that it is the croſs which enſigns the mound of authority, or the ſovereign's globe.

AVE-MARIA, the angel Gabriel's ſalutation of the Virgin Mary, when he brought her the tidings of the incarnation.—It is become a prayer or form of devotion in the Romiſh church. The chaplets and roſaries are divided into ſo many ave-marias, and ſo many paternoſters, to which the members of the Romiſh church attribute great ſpiritual efficacy.

AVENA, OATS; a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx has a double valve, and the awn on the back is contorted. The ſpecies are 13; ſix of them natives of Britain; viz. 1. The nuda, or naked oats. 2. The fatua, or bearded oat-graſs. 3. The pratenſis, or meadow oat-graſs. 4. The pubeſcens, or rough oat-graſs. 5. The elatior, or tall oat-graſs. 6. The flaveſcens, or yellow oat-graſs. It is remarkable, that the native place of the fativa, or common oat, cultivated in our fields, is almoſt totally unknown. Anſon ſays, that he obſerved it growing wild or ſpontaneouſly in the iſland of Juan Fernandez. But a vague obſervation from an author of that kind is not to be depended on.—For the culture, ſee HUSBANDRY.

AVENAGE, in law, a certain quantity of oats paid by a tenant to a landlord, inſtead of rent or ſome other duties.

AVENCHE, an ancient city in the canton of Bern, formerly the capital of all Switzerland. E. long. 7. 7. N. lat. 46. 50.

AVENOR, an officer belonging to the king's ſtables, who provides oats for the horſes. He acts by warrant from the maſter of the horſe.

AVENS, in botany, the ſame with the Caryophyllata. See CARYOPHYLLUS.

AVENTINUS MONS, one of the ſeven hills on which ancient Rome ſtood. The origin of the name *Aventinus* is uncertain; but this hill was alſo called *Murcius*, from Murcia the goddeſs of ſloth, who had a little chapel there; and *Collis Dianæ*, from the temple of Diana; likewiſe *Remonius*, from Remus, who wanted to build the city, and who was buried there. It was taken within the compaſs of the city by Ancus Marcius. To the eaſt it had the city walls; to the ſouth, the Campus Figulinus; to the weſt, the Tiber; and to the north, Mons Palatinus, in circuit two miles and a quarter.

AVENTURE, in law-books, means a miſchance cauſing the death of a perſon without felony.

AVENUE, in gardening, a walk planted on each ſide with trees, and leading to an houſe, garden-gate, wood, &c. and generally terminated by ſome diſtant object. All avenues that lead to a houſe, ought to be at leaſt as wide as the whole front of the houſe, if wider they are better ſtill; and avenues to woods and proſpects ought not to be leſs than 60 feet wide. The trees ſhould not be planted nearer to one another than 35 feet, eſpecially if they are trees of a ſpreading kind; and the ſame ought to be the diſtance, if they are for a regular grove. The trees moſt proper for avenues with us, are the Engliſh elm, the lime, the horſe-cheſnut, the common cheſnut, the beech, and the abele. The old method of planting avenues was with regular rows of trees; but we have now a much more magnificent way of ſetting the trees in clumps, or platoons, making the opening much wider than before, and placing the clumps of trees at about 300 feet diſtant from one another. In each of theſe clumps there ſhould be planted either ſeven or nine trees; but it is to be obſerved, that this is only to be practiſed where the avenue is to be of ſome conſiderable length, for in ſhort walks this will not appear ſo ſightly as ſingle rows of trees. The avenues made by clumps are fitteſt of all for parks. The trees in each clump ſhould be planted about 30 feet aſunder; and a trench ſhould be thrown up round the whole clump, to prevent the deer from coming to the trees to bark them.

AVENZOAR, ABU MERWAN ABDALMALEC EBN ZOHR, an eminent Arabian phyſician, who flouriſhed about the end of the eleventh or the beginning of the twelfth century. He was of noble deſcent, and born at Sevil, the capital of Andaluſia, where he exerciſed his profeſſion with great reputation. According to Dr. Freind, he lived to the age of 135. He began to practiſe at 40, or (as others ſay) at 20; and had the advantage of a longer experience than almoſt any one ever had, for he enjoyed perfect health to his laſt hour.

AVERAGE, in commerce, ſignifies the accidents and misfortunes which happen to ſhips and their cargoes, from the time of their loading and ſailing, to their return and unloading; and is divided into three kinds. 1. The ſimple or particular average, which conſiſts in the extraordinary expences incurred for the ſhip alone, or for the merchandizes alone. Such is the loſs of anchors, maſts, and rigging, occaſioned by the common accidents at ſea; the damages which happen to merchants by ſtorm, prize, ſhipwreck, wet, or rotting; all which muſt be borne and paid by the thing which ſuffered the damage. 2. The large and common average, being thoſe expences incurred, and damages ſuſtained, for the common good and ſecurity both of the merchandizes and veſſels, conſequently to be borne by the ſhip and cargo, and to be regulated upon the whole. Of this number are the goods or money given for the ranſom of the ſhip and cargo, things thrown overboard for the ſafety of the ſhip, the expences of unloading for entering into a river or harbour, and the proviſions and hire of the ſailors when the ſhip is put under an embargo. 3. The ſmall aver-

ages, which are the expences for towing and piloting the ſhip out of or into harbours, creeks, or rivers, one third of which muſt be charged to the ſhip, and two thirds to the cargo.

AVERAGE is more particularly uſed for a certain contribution that merchants make proportionably to their loſſes, who have had their goods caſt into the ſea in the time of a tempeſt. It alſo ſignifies a ſmall duty which thoſe merchants, who ſend goods in another man's ſhip, pay to the maſter for his care of them over and above the freight. Hence it is expreſſed in the bills of lading, paying ſo much freight for the ſaid goods, with primage and *average* accuſtomed.

AVERDUPOIS. See AVOIRDUPOIS.

AVERNUS, a lake of Campania in Italy, near Baiæ, famous among the ancients for its poiſonous qualities. It is deſcribed by Strabo as lying within the Lucrine bay, deep and darkſome, ſurrounded with ſteep banks that hang threatening over it, and only acceſſible by the narrow paſſage through which you ſail in. The poiſonous effluvia from this lake were ſaid to be ſo ſtrong, that they proved fatal to birds endeavouring to fly over it. Virgil aſcribes the exhalation not to the lake itſelf, but to the cavern near it, which was called *Avernus*, or *Cave of the Sybil*, and through which the poets feigned a deſcent to hell. Hence the proper name of the lake is *Lacus Averni*, the "lake near the cavern," as it is called by ſome ancient authors.

AVERRHOA, in botany; a genus of the decandria order, belonging to the pentagynia claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx has 5 leaves; the petals are 5, opening at top; and the apple or fruit is pentagonous, and divided into 5 cells. There are 3 ſpecies, viz. the blimbi, the carambola, and the acida, all natives of the Indies.

The ſecond of theſe, the carambola, called in Bengal the *camrue* or *camrunga*, is remarkable for poſſeſſing a power ſomewhat ſimilar to thoſe ſpecies of Mimoſa which are termed *ſenſitive plants*; its leaves, on being touched, moving very perceptibly. In the mimoſa the moving faculty extends to the branches; but from the hardneſs of the wood, this cannot be expected in the camrunga. The leaves are alternately pinnated, with an odd one; and in their moſt common poſition in the day-time are horizontal, or on the ſame plane with the branch from which they come out. On being touched, they move themſelves downward, frequently in ſo great a degree that the two oppoſite almoſt touch one another by their under ſides, and the young ones ſometimes either come into contact or even paſs each other. The whole of the leaves of one pinna move by ſtriking the branch with the nail of the finger or any hard ſubſtance: or each leaf can be moved ſingly, by making an impreſſion that ſhall not extend beyond that leaf. In this way the leaves of one ſide of the pinna may be made to move, one after another, whilſt the oppoſite continue as they were; or you may make them move alternately, or in ſhort in any order you pleaſe, by touching in a proper manner the leaf you wiſh to put in motion.

Whether the impreſſion be made by puncture, percuſſion, or compreſſion, the motion does not inſtantly follow: generally ſeveral ſeconds intervene, and then it is not by a jirk, but regular and gradual. Afterwards, when the leaves return to their former ſituation, which is commonly in a quarter of an hour or leſs, it is in ſo ſlow a manner as to be almoſt imperceptible. On ſticking a pin into the univerſal petiolus at its origin, the leaf next it, which is always on the outer ſide, moves firſt; then the firſt leaf on the oppoſite ſide, next the ſecond leaf on the outer, and ſo on. But this regular progreſſion ſeldom continues throughout; for the leaves on the outer ſide of the pinna ſeem to be affected both more quickly, and with more energy, than thoſe of the inner; ſo that the fourth leaf on the outer ſide frequently moves as ſoon as the third on the inner; and ſometimes a leaf, eſpecially on the inner ſide, does not move at all, whilſt thoſe above and below it are affected in their proper time. After ſun-ſet the leaves go to ſleep, firſt moving down ſo as to touch one another by their under ſides: they therefore perform rather more extenſive motion at night of themſelves than they can be made to do in the day-time by external impreſſions. A particular account of this extraordinary plant is given in the Philoſ. Tranſ. vol. lxxv.

AVERROISTS, a ſect of peripatetic philoſophers, who appeared in Italy ſome time before the reſtoration of learning, and attacked the immortality of the ſoul. They took their denomination from AVERROES, the celebrated interpreter of Ariſtotle, from whom they borrowed their diſtinguiſhing doctrine. The Averroiſts, who held the ſoul was mortal, according to reaſon or philoſophy, yet pretended to ſubmit to the Chriſtian theology, which declares it immortal. But the diſtinction was held ſuſpicious; and this divorce of faith from reaſon was rejected by the doctors of that time, and condemned by the laſt council of the Lateran under Leo X.

AVERRUNCI (DEI); certain gods, whoſe buſineſs it was, according to the Pagan theology, to avert misfortunes. Apollo and Hercules were of the number of theſe gods among the Greeks; and Caſtor and Pollux among the Romans.

AVERSA, a town of Italy in the kingdom of Naples; E. lon. 14. 20. N. lat. 41. 0.

AVERSION, according to Lord Kaimes, is oppoſed to *affection*, and not to *deſire*, as it commonly is repreſented by authors. We have an affection to one perſon; we have an averſion to another; the former diſpoſes us to do good to its object, the latter to do ill.

AVERTI, in horſemanſhip, is applied to a regular ſtep or motion enjoined in the leſſons. In this ſenſe they ſay, *pas averti*, ſometimes *pas ecouté*, and *pas d'ecole*, which all denote the ſame. The word is mere French, and ſignifies *adviſed*.

AVES, one of the Caribbee iſlands, 451 miles S. of Porto Rico. There is another of the ſame name lying to the northward of this, in N. lat. 15. 0.; and a third near the eaſtern coaſt of Newfoundland, in N. lat. 50. 5.

AVES, *Birds*, the name of Linnæus's ſecond claſs of animals. See ZOOLOGY, and ORNITHOLOGY.

AVESNES, a ſmall town of France, in the department of the North and late province of Hainault, ſeated on the Helper, 25 miles E. of Cambray, and 100 N. E. of Paris. Long. 3. 58. E. Lat. 50. 8. N.

AUGEAS, in fabulous hiſtory, was king of Elis, and particularly famed for his ſtable, which contained 3000 oxen, and had not been cleaned for 30 years. Hercules was deſired to clear away the filth from this ſtable in one day; and Augeas promiſed, if he performed it, to give him a tenth part of the cattle. This taſk Hercules is ſaid to have executed by turning the courſe of the river Alpheus through the ſtable; when Augeas refuſing to ſtand by his engagement, Hercules ſlew him with his arrows, and gave his kingdom to Phyleus his ſon, who had ſhown an abhorrence of his father's perfidy.

AUGMENT, in grammar, an accident of certain tenſes of Greek verbs, being either the prefixing of a ſyllable, or an increaſe of the quantity of the initial vowels.

AUGMENTATION, the name of a court erected 27 Hen. VIII. and ſo called from the augmentation of the revenues of the crown, by the ſuppreſſion of religious houſes. The office ſtill remains, and contains many curious records, though the court has been diſſolved long ſince.

AUGMENTATION, in heraldry; additional charges to a coat-armour, frequently given as particular marks of honour, and

generally borne either in the escutcheon or a canton; as have all the baronets of England, who have borne the arms of the province of Ulster in Ireland.

AUGRE, or AWGRE, an instrument used by coopers and carpenters to bore large round holes. It consists of a wooden handle, and an iron blade terminated at bottom with a steel bit.

AUGSBURG, a handsome, large, and ancient town of Suabia, in Germany, a bishop's see, and an imperial city, or sovereign state, being governed by a town-council and the representatives of the burghers, who are half protestants and half papists. The churches, townhouse, and other public buildings, are magnificent. It is surrounded by beautiful plains, and large forests full of all sorts of game. It is seated between the river Werdach and Lech, 30 miles N. W. of Munich. Lon. 11. 4. E. Lat. 48. 27. N.

AUGSBURG *Confession*, denotes a celebrated confession of faith drawn up by Luther and Melancthon, on behalf of themselves and other ancient reformers, and presented in 1530 to the emperor Charles V. at the diet of Augusta or Augsburg, in the name of the evangelic body. This confession contains 28 chapters; of which the greatest part is employed in representing, with perspicuity and truth, the religious opinions of the protestants, and the rest in pointing out the errors and abuses that occasioned their separation from the church of Rome.

AUGUR, an officer among the Romans, appointed to foretel future events, by the chattering, flight, and feeding of birds. There was a college or community of them, consisting originally of nine members, four of whom were patricians and five plebeians. They bore an augural staff or wand, as the ensign of their authority; and their dignity was so much respected, that they were never deposed, nor any substituted in their place, though they should be convicted of the most enormous crimes. See AUGURY.

AUGURAL, something relating to the augurs.—The augural instruments are represented on several ancient medals. The AUGURAL *Supper* was that given by a priest on his first admission into the order, called also by Varro *Adjicialis*. AUGURAL *Books*, were those wherein the discipline and rules of augury were laid down.

AUGURALE, the place in a camp where the general took auspicia. This answered to the *Auguratorium* in the city.

AUGURALE is also used in Seneca for the ensign or badge of an augur, as the *lituus*.

AUGURATORIUM, a building on the Palatine mount, where public auguries were taken.

AUGURY, in its proper sense, the art of foretelling future events by observations taken from the chattering, singing, feeding, and flight, of birds; though it is used by some writers in a more general signification, as comprising all the different kinds of divination. Augury was a very ancient superstition. When men considered the wonderful migration of birds, how they disappeared at once, and appeared again at stated times, and could give no guess where they went, it was almost natural to suppose, that they retired somewhere out of the sphere of this earth, and perhaps approached the ethereal regions, where they might converse with the gods, and thence be enabled to predict events. It was almost natural for a superstitious people to imagine this; at least to believe it, as soon as some impostor was impudent enough to assert it. Add to this, that the disposition in some birds to imitate the human voice, must contribute much to the confirmation of such a doctrine. Hence these animals were looked upon as the interpreters of the gods, and no affair of consequence, either of private or public concern among the Romans, was undertaken without consulting them.

AUGUST, *Augustus*, in a general sense, something majestic, venerable, or sacred. The appellation was first conferred by the Roman senate upon Octavius, after his being confirmed by them in the sovereign power. It was conceived as expressing something divine, or elevated above the pitch of mankind, being derived from the verb *augeo*, I increase; *tanquam supra humanam sortem auctus*.

AUGUST, in chronology, the eighth month of our year, containing 31 days. August was dedicated to the honour of Augustus Cæsar, because, in the same month, he was created consul, thrice triumphed in Rome, subdued Egypt to the Roman empire, and made an end of civil wars, being before called *Sextilis*, or the sixth month from March.

AUGUSTA, the capital of the state of Georgia in N. America, situated on the S. W. bank of the river Savannah, 134 miles from the sea, and 117 from the town of Savannah. The town does not consist of quite 200 houses; but as it is seated on a fine plain, and enjoys the best soil, with the advantage of a central situation between the upper and lower counties, it is rising into importance. Lon. 82. 0. W. Lat. 33. 20. N.

AUGUSTA *Historia*, is the history of the Roman emperors from the time of Adrian to Carinus, that is, from the year of our Lord 157 to 285, composed by six Latin writers, Æl. Spartianus, Julius Capitolinus, Æl. Lampridius, Vulcatius, Gallicanus, Trebellius Pollio, and Flavius Vopiscus.

AUGUSTE, or AUSTA, an island in the Adriatic sea, subject to Venice. E. long. 17. 50. N. lat. 42. 35.

AUGUSTALES, in Roman antiquity, an epithet given to the flamens or priests appointed to sacrifice to Augustus after his deification; and also to the ludi or games celebrated in honour of the same prince on the fourth of the ides of October.

AUGUSTALIA, a festival instituted by the Romans in honour of Augustus Cæsar, on his return to Rome, after having settled peace in Sicily, Greece, Syria, Asia, and Parthia; on which occasion they likewise built an altar to him, inscribed with the words *Fortunæ reduci*.

AUGUSTALIS PRÆFECTUS, a title peculiar to a Roman magistrate who governed Egypt, with a power much like that of a proconsul in other provinces.

AUGUSTAN CONFESSION. See AUGSBURG CONFESSION.

AUGUSTINE, a cape of South America. W. long. 35. 4. S. lat. 8. 30.

AUGUSTINE (St.), a fort of North America, on the east coast of Cape Florida, situated in W. long. 81. 10. N. lat. 30. 0.

AUGUSTINS, or AUGUSTINIANS, an order of religious; thus called from St. Augustin, whose rule they observe. The Augustins, popularly also called Austin friars, were originally hermits, whom pope Alexander IV. first congregated into one body, under their general Lanfranc, in 1256. Soon after their institution, this order was brought into England, where they had about thirty-two houses at the time of their suppression. The Augustins are clothed in black, and make one of the four orders of mendicants. From these arose a reform, under the denomination of *bare-foot Augustins*, or *Minorets*, or *Friars minor*. There are also canons regular of St. Augustin, who are clothed in white, excepting their cope, which is black. Before the French revolution, they were known at Paris under the denomination of *religious of* GENEVIEVE; that abbey being the chief of the order. There are also nuns and canonesses, who observe the rules of St. Augustin.

AUGUSTINIANS are also those divines who maintain, on the authority of St. Augustin, that GRACE is effectual from its nature, absolutely and morally, and not relatively and gradually. They are divided into rigid and relaxed.

AUGUSTOW, a small but strong town of Poland, in the

duchy and palatinate of Polakia, ſeated on the river Narew. E. long. 24. 2. N. lat. 53. 25.

AUGUSTUS (Fort), a ſmall fortreſs at the head of Lochneſs in Scotland, between the rivers Taarf and Oich.

AVIARY, a place ſet apart for feeding and propagating birds. It ſhould be ſo large as to give the birds ſome freedom of flight; and turfed, to avoid the appearance of foulneſs on the floor.

AVICENIA, Eastern Anacardium; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquepartite; the corolla is bilabiated, the upper lip ſquared; the capſule is leathery, romb-like, and monoſpermous. There are two ſpecies; the tomentoſa or downy, and the nitida or ſhining. The ſeeds of the firſt are ſaid to be the Malacca beans formerly kept in the ſhops (though this is doubtful), the kernels of which were eaten as almonds. The plant producing the Malacca bean, as it is called, is rather thought to be the Bontia *Germinans*.

AVIGATO pear. See Laurus.

AVIGLIANO, a ſmall town of Piedmont in Italy. E. long. 7. 5. N. lat. 44. 40.

AVIGNON, a handſome and large town of France, capital of a territory of the ſame name, which depended lately on the Pope, with an archbiſhop's ſee, and a univerſity. It is advantageouſly ſeated on the river Rhone, 20 miles E. of Niſmes. The French have lately united it to their republic. Lon. 4. 53. E. Lat. 43. 57. N.

Avignon-*Berry*, the fruit of a ſpecies of lycium, growing plentifully near Avignon and in other parts of France. The berry is ſomewhat leſs than a pea; its colour is green, approaching towards a yellow; and it is of an aſtringent and bitter taſte. It is much uſed by the dyers, who ſtain a yellow colour with it: and by the painters, who alſo make a fine golden yellow of it.

AVILA, a city of Old Caſtile, in Spain, ſeated on an eminence on the banks of the river Adaja. W. long. 4. 13. N. lat. 40. 35.

AVIS, a ſmall town of Alentejo in Portugal, ſeated near the river Avis. W. long. 7. 0. N. lat. 38. 40.

Avis (*Knights d'Avis*), an order of knighthood in Portugal, eſtabliſhed about the year 1162. When the city of Evora was taken from the Moors, in the reign of the firſt king of Portugal, it was garriſoned by ſeveral perſons who aſſumed the title of knights of St. Mary of Evora, which was ſoon after changed for that of knights d'Avis, which the king gave them, and whither they removed from Evora. The badge of the order is a green croſs flory, and they obſerve the rule of St. Benedict.

AVISO, a term chiefly uſed in matters of commerce to denote an advertiſement, an advice, or piece of intelligence.

AUK, in ornithology. See Alca.

Biſhop's AUKLAND, a town in the biſhoprie of Durham in England, ſituated on the river Were. W. long. 0. 57. N. lat. 54. 44.

AULA, is uſed for a court baron by Spelman: by ſome old eccleſiaſtical writers, for the nave of a church, and ſometimes for a court-yard.

Aula *Regia* or *Regis*, a court eſtabliſhed by William the Conqueror in his own hall, compoſed of the king's great officers of ſtate, who reſided in his palace, and were uſually attendant on his perſon. This court was regulated by the article which forms the eleventh chapter of Magna Charta, and eſtabliſhed in Weſtminſter-hall, where it has ever ſince continued. See *King's* Bench.

AULCESTER, a town of Warwickſhire in England. W. long. 1. 47. N. lat. 52. 15.

AULETES, in antiquity, denotes a flute-player. One of the Ptolemies, kings of Egypt, father of Cleopatra, bore the ſurname or denomination of *Auletes*.

AULIC, an epithet given to certain officers of the empire, who compoſe a court which decides, without appeal, in all proceſſes entered in it. Thus we ſay, *aulic council*, *aulic chamber*, *aulic counſellor*, &c. The aulic council is compoſed of a preſident, who is a catholic; of a vice-chancellor, preſented by the archbiſhop of Mentz; and of 18 counſellors, nine of whom are proteſtants and nine catholics. They are divided into a bench of lawyers, and always follow the emperor's court; for which reaſon they are called *juſtitium imperatoris*, the emperor's juſtice, and aulic council. The aulic court ceaſes at the death of the emperor; whereas the imperial chamber of Spires is perpetual, repreſenting not only the deceaſed emperor, but the whole Germanic body, which is reputed never to die.

Aulic, in the Sorbonne and foreign univerſities, is an act which a young divine maintains upon being admitted a doctor in divinity. It begins by an harangue of the chancellor, addreſſed to the young doctor, after which he receives the cap, and preſides at the aulic, or diſputation.

AULNEGER. See Alnager.

AULOS, a Grecian long meaſure, the ſame with ſtadium.

AULPS, a town of France, in the department of Var, and late province of Provence, in the dioceſe of Trejus. Long. 6. 30. E. lat. 43. 40.

AUMBRY, a country-word denoting a cup-board.

AUME, a Dutch meaſure for Rheniſh wine, containing 40 Engliſh gallons.

AUNCEL-weight, an ancient kind of balance now out of uſe, being prohibited by ſeveral ſtatutes, on account of the many deceits practiſed by it. It conſiſted of ſcales hanging on hooks, faſtened at each end of a beam, which a man lifted up on his hand. In many parts of England, auncel-weight ſignifies meat ſold by the hand, without ſcales.

AUNE, a long meaſure uſed in France to meaſure cloths, ſtuffs, ribbons, &c. At Rouen, it is equal to one Engliſh ell; at Calais, to 1.52; at Lyons, to 1.061; and at Paris, to 0.95.

AUNIS, lately a ſmall territory of France, in Poitou, and now forming part of the department of Lower Charente.

AVOCADO, or Avigato, *Pear*. See Laurus.

AVOCATORIA, a mandate of the emperor of Germany, addreſſed to ſome prince, in order to ſtop his unlawful proceedings in any cauſe appealed to him.

AVOIDANCE, in the canon law, is when a benefice becomes void of an incumbent; which happens either in fact, as by the death of the perſon; or in law, as by ceſſion, deprivation, reſignation, &c. In the firſt of theſe caſes, the patron muſt take notice of the avoidance at his peril; but in avoidance by law, the ordinary is obliged to give notice to the patron, in order to prevent a lapſe.

AVOIRDUPOIS *Weight*, a weight uſed in England for weighing all the larger and coarſer ſorts of goods; as groceries, cheeſe, butter, fleſh, wool, ſalt, hops, &c. and all metals except gold and ſilver. Avoirdupois weight is thus divided, viz.

16 dr. or drams make		1 ounce, marked	*oz.*
16 oz.	- -	1 pound, -	*lb.*
112 lb.	- -	1 hundred weight,	*cwt.*
20 ewt.	- -	1 -	*ton.*

The Avoirdupois ounce is leſs than the Troy ounce, in the proportion of 700 to 768, but the Avoirdupois pound greater than the Troy pound in the proportion of 700 to 576:

for 1lb. Avoird. is = 7000 grains Troy,
but 1lb. Troy is = 5760 grains Troy,
alſo 1 oz. Avoird. is = 437½ grains Troy,
and 1 oz. Troy is = 480 grains Troy.

AVOSETTA, in ornithology. See RECURVIROSTRA.

AVOWEE, one who has a right to preſent to a benefice. He is thus called in contradiſtinction to thoſe who only have the lands to which the advowſon belongs for a term of years, or by virtue of intruſion or diſſeiſin.

AVOWRY, in law, is where a perſon diſtrained ſues out a replevin; for then the diſtrainer muſt vow, and juſtify his plea, which is called his *avowry*.

AURA, among phyſiologiſts, an airy exhalation or vapour. The word is Latin, derived from the Greek, αυρα, *gentle wind*.

AURACH, a town of Germany, in the S. part of Suabia, in the duchy of Wirtemberg. E. long. 9. 20. N. lat. 48. 25.

AURÆ, in mythology, a name given by the Romans to the nymphs of the air. They are moſtly to be found in the ancient paintings of ceilings; where they are repreſented as light and airy, generally with long robes and flying veils of ſome lively colour or other, and fluttering about in the rare and pleaſing element aſſigned to them. They are characteriſed as ſportive and happy in themſelves, and well-wiſhers to mankind.

AVRANCHES, an ancient town of France, in the department of the Channel, and late province of Normandy. Long. 1. 18. W. lat. 48. 41. N.

AURANTIUM, in botany. See CITRUS.

AURAY, a ſmall ſeaport town of France, in the department of Morbihan, and late province of Bretagne. W. long. 2. 25. N. lat. 47. 48.

AURELIA, in natural hiſtory, the ſame with what is more uſually called *chryſalis*, and ſometimes *nymph*. See CHRYSALIS.

AURENGABAD, a city in the Eaſt Indies, capital of the province of Balagate, in the dominions of the Great Mogul. E. long. 75. 30. N. lat. 19. 10.

AUREOLA, in its original ſignification, ſignifies a jewel, which is propoſed as a reward of victory in ſome public diſpute. Hence the Roman ſchoolmen applied it to denote the reward beſtowed on martyrs, virgins, and doctors, on account of their works of ſupererogation; and painters uſe it to ſignify the crown of glory with which they adorn the heads of ſaints, confeſſors, &c.

AUREUS, a Roman gold coin, equal in value to 25 denarii. According to Ainſworth, the aureus of the higher empire weighed near five pennyweights; and in the lower empire little more than half that weight. We learn from Suetonius, that it was cuſtomary to give aurei to the victors in the chariot-races.

AURICK, a city of Germany; in Eaſt Frieſland, in the circle of Weſtphalia. E. long. 6. 50. N. lat. 53. 28.

AURICLE, in anatomy, that part of the ear which is prominent from the head, called by many authors *auris externa*. AURICLES are likewiſe two muſcular bags ſituated at the baſis of the heart, and intended as diverticula for the blood during the diaſtole. See ANATOMY, P. 193.

AURICULA, in botany. See PRIMULA.

AURIFLAMMA, in the French hiſtory, properly denotes a flag or ſtandard belonging to the abbey of St. Dennis, ſuſpended over the tomb of that ſaint, which the religious, on occaſion of any war in defence of their lands or rights, took down, with great ceremony, and gave to their protector or advocate, to be borne at the head of their forces.

AURIFLAMMA is alſo ſometimes uſed to denote the chief flag or ſtandard in any army.

AURIGA, *the* WAGGONER, in aſtronomy, a conſtellation of the northern hemiſphere, conſiſting of 23 ſtars, according to Tycho; 40, according to Hevelius; and 68, in the Britannic catalogue.

AURILLAC, a town of France, in the department of Cantal, and late province of Auvergne, ſeated on a ſmall river called *Jordanne*. E. long. 2. 33. N. lat. 44. 55.

AURIPIGMENTUM, ORPIMENT, in natural hiſtory. See ORPIMENT.

AURISCALPIUM, an inſtrument to clean the ears, and for other operations in diſorders of that part.

AURORA, the morning twilight, or that faint light which appears in the morning when the ſun is within 18 degrees of the horizon.

AURORA, the goddeſs of the morning, according to the Pagan mythology. She was the daughter of Hyperion and Theia, according to Heſiod; but of Titan and Terra, according to others. It was under this name that the ancients deified the light which foreruns the riſing of the ſun above our hemiſphere. The poets repreſent her as riſing out of the ocean, in a chariot, with roſy fingers dropping gentle dew. Virgil deſcribes her aſcending in a flame-coloured chariot with four horſes.

AURORA, one of the New Hebrides iſlands in the South Sea, in which Mr. Foſter ſuppoſes the *Peak d'Etoile* mentioned by Mr. Bougainville to be ſituated. The iſland is inhabited; but none of its inhabitants came off to viſit Captain Cook. The country is woody, and the vegetation ſeemed to be exceſſively luxuriant. It is about 12 leagues long, but not above five miles broad in any part; lying nearly north and ſouth. The middle lies in S. lat. 15. 6. E. long. 168. 24.

AURORA BOREALIS, NORTHERN LIGHT, or *Streamers*; a kind of meteor appearing in the northern part of the heavens, moſtly in the winter ſeaſon, and in froſty weather. It is uſually of a reddiſh colour, inclining to yellow, and ſends out frequent coruſcations of pale light, which ſeem to riſe from the horizon in a pyramidal undulating form, and ſhooting with great velocity up to the zenith. It appears often in form of an arch, which is partly bright, and partly dark, but generally tranſparent. And the matter of it is not found to have any effect on the rays of light, which paſs freely through it. Dr. Hamilton obſerves, that he could plainly diſcern the ſmalleſt ſpeck in the Pleiades through the denſity of thoſe clouds which formed part of the aurora borealis in 1763, without the leaſt diminution of its ſplendour, or increaſe of twinkling. Sometimes it produces an iris; and hence M. Godin judges, that moſt of the extraordinary meteors and phænomena in the ſkies, related as prodigies by hiſtorians, as battles, and the like, may probably enough be reduced to the claſs of aurora borealis.

This kind of meteor never appears near the equator; but, it ſeems, is frequent enough towards the ſouth pole, like as towards the north, having been obſerved there by voyagers. See Philoſ. Tranſ. N° 461, and vol. 54; alſo Forſter's account of his voyage round the world with Captain Cook, where he deſcribes their appearance as obſerved for ſeveral nights together, in ſharp froſty weather, which was much the ſame as thoſe obſerved in the north, exceptſing that they were of a lighter colour. It ſeems that meteors of this kind have appeared ſometimes more frequently than others; whence it would ſeem, that the air, or earth, or both, are not at all times diſpoſed to produce this phænomenon.

The extent of theſe appearances is alſo amazingly great. That which occurred in March 1716 was viſible from the

W. of Ireland to the confines of Ruſſia and the E. of Poland; extending at leaſt near 30 degrees of long. and from about the 50th degree in lat. over almoſt all the N. of Europe; and in all places, at the ſame time, it exhibited the like wondrous appearances. Father Boſcovich has determined the height of an aurora borealis, which was obſerved by the Marquis of Polini the 16th of December 1737, and found it was 825 miles high; and Mr. Bergman, from a mean of 30 computations, makes the average height of the aurora borealis amount to 70 Swediſh, or 469 Engliſh miles. But Euler ſuppoſes the height to be ſeveral thouſands of miles; and Mairan alſo aſſigns to them a very elevated region.

Many attempts have been made to determine the cauſe of this phænomenon. Dr. Halley imagines that the watery vapours, or effluvia, exceedingly rarefied by ſubterraneous fire, and tinged with ſulphureous ſtreams, which many naturaliſts have ſuppoſed to be the cauſe of earthquakes, may alſo be the cauſe of this appearance: or that it is produced by a kind of ſubtile matter, freely pervading the pores of the earth, and which, entering into it nearer the ſouthern pole, paſſes out again with ſome force into the æther, at the ſame diſtance from the northern. This ſubtile matter, by becoming more denſe, or having its velocity increaſed, may perhaps be capable of producing a ſmall degree of light, after the manner of effluvia from electric bodies, which, by a ſtrong and quick friction, emit light in the dark; to which ſort of light this ſeems to have a great affinity. On this ſubject ſee Philoſ. Tranſ. N° 347; and alſo Mr. Cotes's deſcription of this phænomenon, and his method of explaining it, by ſtreams emitted from the heterogeneous and fermenting vapours of the atmoſphere, in Smith's Optics, p. 69.

The celebrated M. de Mairan, in an expreſs treatiſe on the Aurora Borealis, publiſhed in 1731, ſuppoſes its cauſe to be the zodiacal light, which, according to him, is no other than the ſun's atmoſphere: this light happening, on ſome occaſions, to meet the upper parts of our atmoſphere about the limits where univerſal gravity begins to act more forcibly towards the earth than towards the ſun, falls into our air to a greater or leſs depth, as its ſpecific gravity is greater or leſs, compared with the air through which it paſſes. However, M. Euler thinks the cauſe of the aurora borealis not owing to the zodiacal light, as M. de Mairan ſuppoſes; but to particles of our atmoſphere, driven beyond its limits by the impulſe of the ſolar light. And on this ſuppoſition he endeavours to account for the phænomena obſerved concerning this light. He ſuppoſes the zodiacal light, and the tails of comets, to be owing to a ſimilar cauſe.

But ever ſince the identity of lightning and the electric matter has been determined, philoſophers have been naturally led to ſeek for the explication of aërial meteors in the principles of electricity; and there is now no doubt but moſt of them, and eſpecially the aurora borealis, are electrical phænomena. Beſides the more obvious and known appearances which conſtitute a reſemblance between this meteor and the electric matter by which lightning is produced, it has been obſerved that the aurora occaſions a very ſenſible fluctuation in the magnetic needle; and that when it has extended lower than uſual in the atmoſphere, the flaſhes have been attended with various ſounds of rumbling and hiſſing, eſpecially in Ruſſia and the other more northern parts of Europe; as noticed by Sig. Beccaria and M. Meſſier. Mr. Canton, ſoon after he had obtained electricity from the clouds, offered a conjecture, that the aurora is occaſioned by the daſhing of electric fire poſitive towards negative clouds at a great diſtance, through the upper part of the atmoſphere, where the reſiſtance is leaſt: and he ſuppoſes that the aurora which happens at the time when the magnetic needle is diſturbed by the heat of the earth, is the electricity of the heated air above it: and this appears chiefly in the northern regions, as the alteration in the heat of the air in thoſe parts is the greateſt. Nor is this hypotheſis improbable, when it is conſidered, that electricity is the cauſe of thunder and lightning; that it has been extracted from the air at the time of the aurora borealis; that the inhabitants of the northern countries obſerve it remarkably ſtrong when a ſudden thaw ſucceeds very cold ſevere weather; and that the tourmalin is known to emit and abſorb the electric fluid only by the increaſe or diminution of its heat. Poſitive and negative electricity in the air, with a proper quantity of moiſture to ſerve as a conductor, will account for this and other meteors, ſometimes ſeen in a ſerene ſky. Mr. Canton has ſince contrived to exhibit this meteor by means of the Torricellian vacuum, in a glaſs tube about three feet long, and ſealed hermetically. When one end of the tube is held in the hand, and the other applied to the conductor, the whole tube will be illuminated from end to end, and will continue luminous without interruption for a conſiderable time after it has been removed from the conductor. If, after this, it be drawn through the hand either way, the light will be remarkably intenſe through the whole length of the tube. And though a great part of the electricity be diſcharged by this operation, it will ſtill flaſh at intervals, when held only at one extremity, and kept quite ſtill; but if, at the ſame time, it be graſped by the other hand in a different place, ſtrong flaſhes of light will dart from one end to the other; and theſe will continue 24 hours or more, without a freſh excitation. Sig. Beccaria conjectures that there is a conſtant and regular circulation of the electric fluid from north to ſouth; and he thinks that the aurora borealis may be this electric matter performing its circulation in ſuch a ſtate of the atmoſphere as renders it viſible, or approaching nearer than uſual to the earth. Though probably this is not the mode of its operation, as the meteor is obſerved in the ſouthern hemiſphere, with the ſame appearances as in the northern. Dr. Franklin ſuppoſes, that the electric fire diſcharged into the polar regions, from many leagues of vaporiſed air raiſed from the ocean between the tropics, accounts for the aurora borealis; and that it appears firſt, where it is firſt in motion, namely, in the moſt northern part; and the appearance proceeds ſouthward, though the fire really moves northward. Mr. Kirwan, in the Tranſactions of the Royal Iriſh Academy, ann. 1788, has alſo ſome ingenious remarks on the *auroræ borealis & auſtralis*. He gives his reaſons for ſuppoſing the rarefaction of the atmoſphere in the polar regions to proceed from them, and theſe from a combuſtion of inflammable air cauſed by electricity. He obſerves, that after an aurora borealis the barometer commonly falls, and high winds from the ſouth generally follow.

AURUM. See Gold, Chemistry, and Metallurgy. This metal was introduced into medicine by the Arabians, who eſteemed it one of the greateſt cordials, but it has juſtly loſt its reputation. A place, however, is given in ſome of the foreign pharmacopœias to the aurum fulminans; which has been recommended in ſome convulſive diſeaſes, particularly in the chorea ſancti viti.

Aurum *Fulminans*. See Chemistry.

Aurum *Muſivum*. See Chemistry.

AUSCH. See Auch.

AUSI, an ancient and very ſavage people of Libya. Herodotus tells us that they were unacquainted with marriage, and had all their women in common. The children were brought up by their mothers till they were able to walk: after which they were introduced to an aſſembly of the men, who met every three months; and the man to whom any child firſt ſpoke, acknowledged himſelf its father. They celebrated annually a feaſt in honour of Minerva, in which the girls, divided into two companies, fought with ſticks and ſtones, and thoſe

who died of their wounds were concluded not to have been virgins.

AUSITÆ, or ÆSITÆ, a tribe of ancient Arabs, ſuppoſed by Bochart to have inhabited the land of Uz mentioned in ſcripture.

AUSPEX, a name originally given to thoſe who were afterwards denominated *augurs*. In which ſenſe the word is ſuppoſed to be formed from *avis* bird, and *inſpicere* to inſpect; *auſpices*, q. d. *aviſpices*. Some will therefore have auſpices properly to denote thoſe who foretold future events from the flight of birds.

AUSPICIUM, AUSPICY, the ſame with augury.

AUSTER, one of the four cardinal winds, as Servius calls them, blowing from the ſouth.

AUSTERE, rough, aſtringent. Thus an auſtere taſte is ſuch a one as conſtringes the mouth and tongue; as that of unripe fruits, harſh wines, &c.

AUSTERITY, among moral writers, implies ſeverity and rigour. Thus we ſay, *Auſterity of manners*, *auſterities of the monaſtic life*, &c.

AUSTRAL, AUSTRALIS, the ſame with ſouthern. The word is derived from *auſter*, ſouth wind. Thus auſtral ſigns are the ſix laſt ſigns of the zodiac; ſo called becauſe they are on the ſouth ſide of the equinoctial.

AUSTRALIS PISCIS, the SOUTHERN FISH, is a conſtellation of the ſouthern hemiſphere, not viſible in our latitude; whoſe ſtars in Ptolemy's catalogue are 18, and in the Britannic catalogue 24.

AUSTRIA, one of the nine circles of the German empire, bounded on the W. by Swiſſerland; on the N. by Suabia, Bavaria, Bohemia, and Moravia: on the E. by Italy and Croatia. It contains the archduchy of Auſtria, the duchies of Styria, Carinthia, Carniola, and Goritia, the county of Tirol, and the biſhoprics of Brixen and Trent.

AUSTRIA, an archduchy, in the circle of the ſame name. The river Ens divides it into the Upper and Lower; Vienna is the capital of the Lower, and Lintz the capital of the Upper. Auſtria excels all the provinces of Germany in the fertility of its ſoil, the plenty of its paſtures, and the wholeſomeneſs of the air.

AUSTROMANCY, AUSTROMANTIA, properly denotes ſoothſaying, or a vain method of predicting futurity, from an obſervation of the winds.

AUTERFOITS ACQUIT. } See the artiele PLEA to *Indictment*.
AUTERFOITS *Attaint*.
AUTERFOITS *Convict*.

AUTHENTIC, ſomething of acknowledged and received authority. In law, it ſignifies ſomething clothed in all its formalities, and atteſted by perſons to whom credit has been regularly given. Thus we ſay, *authentic papers*, *authentic inſtruments*.

AUTHOR, properly ſignifies one who created or produced any thing. Thus God, by way of eminence, is called the *Author of nature*, the *Author of the univerſe*, &c. In matters of literature, it ſignifies a perſon who has compoſed ſome book or writing.

AUTHORITY, in a general ſenſe, ſignifies a right to command, and make one's ſelf obeyed. In which ſenſe we ſay, *the royal authority*, *the epiſcopal authority*, *the authority of a father*, &c. It denotes alſo the teſtimony of an author, ſome apophthegm or ſentence of an eminent perſon quoted in a diſcourſe by way of proof. *Authority* is repreſented, in painting, as a grave matron ſitting in a chair of ſtate, richly clothed in a garment embroidered with gold, holding in her right-hand a ſword, and in her left a ſceptre. By her ſide is a double trophy of books and arms.

AUTOCHTHONES, an appellation aſſumed by ſome nations, importing that they ſprang, or were produced, from the ſame ſoil which they ſtill inhabited. In this ſenſe, *Autochthones* amounts to the ſame with *Aborigines*. The Athenians valued themſelves on their being Autochthones, *ſelf-born*, or γηγενεις, *earth-born*; it being the prevailing opinion among the ancients, that, in the beginning, the earth, by ſome prolific power, produced men, as it ſtill does plants. The proper Autochthones were thoſe primitive men who had no other parent beſide the earth. But the name was alſo aſſumed by the deſcendants of theſe men, provided they never changed their ancient ſtate, nor ſuffered other nations to mix with them. In this ſenſe it was that the Greeks, and eſpecially the Athenians, pretended to be Autochthones; and as a badge thereof, wore a golden graſshopper woven in their hair, an inſect ſuppoſed to have the ſame origin.

AUTOCRATOR, a perſon veſted with an abſolute independent power, by which he is rendered unaccountable to any other for his actions. The power of the Athenian generals, or commanders, was uſually limited; ſo that, at the expiration of their office, they were liable to render an account of their adminiſtration. But, on ſome extraordinary occaſions, they were exempted from this reſtraint, and ſent with a full and uncontroulable authority: in which ſenſe they were ſtyled Αὐτοκράτορες. The ſame people alſo applied the name to ſome of their ambaſſadors, who were veſted with a full power of determining matters according to their own diſcretion. Theſe were denominated Πρέσβεις Αὐτοκράτορες, and reſembled our plenipotentiaries.

AUTO DA FE, act of faith. See ACT *of Faith*.

AUTODIDACTUS, a perſon ſelf-taught, or who has had no maſter or aſſiſtant of his ſtudies beſides himſelf.

AUTOGRAPH, denotes a perſon's hand-writing, or the original manuſcript of any book, &c.

AUTOLITHOTOMUS, he who cuts himſelf for the ſtone. Of this we have a very extraordinary inſtance given by Reiſelius, in the Ephemerides of the Academy *Naturæ Curioſorum*, dec. 1 an. 3. obſ. 192.

AUTOMATON, from αὐτὸς *ipſe*, and μάομαι *excitor*, a ſelf-moving machine, or one ſo conſtructed, by means of weights, levers, pullies, &c. as to move for a conſiderable time, as though endowed with animal life. According to this definition, clocks, watches, and all machines of that kind, are automata.

Under the article ANDROIDES we obſerved, that the higheſt perfection to which automata could be carried was to imitate exactly the motions and actions of living creatures, eſpecially of mankind, which are more difficultly imitated than thoſe of other animals. Very ſurpriſing imitations, however, have been made of other creatures. So long ago as 400 years before Chriſt, Archytas of Tarentum is ſaid to have made a wooden pigeon that could fly; nor will this appear at all incredible, when we conſider the flute-player made by M. Vaucanſon, and the cheſs player by M. Kempell. Dr. Hook is alſo ſaid to have made the model of a flying chariot, capable of ſupporting itſelf in the air. But M. Vaucanſon abovementioned diſtinguiſhed himſelf ſtill more eminently. That gentleman, encouraged by the favourable reception of his flute-player, made a duck, which was capable of eating, drinking, and imitating exactly the voice of a natural one. Nay, what is ſtill more ſurpriſing, the food it ſwallowed was evacuated in a digeſted ſtate; not that it was really in a ſtate of natural excrement, but only conſiderably altered from what it was when ſwallowed; and this digeſtion was performed on the principles of ſolution, not of trituration. The wings, viſcera, and bones, of this artificial duck, were alſo formed ſo as very ſtrongly to reſemble thoſe of a living animal. Even in the actions of eating and drinking, this reſemblance was preſerved;

the artificial duck ſwallowed with avidity and with quick motions of the head and throat; and likewiſe muddled the water with his bill, exactly like a natural one. M. Le Droz of La Chaux de Fonds in the county of Neufchatel, alſo executed ſome very curious pieces of mechaniſm, which well deſerve to be ranked with thoſe already mentioned. See ANDROIDES.

AUTONOMIA, a power of living or being governed by our own laws and magiſtrates. The liberty of the cities which lived under the faith and protection of the Romans, conſiſted in their autonomia, *i. e.* they were allowed to make their own laws, and elect their own magiſtrates; by whom juſtice was to be adminiſtered, and not by Roman preſidents or judges, as was done in other places which had not this privilege.

AUTOPYROS, from αὐτὸς, and πυρὸς *wheat*; in the ancient diet, an epithet given to a ſpecies of bread, wherein the whole ſubſtance of the wheat was retained without retrenching any part of the bran. Galen deſcribes it otherwiſe, viz. as bread where only the coarſer bran was taken out. And thus it was a medium between the fineſt bread, called *ſimilagineus*, and the coarſeſt called *furfuraceus*. This was alſo called *autopyrites* and *ſyncomiſtus*.

AUTUMN, the third ſeaſon of the year, when the harveſt and fruits are gathered in. Autumn is repreſented, in painting, by a man at perfect age, clothed like the vernal, and likewiſe girded with a ſtarry girdle; holding in one hand a pair of ſcales equally poiſed, with a globe in each; in the other hand, a bunch of divers fruits and grapes. His age denotes the perfection of this ſeaſon; and the balance, that ſign of the zodiac which the ſun enters when our autumn begins. Autumn begins on the day when the ſun's meridian diſtance from the zenith, being on the decreaſe, is a mean between the greateſt and the leaſt; which in theſe countries is ſuppoſed to happen when the ſun enters Libra. Its end coincides with the beginning of winter. Several nations have computed the years by autumns; the Engliſh Saxons, by winters. Tacitus tells us, the ancient Germans were acquainted with all the other ſeaſons of the year, but had no notion of autumn. Autumn has always been reputed an unhealthy ſeaſon, Tertullian calls it *tentator valitudinum*: and the ſatyriſt ſpeaks of it in the ſame light. *Autumnus Libitinæ queſtus acerbæ.*

AUTUMNAL POINT, is that part of the equinox from which the ſun begins to deſcend towards the ſouth pole.

AUTUMNAL *Signs*, in aſtronomy, are the ſigns Libra, Scorpio, Sagittarius, through which the ſun paſſes during the autumn.

AUTUMNAL *Equinox*, that time when the ſun enters the autumnal point.

AUTUN, an ancient town of France, the epiſcopal ſee of the department of Saone and Loire, in the late province of Burgundy; ſeated on the river Arroux, at the foot of three mountains. It contains a great number of Roman antiquities, and thoſe in better preſervation than in any other city of France; particularly the temples of Janus and Cybele. Autun is 45 miles E. by S. of Nevers, and 162 S. E. of Paris. Lon. 4. 23. E. Lat. 46. 57. N.

AUVERGNE, a late province of France, about 100 miles in length, and 75 in breadth. It is bounded on the N. by the Bourbonnois, on the E. by Forez and Velay, on the W. by Limoſin, Querci, and La Marche, and on the S. by Rouergue and the Cevennes. It now forms the two departments of Cantal and Puy-de-Dome.

AUVERNAS, a very deep-coloured heady wine, made of a black raiſin ſo called, which comes from Orleans. It is not fit to drink before it is above a year old; but if kept two or three years, it becomes excellent.

AUXERRE, an ancient town of France, in the department of Yonne, late an epiſcopal ſee of Burgundy, and ſeated on the river Yonne. Auxerre is 25 miles S. of Sens. Lon. 3. 39. E. Lat. 47. 48. N.

AUXESIS, in mythology, a goddeſs worſhipped by the inhabitants of Egina, and mentioned by Herodotus and Pauſanias.

AUXESIS, in rhetoric, a figure whereby any thing is magnified too much.

AUXILIARY VERBS, in grammar, are ſuch as help to form or conjugate others; that is, are prefixed to them, to form or denote the modes or tenſes thereof; as, *to have* and *to be*, in the Engliſh; *etre* and *avoir*, in the French; *ho* and *ſono* in the Italian, &c. In the Engliſh language, the auxiliary verb *am* ſupplies the want of paſſive verbs.

AUXONNE, a ſmall town of France, in the department of Côte d'Or, and late province of Burgundy, ſeated on the Saone. E. long. 5. 22. N. lat. 47. 11.

AUXY; the French give the name of *auxy wool* to that which is ſpun in the neighbourhood of Abbeville, by thoſe workmen who are called *loupiers*. It is a very fine and beautiful wool, which is commonly uſed to make the fineſt ſtockings.

AWARD, in law, the judgement of an arbitrator, or of one who is not appointed by the law a judge, but choſen by the parties themſelves for terminating their difference. See ARBITER and ARBITRATION.

AWL, among ſhoemakers, an inſtrument wherewith holes are bored through the leather, to facilitate the ſtitching or ſewing the ſame. The blade of the awl is uſually a little flat and bended, and the point ground to an acute angle.

AWLAN, a ſmall imperial town of Germany, in the circle of Suabia, ſeated on the river Kochen. E. long. 11. 15. N. lat. 48. 52.

AWME, or AUME, a Dutch liquid meaſure containing eight ſteckans, or 20 verges or verteels, equal to the tierce in England, or to one ſixth of a ton in France.

AWN, in botany. See ARISTA.

AWNING, in the ſea-language, is the hanging a ſail, tarpawling, or the like, over any part of the ſhip, to keep off the ſun, rain, or wind.

AX, a carpenter's inſtrument, ſerving to hew wood. The ax differs from the joiner's hatchet, in that it is made larger and heavier, as ſerving to hew large ſtuff; and its edge tapering into the middle of its blade. It is furniſhed with a long handle or helve, as being to be uſed with both hands.

Battle-Ax. See CELT.

AXAMENTA, in antiquity, a denomination given to the verſes or ſongs of the *ſalii*, which they ſung in honour of all men. The word is formed, according to ſome, from *axare*, q. d. *nominare*. Others will have the *carmina ſaliaria* to have been denominated *axamenta*, on account of their having been written in *axibus*, or on wooden tables. The *axamenta* were not compoſed, as ſome have aſſerted, but only ſung by the *ſalii*. The author of them was Numa Pompilius; and as the ſtyle might not be altered, they grew in time ſo obſcure, that the *ſalii* themſelves did not underſtand them. Varro ſays they were 700 years old. Quint. Inſt. Or. lib. i. c. 11.

AXAMENTA, or *Aſſamenta*, in ancient muſic, hymns or ſongs performed wholly with human voices.

AXAYACATL, the name of a ſpecies of fly, common in Mexico, about the Lake; the eggs of which being depoſited in immenſe quantities, upon the ruſhes and corn-flags, form large maſſes, which are taken up by fiſhermen and carried to market for ſale. This caviare, called *ahuauhtli*, which has much the ſame taſte with the caviare of fiſh, uſed to be ate by the Mexicans, and is now a common diſh among the Spaniards. The Mexicans eat not only the eggs, but the flies themſelves, made up together into a maſs, and prepared with ſaltpetre.

AXBRIDGE, a town of Somerſetſhire in England. W. long. 2. 20. N. lat. 51. 30.

AXEL, a ſmall fortified town in Dutch Flanders. E. long. 3. 40. N. lat. 51. 17.

AXHOLM, an iſland in the N. W. part of Lincolnſhire in England. It is formed by the rivers Trent, Idel, and Dan; and is about ten miles long and five broad.

AXIACE, an ancient town of Sarmatia Europea; now *Oczakow*, the capital of Budziac Tartary. E. long. 32. 30. N. lat. 46. 0.

AXILLA, in anatomy, that cavity under the upper part of the arm, called the arm-pit.

Axilla, in botany, is the ſpace comprehended between the ſtems of plants and their leaves. Hence we ſay thoſe flowers grow in the axillæ of the leaves; *i. e.* at the baſe of the leaves, or juſt within the angle of their pedicles.

AXILLARY, ſomething belonging to or lying near the axilla. Thus, *axillary artery* is that part of the ſubclavian branches of the aſcending trunk of the aorta which paſſes under the arm-pits; *axillary glands* are ſituated under the arm-pits, enveloped in fat, and lie cloſe by the axillary veſſels; and *axillary vein* is one of the ſubclavians which paſſes under the arm-pit, uniting itſelf from ſeveral branches, which are ſpread over the arm.

AXIM, a ſmall territory on the gold-coaſt in Africa. The capital, which is alſo called *Axim*, or by ſome *Achombone*, is ſituated in W. long. 24. 0. N. lat. 5. 0.

AXINOMANCY, Axinomantia, from *αξινη ſecuris*, and *μαντια divinatio*; an ancient ſpecies of divination, or a method of foretelling future events, by means of an ax or hatchet. —This art was in conſiderable repute among the ancients; and was performed, according to ſome, by laying an agate-ſtone on a red-hot hatchet; and alſo by fixing a hatchet on a round ſtake ſo as to be exactly poiſed; then the names of thoſe that were ſuſpected were repeated, and he at whoſe name the hatchet moved was pronounced guilty.

AXIOM, Axioma, from *αξιοω I am worthy*; a ſelf-evident truth, or a propoſition whoſe truth every perſon receives at firſt ſight. Thus, that the whole is greater than a part; that a thing cannot be and not be at the ſame time; and that from nothing, nothing can ariſe; are axioms.

Axiom is alſo an eſtabliſhed principle in ſome art or ſcience. Thus, it is an axiom in phyſics, that nature does nothing in vain; that effects are proportional to their cauſes, &c. So it is an axiom in geometry, that things equal to the ſame third are alſo equal to one another; that if to equal things you add equals, the ſums will be equal, &c. It is an axiom in optics, that the angle of incidence is equal to the angle of reflection, &c.

AXIS, in geometry, the ſtraight line in a plain figure, about which it revolves, to produce or generate a ſolid. Thus, if a ſemicircle be moved round its diameter at reſt, it will generate a ſphere, the axis of which is that diameter.

Axis, in aſtronomy, is an imaginary right line ſuppoſed to paſs through the centre of the earth and the heavenly bodies, about which they perform their diurnal revolutions.

Axis, in conic-ſections, a right line dividing the ſection into two equal parts, and cutting all its ordinates at right angles.

Axis, in mechanics. The axis of a balance is that line about which it moves, or rather turns about. *Axis of oſcillation*, is a right line parallel to the horizon, paſſing through the centre about which a pendulum vibrates. *Axis in peritrochio*, is one of the ſix mechanical powers, conſiſting of a peritrochium or wheel concentric with the baſe of a cylinder, and moveable together with it about its axis.

Axis, in optics, is that particular ray of light coming from any object which falls perpendicularly on the eye.

Axis, in architecture. *Spiral axis*, is the axis of a twiſted column drawn ſpirally in order to trace the circumvolutions without. *Axis of the Ionic capital*, is a line paſſing perpendicularly through the middle of the eye of the volute.

Axis *of a Veſſel*, is an imaginary right line paſſing through the middle of it perpendicularly to its baſe, and equally diſtant from its ſides.

Axis, in botany, is a taper column placed in the centre of ſome flowers or catkins, about which the other parts are diſpoſed.

Axis, in anatomy, the name of the ſecond vertebra of the neck: it has a proceſs or tooth which goes into the firſt vertebra, and this is by ſome called the *axis*.

AXMINSTER, a town of Devonſhire, ſituated on the river Ax, in the great road between London and Exeter, in W. long. 3. 25. N. lat. 50. 40.

AXOLOTI; a ſort of lizard. See Lacerta.

AXUNGIA, in a general ſenſe, denotes old lard, or the drieſt and hardeſt of any fat in the bodies of animals: but more properly it ſignifies only hog's lard.

Axungia *Vitri*, *Sandiver*, or *Fat of Glaſs*, a kind of ſalt which ſeparates from the glaſs while it is in fuſion. It is of an acrimonious and biting taſte. The farriers uſe it for cleanſing the eyes of horſes. It is alſo made uſe of for cleanſing the teeth; and it is ſometimes applied to languid ulcers, the herpes, or the itch, by way of deſiccative.

AXYRIS; a genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx of the male is tripartite; it has no corolla. The calyx of the female conſiſts of two leaves; it has two ſtyli and one ſeed. The ſpecies are four, none of them natives of Britain.

AYAMONTE, a ſea-port town of Andaluſia in Spain, ſeated on the river Gaudiana. W. long. 8. 5. N. lat. 37. 9.

AYENIA, in botany; a genus of the pentandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The calyx has two leaves; the petals are in the form of a ſtar, with long ungues; and the capſule has five cells. There are three ſpecies, all natives of the Weſt Indies.

AYLESBURY. See Ailesbury. This place gave title of Earl to the noble family of Bruce, now to a branch of the Brudenells by ſucceſſion.

AYRY, or Aery, *of Hawks*, a neſt or company of hawks; ſo called from the old French word *aire*, which ſignified the ſame.

AYTONIA, in botany; a genus of the monadelphia order, belonging to the pentandria claſs of plants; the characters of which are: the calyx is quinquepartite; the corolla conſiſts of four petals; the berry is dry, quadrangular, unilocular, and many-ſeeded. There is but one ſpecies, the capenſis, a native of the Cape, but of which we have not been able to find any particular deſcription.

AZAB, in the Turkiſh armies, a diſtinct body of ſoldiery, who are great rivals of the Janizaries.

AZALEA, American Upright Honeysuckle; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The corolla is bell-ſhaped; the ſtamina are inſerted into the receptacle; and the capſule has five cells. There are ſix ſpecies, of which the moſt remarkable are the following: 1. The viſcoſa, with a white flower, is a low ſhrub, ariſing with ſeveral ſtems to the height of two or three feet. The leaves come out in cluſters without any order at the end of the ſhoots, and their edges are ſet with very ſhort teeth which are rough. The flowers come out in cluſters between the leaves, have much the appearance of honeyſuckle, and are as well ſcented. 2. The nudiflora, or red American upright honeyſuckle, grows taller than the firſt; and in its native country will ſometimes arrive at the height of 12 feet, but in

Britain never riſes to above half that height. It hath ſeveral ſtems with oblong ſmooth leaves. The flower-ſtalks ariſe from the diviſion of the branches, which are long and naked, ſupporting a cluſter of red flowers: theſe are divided at the top into five equal ſegments which ſpread open. Another ſpecies with bright red flowers was found by Mr. Lightfoot upon the tops of many mountains in the Highlands of Scotland.—The firſt two ſpecies require a moiſt ſoil and a ſandy ſituation, and can only be propagated from ſlips, as they never produce good ſeeds in Britain. The autumn is the beſt time to remove plants, and their roots ought to be covered in winter. They are moſt beautiful plants, and well worth cultivating.

AZAMOR, a ſmall ſea-port town of the kingdom of Morocco in Africa. W. long. 7. 0. N. lat. 32. 50.

AZARAKITES, a ſect of Mahometan Arabs.

AZAZEL. This word relates to the authority of the ſcape-goat, under the Jewiſh religion. Some call the goat itſelf by this name, as St. Jerom and Theodoret. Dr. Spencer ſays, the ſcape-goat was to be ſent to Azazel; by which is meant the devil. Mr. le Clerc tranſlates it *præcipitium*, making it to be that ſteep and inacceſſible place to which the goat was ſent, and where it was ſuppoſed to periſh.

AZEM, Asem, Assam, or Acham, a country of Aſia to the north of Ava, but little known to Europeans. It is thought that the inhabitants of Azem were long ago the inventors of cannon and gun-powder; and that from them the invention paſſed to the inhabitants of Pegu, and from thence to the Chineſe.

AZIMUTH, in aſtronomy, an arch of the horizon, intercepted between the meridian of the place and the azimuth, or vertical circle paſſing through the centre of the object, which is equal to the angle of the zenith, formed by the meridian and vertical circle: or it is found by this proportion, As the radius to the tangent of the latitude of the place, ſo is the tangent of the ſun's or ſtar's altitude, for inſtance, to the coſine of the azimuth from the ſouth, at the time of the equinox.

Magnetical Azimuth, an arch of the horizon intercepted between the azimuth, or vertical circle, paſſing through the centre of any heavenly body and the magnetical meridian. This is found by obſerving the object with an azimuth compaſs.

Azimuth-*Compaſs*, an inſtrument for finding either the magnetical azimuth or amplitude of an heavenly object. See Compass.

Azimuth *Circles*, called alſo *azimuths*, or *vertical circles*, are great circles of the ſphere interſecting each other in the zenith and nadir, and cutting the horizon at right angles. Theſe azimuths are repreſented by the rhumbs on common ſea-charts; and on the globe they are repreſented by the quadrant of altitude, when ſcrewed in the zenith. On theſe azimuths is reckoned the height of the ſtars and of the ſun when not in the meridian.

AZMER, a town of the Eaſt Indies in the dominions of the Great Mogul, capital of a province of the ſame name; about 62 leagues diſtant from Agra.

AZOGA ships, are thoſe Spaniſh ſhips commonly called the *quickſilver ſhips*, from their carrying quickſilver to the Spaniſh Weſt Indies, in order to extract the ſilver out of the mines of Mexico and Peru. Theſe ſhips, ſtrictly ſpeaking, are not to carry any goods but on the king of Spain's account.

AZONI, in ancient mythology, a name applied by the Greeks to ſuch of the gods as were deities at large: not appropriated to the worſhip of any particular town or country; but acknowledged in general by all countries, and worſhipped by every nation. Theſe the Latins called *dii communes*. Of this ſort were the Sun, Mars, Luna, &c.

AZORES, iſlands in the Atlantic ocean, lying between 25 and 33 degrees of weſt longitude, and between 36 and 40 degrees of north latitude. They belong to the Portugueſe, and are alſo called the *weſtern iſles*, on account of their ſituation. They were diſcovered by the Flemings in the 15th century. They are ſeven in number, viz. Tercera, St. Michael's, St. Mary's, Graciosa, St. George's Iſland, Pico, and Fayal.

AZOTH, in ancient chemiſtry, the firſt matter of metals, or the mercury of a metal; more particularly that which they call the *mercury of philoſophers*, which they pretended to draw from all ſorts of metallic bodies.

AZOTUS, Azoth, or Ashdod, one of the five cities of the Philiſtines, and a celebrated ſea-port on the Mediterranean, ſituated about 14 or 15 miles S. of Ekron, between that and Aſcalan. The town is now called by the Arabs *Haſaneyun*.

AZURE, in a general ſenſe, the blue colour of the ſky. See Sky and Blue.

Azure, among painters, ſignifies in general a fine blue colour, but was formerly a term applied to *lapis lazuli*, called *azure ſtone*, and to the blue prepared from it. However, ſince a blue has been extracted from cobalt, cuſtom has applied to it the name of *azure*, although it differs conſiderably from the former, and is incapable of being uſed for the ſame purpoſes, and particularly for painting in oil. The former at preſent is called *lapis lazuli*; or only *lapis*; and the blue prepared from it for painting in oil, is called *ultramarine*. Blue glaſs made from the earth of cobalt and vitrifiable matters is alſo called *azure*. This glaſs, which is named *ſmalt* when in maſſes, is called *azure* only when reduced to a fine powder. Several kinds of azure are diſtinguiſhed, according to their degrees of beauty, by the names of *fine azure*, *powdered azure*, and *azure of four fires*. In general, the more intenſe the colour, and the finer the powder, the more beautiful and clear it is. Azure is employed to colour ſtarch; hence it has alſo been called *ſtarch blue*. It is uſed for painting in colours, and for a blue enamel alſo.

Azure, in heraldry, the blue colour in the arms of any perſon below the rank of a baron. In the eſcutcheon of a nobleman, it is called *ſapphire*; and in that of a ſovereign prince, *Jupiter*. In engraving, this colour is expreſſed by lines or ſtrokes drawn horizontally.

AZYGOS, in anatomy, a vein riſing with the thorax, on the right ſide, having no fellow on the left; whence it is called *azygos*, or *vena ſine pari*.

AZYMITES, in church-hiſtory, Chriſtians who adminiſter the euchariſt with unleavened bread. The word is formed from the Greek α priv. and ζυμη *ferment*. This appellation is given to the Latin by the Greek church, becauſe the members of the former uſe fermented bread in the celebration of the euchariſt. They alſo call the Armenians and Maronites by the ſame name, and for the ſame reaſon.

AZYMOUS, unfermented, or made without leaven; as unleavened bread. Sea-biſket is of this kind.

B.

B A A

B, THE ſecond letter of the Engliſh and moſt other alphabets. It is the firſt conſonant, and firſt mute, and its pronunciation is ſuppoſed to reſemble the bleating of a ſheep. B is alſo one of thoſe letters which are called *labial*, becauſe the principal organs employed in its pronunciation are the lips. It is pronounced by preſſing the whole length of them together, and forcing them open with a ſtrong breath. It has a near affinity with the other labials P and V, and is often uſed for P both by the Armenians and other orientals, as in *Betrus* for *Petrus*, *apſens* for *abſens*, &c.; and by the Romans for V, as in *amabit* for *amavit*, *berna* for *verna*, &c. whence aroſe that jeſt of Aurelian on the emperor Bonoſus, *Non ut vivat natus eſt, ſed ut bibat.*

Plutarch obſerves, that the Macedonians changed φ into B, and pronounced *Bilip*, *Berenice*, &c. for *Philip*, *Pherenice*, &c.; and thoſe of Delphos uſed B inſtead of Π, Βαθειν for παθειν, βιχρον for πικρον, &c. The Latins ſaid *ſuppono*, *oppono*, for *ſubpono*, *obpono*; and pronounced *optinuit*, though they wrote *obtinuit*, as Quintilian has obſerved. They alſo uſed B for F or PH: thus, in an ancient inſcription mentioned by Gruter, OBRENDARIO is uſed for OFRENDARIO.

As a numeral, B was uſed by the Greeks and Hebrews to denote 2; but among the Romans for 300, and with a daſh over it (thus $\overline{B}$, for 3000.

B is alſo uſed as an abbreviation. Thus B. A. ſtands for bachelor of arts; B. L. for bachelor of laws; and B. D. for bachelor of divinity. B. F. in the preface to the decrees or ſenatus conſulta of the old Romans ſignified *bonum factum*. In muſic, B ſtands for the tone above A; as B♭, or ♭B, does for B flat, or the ſemi-tone major above A. B. alſo ſtands for baſs; and B. C. for *baſſo continuo*, or thorough baſs.

BAAL, the ſame as BEL, or BELUS; an idol of the Chaldeans, and Phœnicians, or Canaanites. The former worſhipped Mars under this name, according to Joſephus; who, ſpeaking of Thurus the ſucceſſor of Ninus, ſays, "To this Mars the Aſſyrians erected the firſt ſtatue, and worſhipped him as a god, calling him *Baal*." It is probable the Phœnicians worſhipped the Sun under the name of Baal; for Joſiah, willing to make ſome amends for the wickedneſs of Manaſſeh, in worſhipping Baal, and all the hoſt of heaven, *put to death the idolatrous prieſts that burnt incenſe unto Baal.* The temples conſecrated to this god, are called in the Scripture *Chamanim*, which ſignifies *places incloſed with walls* in which was kept a perpetual fire. The word *baal*, in the Punic language, ſignifies *lord* or *maſter*; and doubtleſs meant the Supreme Deity, the Lord and Maſter of the univerſe. It is often joined with the name of ſome falſe god, as *Baal-berith*, *Baal-peor*, *Baal-zephon*, &c.

BAAL-BERITH, the god of the Shechemites. Bochart conjectures, that Berith is the ſame as *Beroe*, the daughter of Venus and Adonis, who was given in marriage to Bacchus; and that ſhe gave her name to the city of Berith in Phœnicia, and became afterwards the goddeſs of it. Baal-berith ſignifies *Lord of the Covenant*, and may be taken for the god who preſides over alliances and oaths, in like manner as the Greeks had their Ζευς ορκιος, and the Romans their *Deus Fidius*, or *Jupiter Piſtius*. The idolatrous Iſraelites, we are told, *made Baal-berith their god*, Judg. viii. 33.

B A B

BAAL-PEOR, *Baal-phegor*, or *Beel-phegor*, an idol of the Moabites and Midianites. We are told, that *Iſrael joined himſelf to Baal-peor*; and that Solomon erected an altar to this idol upon the mount of Olives. Baal-peor has been ſuppoſed to be no other than a Priapus, and that the worſhip of him conſiſted in the moſt obſcene practices. Others have thought, that, as Baal is a general name ſignifying *Lord*, Peor may be the name of ſome great prince deified after his death.

BAAL-ZEBUB, *Beel-zebub*, or *Belzebub*; the idol, or god of the Ekronites. In Scripture he is called the *Prince of Devils*. His name is rendered the *Lord of Flies*, or the *God-fly*; which ſome think was a mock appellation beſtowed on him by the Jews. He had a famous temple and oracle at Ekron. The worſhip of this falſe god muſt have prevailed in our Saviour's time, ſince the Jews accuſed him of driving out devils in the name of *Belzebub* their prince. Scaliger derives the name of this deity from *Baalim-zebahim*, which ſignifies the *Lord of ſacrifices*.

BABBLING, among hunters, is when the hounds are too buſy after they have found a good ſcent.

BABEL, a city and tower undertaken, as the holy ſcriptures relate, to be built by the whole human race ſoon after the flood, and remarkable for the miraculous fruſtration of the attempt by the confuſion of languages. Moſt authors are of opinion that it was ſituated exactly in the place where the celebrated city of Babylon afterwards ſtood. Authors have been much divided about the motive by which the whole race of mankind were induced to join as one man in ſuch an undertaking. Oriental writers ſay, that the city was 313 fathoms in length, and 151 in breadth; that the walls were 5533 fathoms high, and 33 in breadth; and that the tower itſelf was no leſs than 10,000 fathoms, or 12 miles high.

BABEL MANDEL, the GATE OF MOURNING; a famous ſtrait in the Indian ocean, between the coaſt of Arabia Felix in Aſia, and that of Adel and Zeila in Africa, at the entrance into the Red Sea. By ſome it is alſo called the *Straits of Moka*. E. long. 44. 30. N. lat. 12. 40.

BABENHAUSEN, a town of Germany in Suabia. E. long. 9. 16. N. lat. 48. 39.

BABINA (*Commonwealth of*), a ſociety ludicrouſly ſo called, which was founded in Poland in the reign of Sigiſmund Auguſtus, in the 16th century. It took its riſe from a ſet of gentlemen, inhabitants of Lublin, who had agreed to meet at a place called *Babina*, merely for the purpoſes of mirth and jollity. They rendered vice and folly ridiculous, by a ſham promotion of certain perſons to mock dignities and appointments under a fictitious commonwealth or government. Never did any inſtitution of this nature become ſo general or ſo uſeful; but at length the ſociety degenerated into a ſet of buffoons, and banterers of every thing ſacred or profane. For ſeveral years it was patroniſed by the kings of Poland, and Sigiſmund himſelf became a member; the ſtaroſta of Babina telling him jocularly, that "His majeſty had certain qualities which intitled him to the firſt dignity in the commonwealth." Not the leaſt remnant of the ſociety now exiſts, though it was honoured with extraordinary privileges by kings and emperors.

BABOON, in zoology. See SIMIA.

BABYLON, the capital of the ancient kingdom of Babylonia or Chaldæa, and ſuppoſed to have ſtood in E. long. 44. 0. N. lat. 32. 0. Semiramis is ſaid by ſome, and Belus by others, to have founded this city. Yet, by whomſoever it was founded, Nebuchadnezzar was the perſon who put the laſt hand to it, and made it one of the wonders of the world. Yet it plainly appears, that this city was never wholly inhabited. It never had time to grow up to what Nebuchadnezzar viſibly intended to have made it; for, Cyrus removing the ſeat of the empire ſoon after to Shuſhan, Babylon fell by degrees to utter decay. Many of the moderns, indeed, are of opinion that the extravagant deſcriptions given of Babylon by ancient writers are very far from being true; although it is certain that few other arguments can be brought againſt the reality of them, than that we do not ſee things of a ſimilar kind executed in our own days.

Babylon, a town of Egypt near the caſtmoſt branch of the river Nile, now ſuppoſed to be *Grand Cairo*. E. long. 31. 12. N. lat. 30. 5.

BABYLONIA, or Chaldæa, a kingdom of Aſia, and the moſt ancient in the world, being founded by Nimrod the grandſon of Ham, who alſo, according to the margin of our bibles, founded Nineveh the capital of the kingdom of Aſſyria. Nothing certain is known concerning either of theſe, except what may be gathered from ſcripture.

BABYLONIAN, Babylonius, is uſed in ſome anciént writers for an aſtrologer, or any thing relating to aſtrology. Hence *Babylonia cura*, the art of caſting nativities; and *numeri Babylonii*, the computation of aſtrologers.

BABYLONICA texta, a rich ſort of weavings, or hangings, denominated from the city Babylon, where the practice of interweaving divers colours in their hangings firſt obtained. Hence alſo Babylonic garments, Babylonic ſkins, Babylonic carpets, houſings, &c. *Babylonica ſolana*, coverings laid over couches, &c. painted with gold, purple, and other colours.

BABYLONICS, babylonica, in natural hiſtory, a fragment of the ancient hiſtory of the world, ending at 267 years before Chriſt; and compoſed by Beroſus, or Beroſſus, a prieſt of Babylon, about the time of Alexander. Babylonics are ſometimes alſo cited in ancient writers by the title of *Caldaics*. The babylonics were very conſonant with ſcripture, as Joſephus and the ancient Chriſtian chronologers aſſert; whence the author is uſually ſuppoſed to have conſulted the Jewiſh writers. Beroſus ſpeaks of an univerſal deluge, an ark, &c. He reckons ten generations between the firſt man and the deluge, and marks the duration of the ſeveral generations by *ſaroi*, or periods of 223 lunar months; which reduced to years, differ not much from the chronology of Moſes. The babylonics conſiſted of three books, including the hiſtory of the ancient Babylonians, Medes, &c. But only a few imperfect extracts are now remaining of the work; preſerved chiefly by Joſephus and Syncellus, where all the paſſages of citations of ancient authors out of Beroſus are collected with great exactneſs. Annius of Viterbo, to ſupply the loſs, forged a complete Beroſus out of his own head. The world has not thanked him for the impoſture.

BABYROUSSA, in zoology, a ſynonime of a ſpecies of ſus. See Sus.

BAC, in navigation, is uſed for a praam, or ferry-boat.

Bac, or *Back*, in brewing, a large flat kind of tub, or veſſel, wherein the wort is put to ſtand and cool before boiling. The ingredients of beer paſs through three kinds of veſſels. They are maſhed in one, worked in another, and cooled in a third called a *back*, or *cooler*.

Bac, in diſtillery, a veſſel into which the liquor to be fermented is pumped from the cooler, in order to be worked with yeaſt.

Bac-*Maker*, is one who makes liquor-bacs, under-bacs, coolers, maſh-tuns, working-tuns, &c. for the brewers. The workmanſhip is partly carpentry, in a particular manner, for it muſt be tight enough to hold liquor; and partly cooperage, *viz.* the maſh-tun, or vat, which is hooped.

BACA, or Baza, a town of Spain in the kingdom of Granada. W. long. 3. 6. N. lat. 37. 18.

BACAIM, a handſome ſea-port town of the kingdom of Viſapour on the Malabar coaſt in Aſia; ſubject to the Portugueſe. E. long. 73. 10. N. lat. 19. 0.

BACASERAY, a town in the peninſula of Crim Tartary, where the late khans uſually reſided. E. long. 35. 10. N. lat. 45. 30.

BACCA, berry, in botany, is uſed to ſignify ſuch fruits as conſiſt of a pericarpium full of juice and ſeeds, without any valves.

BACANTIBI, in eccleſiaſtical antiquity, wandering clerks, who ſtrolled from church to church. The word ſeems formed by corruption from *vacantivi*.

BACCALARIA, in middle-age writers, denotes a kind of country-farms, conſiſting of ſeveral manſes. *Baccalaria dominizaria*, or *indominicata*, was more particularly uſed for a farm belonging to the lord, and kept in his own hands.

BACCARACH, a town of Germany in the Lower Palatinate, ſituated on the Rhine, in E. long. 7. 5. N. lat. 49. 57.

BACCHÆ, in antiquity, the prieſteſſes of Bacchus, who celebrated the *orgia*, or myſteries of that god. The word was alſo uſed for the ivy crowns or garlands worn by the prieſts of Bacchus, in offering ſacrifices to him.

BACCHANALIA, feaſts celebrated in honour of Bacchus by the ancients. The two moſt remarkable were called the *greater* and *leſſer*. The latter, called *lenæa*, from a word ſignifying a *wine-preſs*, were held in the open fields about autumn; the greater, called *Dionyſia*, from one of the names of Bacchus, were celebrated in the city about the ſpring-time. Both theſe feaſts were accompanied with games, ſpectacles, and theatrical repreſentations; and it was at this time the poets contended for the prize of poetry. Thoſe who were initiated into the celebration of theſe feaſts, repreſented, ſome Silenus; others, Pan; others, Satyrs; and in this manner appeared in public, night and day, counterfeiting drunkenneſs, dancing obſcenely, and committing without reſerve, all kinds of licentiouſneſs and debauchery.

BACCHARIS, PLOUGHMAN'S SPIKENARD; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The characters are theſe: It has a naked receptacle, and hairy pappus; with a cylindrical imbricated calyx, and feminine florets mixed with the hermiphrodite ones. There are ſeven ſpecies, all natives of warm climates; but none of them merit notice except the two following. 1. The ivæfolia, or African tree-groundſel, a native of the Cape of Good Hope, as alſo of Peru and other warm parts of America. It grows to the height of five or ſix feet; and though there is little beauty in the flower, has been long admitted into the gardens of the curious. It is pretty hardy, and will live abroad in moderate winters in England, but is uſually kept in green-houſes, and placed abroad only in ſummer. It may be propagated either by cuttings or by ſeeds, which ripen well in this country. 2. The halimifolia, or Virginia groundſel-tree, is a native of Virginia and other parts of North America. It grows about ſeven or eight feet high, with a crooked ſhrubby ſtem, and flowers in October: the flowers are white, and not very beautiful; but the leaves continuing green, has occaſioned this ſhrub to be admitted into many curious gardens. It may be propagated by cuttings; and will live very well in the open air, though ſevere froſt will ſometimes deſtroy it.

BACCHI, in mechanics, a kind of ancient machines, in form of goats, uſed by Jupiter, in his wars againſt the giants. Rudbeck deſcribes two kinds of bacchi, one made like the battering ram, wherewith Jupiter demoliſhed the enemy's fortifications; the others contrived to caſt fire out of, from whence the Greeks are conjectured to have framed their idea of *chimera*.

BACCHIC, ſomething relating to the ceremonies of Bacchus. The celebrated *intaglio*, called Michael Angelo's ring, is a repreſentation of a bacchic feaſt.

Bacchic *Song*, is ſometimes uſed for a *chanſon à boire*, or compoſition to inſpire jollity. But in a more proper ſenſe, it is reſtrained to a dithyrambic ode or hymn.

BACCHIUS, in ancient poetry, a kind of foot compoſed of a ſhort ſyllable and two long ones; as the word ăvārī. It takes its name from the god Bacchus, becauſe it frequently entered into the hymns compoſed in honour of him. The Romans called it likewiſe *æquirius*, *tripodius*, *ſaltans*.

BACCHUS, in heathen mythology, the god of wine, with whoſe fabulous adventures every ſchool boy is acquainted.

BACHELOR, or Batchelor, a common term for a man not married, or who is yet in a ſtate of celibacy. The Roman cenſors frequently impoſed fines on old bachelors. Dion of Halicarnaſſus mentions an old conſtitution, by which all perſons of full age were obliged to marry. But the moſt celebrated law of this kind was that made under Auguſtus, called the *Lex Julia de maritandis ordinibus*; by which bachelors were made incapable of legacies or inheritances by will, unleſs from their near relations. This brought many to marry, according to Plutarch's obſervation, not ſo much for the ſake of raiſing heirs to their own eſtates, as to make themſelves capable of inheriting thoſe of other men. The rabbins maintain, that by the laws of Moſes, every body ſhould marry at 20, and this makes one of their 613 precepts. Hence thoſe maxims ſo frequent among their caſuiſts, that he who does not take the neceſſary meaſures to leave heirs behind him, is not a man, but ought to be reputed a homicide. Lycurgus was not more favourable; for by his laws bachelors are branded with infamy, excluded from all offices civil and military, and even from the ſhows and public ſports. But the Chriſtian religion is more indulgent to the bachelor ſtate: for the ancient church recommended it as in ſome circumſtances preferable to, and more perfect than, the matrimonial. In the canon law, we find injunctions on bachelors, when arrived at puberty, either to marry or turn monks and profeſs chaſtity in earneſt. In England, there was a tax on bachelors, after 25 years of age, 12l. 10s. for a duke, a common perſon 1s. by 7 Will. III. 1695. In Britain, at preſent, they are taxed by a double duty on their male ſervants. Thus every man of the age of 21 years and upwards, never having been married, who ſhall keep one male ſervant or more, ſhall pay 1l. 5s. for each, above or in addition to the ordinary duties leviable for servants.

Bachelor was anciently a denomination given to thoſe who had attained to knighthood, but had not a number of vaſſals ſufficient to have their banner carried before them in the field of battle; or, if they were of the order of Bannerets, were not of age to diſplay their own banner, but obliged to march to battle under another's banner. It was alſo a title given to young cavaliers, who, having made their firſt campaign, received the military girdle accordingly. And it ſerved to denominate him who had overcome another in a tournament the firſt time he ever engaged. The word *bachelor*, in a military ſenſe, is derived by Cujas from *buccelarius*, a kind of cavalry, anciently in great eſteem. Du Cange deduces it from *baccalaria*, a kind of fees or farms, conſiſting of ſeveral pieces of ground, each whereof contained 12 acres, or as much as two oxen would plough; the poſſeſſors of which baccalaria were called *bachelors*. Caſeneuve and Altaſerra derive bachelor from *baculus* or *bacillus*, a ſtaff, becauſe the young cavaliers exerciſed themſelves in fighting with ſtaves. Martinius derives it from *baccalaureus*, i. e. *bacca laurea donatus*, in alluſion to the ancient cuſtom of crowning poets with laurel, *baccis lauri*, as was the caſe with Petrarch at Rome in 1341. Alciat and Vives are of the ſame opinion: nor is this etymology improbable.

Knights-Bachelors, the moſt ancient, but the loweſt order of knights in England; known by the name of *knights* only. Some ſay, they are ſtyled *knights-bachelors*, either as denoting their degree, *quaſi bas chevaliers*; or, according to others, becauſe this title does not deſcend to their poſterity. The cuſtom of the ancient Germans was to give their young men a ſhield and a lance in the great council: this was equivalent to the *toga virilis* of the Romans. Before this, they were not permitted to bear arms, but were accounted as part of the father's houſehold; after it, as part of the public. Hence ſome derive the uſage of knighting, which has prevailed all over the weſtern world, ſince its reduction by colonies, from thoſe northern heroes. Knights are called in Latin *equites aurati: aurati*, from the gilt ſpurs they wore; and *equites*, becauſe they always ſerved on horſeback: for it is obſervable, that almoſt all nations call their knights by ſome appellation derived from an horſe. They are alſo called in our law *milites*, becauſe they formed a part, or indeed the whole, of the royal army, in virtue of their feodal tenures; one condition of which was, that every one who held a knight's fee, which in Henry II.'s time amounted to 20l. *per annum*, was obliged to be knighted, and attend the king in his wars, or pay a fine for his non-compliance. The exertion of this prerogative, as an expedient to raiſe money in the reign of Charles I. gave great offence, though warranted by law and the recent example of Queen Elizabeth. At the Reſtoration, it was, together with all other military branches of the feodal law, aboliſhed: and it now only exiſts as an honorary title; though, on account of its indiſcriminate attainment, not very generally regarded.

Bachelors, in an univerſity ſenſe, are perſons that have attained to the baccalaureate, or who have taken the firſt degree in the liberal arts and ſciences. The degree of bachelor was firſt introduced in the 13th century by Pope Gregory IX. but it remains ſtill unknown in Italy. At Oxford, before a perſon is entitled to the degree of *bachelor of arts*, he muſt have ſtudied there four years; three years more to become maſter of arts; and ſeven more to commence bachelor of divinity. At Cambridge, to commence bachelor of arts, he muſt have been admitted near four years; and above three years more before he commence maſter; and ſeven more ſtill to become bachelor of divinity. He may commence bachelor of law after having ſtudied it ſix years. We alſo find mention made of bachelors of the church, *baccalarii eccleſiæ*: and of the biſhop with his canons and *baccalaria, cum conſilio et conſenſu omnium canonicorum ſuorum et baccalariorum*.

Bachelors, in the livery companies of London, are thoſe not yet admitted to the livery. Theſe companies generally conſiſt of a maſter, two wardens, the livery, and the *bachelors*, who are yet but in expectation of dignity in the company, and have their function only in attendance on the maſter and wardens. They are alſo called *yeomen*.

BACHERAC, a town of the Palatine of the Rhine, ſituated on the weſtern ſhore of that river, in E. long. 7°. and N. lat. 58°.

BACHIAN, one of the Molucca iſlands, belonging to the Dutch; ſituated under the equator. E. lon. 125°.

BACHU, a city of Shirvan in Perſia, and the beſt haven in the Caſpian Sea. E. long. 49. 5. N. lat. 40. 0.

BACK, Back-*Bone*, or Spine. See Anatomy.

Back, in the manege, and among farriers. A horſe's back

ſhould be ſtraight, not hollow, which is called *ſaddle-backed*: horſes of this kind are generally light, and carry their heads high, but are deficient in ſtrength and ſervice. A horſe with a weak back is apt to ſtumble. In the French riding-ſchools, to mount a horſe *a dos*, is to mount him bare backed, without a ſaddle.

Back-*Gammon*, an ingenious game played with dice, upon a table, by two perſons.

Manner of playing the game. The table is divided into two parts, upon which there are 24 black and white ſpaces, called points. Each adverſary has 15 men, black and white, to diſtinguiſh them; and they are diſpoſed of in the following manner. Suppoſing the game to be played into the right-hand table, two are placed upon the ace point in the adverſary's table, five upon the ſix point in the oppoſite table, three upon the cinque point in the hithermoſt table, and five on the ſix point in the right-hand table. The grand object in this game is for each player to bring the men round into his right-hand table, by throwing with a pair of dice thoſe throws that contribute towards it, and at the ſame time prevent the adverſary doing the like. The firſt beſt throw upon the dice is eſteemed aces, becauſe it ſtops the ſix point in the outer table, and ſecures the cinque in the thrower's table; whereby the adverſary's two men upon the thrower's ace point cannot get out with either quatre, cinque, or ſix. This throw is an advantage often given to the antagoniſt by the ſuperior player.

When he carries his men home in order to loſe no point, he is to carry the moſt diſtant man to his adverſary's bar point, that being the firſt ſtage he is to place it on; the next ſtage is ſix points farther, viz. in the place where the adverſary's five men are firſt placed out of his tables. He muſt go on in this method till all his men are brought home, except two, when by loſing a point, he may often ſave the gammon, by throwing two fours or two fives.

When a hit is only played for, he ſhould endeavour to gain either his own or adverſary's cinque point: and if that fails by his being hit by the adverſary, and he finds him forwarder than himſelf, in that caſe he muſt throw more men into the adverſary's tables; which is done in this manner: He muſt put a man upon his cinque or bar point; and if the adverſary fails to hit it, he may then gain a forward game inſtead of a back game: but if the adverſary hits him, he ſhould play for a back game; and then the greater number of men which are taken up makes his game the better, becauſe by theſe means he will preſerve his game at home: and then he ſhould endeavour to gain both his adverſary's ace and trois points, or his ace and deuce points, and take care to keep three men upon the adverſary's ace point, that in caſe he hits him from thence, that point may remain ſtill ſecure to himſelf.

A back game ſhould not be played for at the beginning of a ſet, becauſe it would be a great diſadvantage, the player running the riſk of a gammon to win a ſingle hit. A variety of inſtructions with regard to this curious game, are given by Mr. Hoyle, who calculates the odds of the game with great accuracy. The following particulars, however, may be of uſe to the generality of players.

Directions for the player to bear his men. If a player has taken up two of the adverſary's men, and happens to have two, three, or more points made in his own tables, he ſhould ſpread his men, that he either may take a new point in his tables, or be ready to hit the man which the adverſary may happen to enter. If he finds, upon the adverſary's entering, that the game is upon a par, or that the advantage is on his own ſide, he ſhould take the adverſary's man up whenever he can, it being 25 to 11 that he is not hit: except when he is playing for a ſingle hit only; then, if playing the throw otherwiſe gives him a better chance for it, he ought to do it.

It being five to one againſt his being hit with double dice, he ſhould never be deterred from taking up any one man of the adverſary's.

If he has taken up one of the adverſary's men, and ſhould happen to have five points in his own tables, and forced to leave a blot out of his tables, he ſhould endeavour to leave it upon doublets preferable to any other chance, becauſe in that caſe the odds are 35 to one that he is not hit; whereas it is only 17 to one but he is hit upon any other chance.

When the adverſary is very forward, a player ſhould never move a man from his own quatre, trois, or deuce points, thinking to bear that man from the point where he put it, as nothing but high doublets can give him any chance for the hit. Inſtead of playing an ace or a deuce from any of thoſe points, he ſhould play them from his own ſize or higheſt points, ſo that throwing two fives, or two fours, his ſize and cinque points being eaſed, would be a conſiderable advantage to him; whereas had they been loaded, he muſt have been obliged to play otherwiſe.

It is the intereſt of the adverſary to take up the player as ſoon as he enters. The blot ſhould be left upon the adverſary's loweſt point; that is to ſay, upon his deuce point rather than upon his trois point; or upon his trois point rather than his quatre point; or upon his quatre point preferable to his cinque point, for a reaſon before mentioned; all the men the adverſary plays upon his trois, or his deuce points, are deemed loſt, being greatly out of play; ſo that thoſe men not having it in their power to make his cinque point, and his game being crowded in one place and open in another, the adverſary muſt be greatly annoyed by the player.

If the player has two of the adverſary's men in his tables, he has a better chance for a hit than if he had more, provided his game is forwarder than that of his antagoniſt; for if he had three or more of the adverſary's men in his tables, he would ſtand a worſe chance to be hit.

When a player is running to ſave the gammon, if he ſhould have two men upon his ace point, and ſeveral men abroad, although he ſhould loſe one point or two in putting his men into his tables, it is his intereſt to leave a man upon the adverſary's ace point, becauſe it will prevent his adverſary from bearing his men to the greateſt advantage, and at the ſame time the player will have a chance of the adverſary's making a blot, which he may chance to hit. However, if a player finds, upon a throw, that he has a probability of ſaving his gammon, he ſhould never wait for a blot, as the odds are greatly againſt his hitting it, but ſhould embrace that opportunity.

How to calculate the odds of ſaving or winning the gammon. Suppoſe the adverſary has ſo many men abroad as require three throws to put them into his tables, and at the ſame time that the player's tables are made up, and that he has taken up one of the adverſary's men; in this caſe, it is about an equal wager that the adverſary is gammoned. For in all probability the player has borne two men before he opens his tables, and when he bears the third man, he will be obliged to open his ſize or cinque point. It is then probable, that the adverſary is obliged to throw twice before he enters his men in the player's tables, twice more before he puts that man into his own tables, and three throws more to put the men which are abroad into his own tables, in all ſeven throws. Now the player having 12 men to bear, he may be forced to make an ace or a deuce twice before he can bear all his men, and conſequently will require ſeven throws in bearing them; ſo that, upon the whole, it is about equal whether the adverſary is gammoned or not.

Suppoſe a player has three men upon his adverſary's ace point and five points in his own tables, and that the adverſary has all his men in his tables, three upon each of his five higheſt

points. Has the player a probability of gammoning his adverſary or not?

	Points
For bearing three men from his 6th point is	18
From his 5th point	15
From his 4th point	12
From his 3d point	6
From his 2d point	9
In all	60
Bringing his three men from the adverſary's ace point to his ſize point in his own tables, being 18 points each, and making together	54
There muſt remain	6

It is plain from this calculation, that the player has much the beſt of the probability of the gammon, excluſive of one or more blots which the adverſary is liable to make in bearing his men, ſuppoſing at the ſame time the throws to be upon an equality.

Suppoſe two blots are left, either of which cannot be hit but by double dice; one muſt be hit by throwing eight and the other by throwing nine; ſo that the adverſary has only one die to hit either of them. What are the odds of hitting either of them? The chances of two dice being in all 36

The chances to hit 8 are 6 and 2 twice	2
5 and 3 twice	2
2 Deuces	1
2 Fours	1
The chances to hit 9 are 6 and 3 twice	2
5 and 4 twice	2
2 Trois	1
For hitting in all	11
Chances for not hitting, remain	25

So that the odds are 25 to 11 againſt hitting either of theſe blots.

This method may be taken to find out the odds of hitting three, four, or five blots upon double dice; or blots made upon double and ſingle dice at the ſame time. After knowing how many chances there are to hit any of thoſe blots, they muſt be added all together, and then ſubtracted from the number 36, which are the chances of the two dice, and the queſtion is ſolved.

A critical caſe for a Back-game. Suppoſe the fore-game to be played by A, and that all his men are placed as uſual; B has fourteen of his men placed upon his adverſary's ace point and one man upon his adverſary's deuce point, and B is to throw. Who has the beſt of the hit?—*Anſwer:* A has the beſt of it, gold to ſilver: becauſe, if B does not throw an ace to take his adverſary's deuce point, which is 25 to 11 againſt him, A will take up B's men in his tables, either ſingly or to make points; and then if B ſecures either A's deuce or trois point, A will put as many men down as poſſible, in order to hit, and thereby get a back-game. It is evident that the back-game is very powerful; conſequently, whoever practiſes it muſt become a greater proficient at the game than he could by any other means.

Another critical caſe. Suppoſe A to have five men placed upon his ſize point, as many upon his quatre point, and the ſame number upon his deuce point, all in his own tables. At the ſame time, let us ſuppoſe B to have three men placed upon A's ace point, as many upon A's trois point, and the ſame number upon A's cinque point, in his own tables, and three men placed as uſual out of his tables. Who has the beſt of the hit?—*Anſwer:* The game is equal, till B has gained his cinque and quatre points in his own tables; which if he can effect, and by playing two men from A's cinque point, in order to force his adverſary to blot by throwing a cane, which ſhould B hit, he will have the beſt of the hit.

A caſe of curioſity and inſtruction: in which is ſhown the probability of making the hit laſt by one of the players for many hours, although they ſhall both play as faſt as uſual. Suppoſe B to have bore 13 men, and that A has his fifteen men in B's tables, *viz.* three men upon his ſize point, as many upon the cinque point, three upon his quatre point, the ſame number upon his trois point, two upon his deuce point, and one upon his ace point. A in this ſituation can prolong it, as aforeſaid, by bringing his 15 men home, always ſecuring ſix cloſe points till B has entered his two men, and brought them upon any certain point; as ſoon as B has gained that point, A will open an ace, deuce, or trois point, or all of them; which done, B hits one of them, and A taking care to have two or three men in B's tables, is ready to hit that man; and alſo he being certain of taking up the other man, has it in his power to prolong the hit almoſt to any length, provided he takes care not to open ſuch points as two fours, two fives, or two ſixes, but always to open the ace, deuce, or trois points, for B to hit him.

The Laws of Backgammon are, 1. If a man is taken from any point, it muſt be played; if two men are taken from it, they alſo muſt be played. 2. A man is not ſuppoſed to be played till it is placed upon a point and quitted. 3. If a player has only fourteen men in play, there is no penalty inflicted, becauſe by his playing with a leſs number than he is entitled to, he plays to a diſadvantage for want of the deficient man to make up his tables. 4. If he bears any number of men before he has entered a man taken up, and which of courſe he was obliged to enter, ſuch men ſo borne muſt be entered again in the adverſary's tables as well as the man taken up. 5. If he has miſtaken his throw and played it, and his adverſary has thrown, it is not in the choice of either of the players to alter it, unleſs they both agree ſo to do.

Back-*Painting*, a method of painting mezzotinto prints, paſted on glaſs, with oil-colours. The art conſiſts chiefly in laying the print upon a piece of crown-glaſs, of a correſponding ſize. In order to do this, the print muſt be well ſoaked in clean water, after which it muſt be laid between four ſheets of paper, two over and two under it, that ſome of the moiſture may be drawn out of it. In the mean while, let the glaſs upon which the print is to be laid be warmed at the fire; then with a bruſh dipped in melted Straſburg turpentine, ſpread the turpentine ſmoothly and evenly on the glaſs. Then lay the print upon the glaſs, rubbing it gently from one end to the other, that it may lie cloſe. Laſtly, with the finger, rub off the paper from the back ſide of the print, till nothing can be ſeen but the print, like a thin film left upon the glaſs, and ſet it aſide to dry. When it is dry, varniſh it over with ſome white tranſparent varniſh, that the ſtrokes and ſhades of the print may be ſeen through it; and it will then be fit for painting. The colours neceſſary to be uſed are merely ſuch oil colours as painters commonly employ. All the caution neceſſary is, to chooſe proper tints, and to take care in laying them on not to paſs beyond the limits of the ſubject you happen to be colouring. This proceſs, though mere daubing, as far as ingenuity is concerned, is a great advantage to mezzotinto prints; their ſhades being, on account of their ſoftneſs, particularly well adapted for this kind of back-painting.

Back-*Staff*, a name formerly given to a ſea-quadrant invented by Captain Davis: becauſe the back of the artiſt is turned towards the ſun at the time of obſervation. See Quadrant.

Back-*Stays*, of a ſhip, are ropes belonging to the main-maſt and fore maſt, and the maſts belonging to them; ſerving to keep them from pitching forwards or overboard.

Back-*Worm*. See Filanders.

BACKING, in horſemanſhip, the operation of breaking *a colt* to the ſaddle, or bringing him to endure a rider. To *back* a colt, they uſually take him into ploughed ground, trot him a while, to cure him of his wantonneſs; then having one ſtay to his head, and another to govern the chaffing rein, the groom mounts his back, not ſuddenly, but by degrees, firſt making ſeveral offers, or half-riſings. When he bears theſe patiently, the rider mounts in earneſt, and ſettles in his place, cheriſhing him, &c.

Backing *the Sails*, in navigation; to arrange them in a ſituation that will force the ſhip to retreat, or move backwards. This is, however, only done in narrow channels, when a ſhip is carried along ſidewiſe by the tide or current, and wants to avoid any thing that may interrupt her progreſs, as ſhoals, veſſels at anchor, &c. or in the line of battle, when a ſhip wants to be immediately oppoſite to another with which ſhe is engaged.

Backing *Warrants*, in *Law*, denotes the ſigning of ſuch as have been iſſued by a juſtice of the peace in one county, by a juſtice of the peace in another county, which is neceſſary before they can be executed there. This practice is authorized by ſtatutes 23 Geo. II. c. 26. and 24 Geo. II. c. 55.

BACKS, among dealers in leather, denote the thickeſt and beſt tanned hides, uſed chiefly for ſoles of ſhoes.

Backs, in brewing and diſtilling. See Bac.

BACULARIUS, in writers of the middle age, an eccleſiaſtical apparitor, or verger; who carries a ſtaff, *baculus*, in his hand, as an enſign of his office.

BACON, ſwines fleſh ſalted, and dried in the chimney. Old hiſtorians and law-writers ſpeak of the *ſervice of the bacon*, a cuſtom in the manor of Whichenacre in Staffordſhire, and priory of Dunmow in Eſſex; in the former of which places, by an ancient grant of the lord, a flitch of bacon, with half a quarter of wheat, was to be given to every married couple who could ſwear, that, having been married a year and a day, they would never within that time have once exchanged their mate for any other perſon on earth, however richer, fairer, or the like. But they were to bring two of their neighbours to ſwear with them that they believed they ſwore the truth. On this the lord of another neighbouring manor, of Rudlow, was to find a horſe ſaddled, and a ſack to carry the bounty in, with drums and trumpets, as far as a day's journey out of the manor: all the tenants of the manor being ſummoned to attend, and pay ſervice to the bacon. The bacon of Dunmow, firſt erected under Henry III. was on much the ſame footing; only the tenor of the oath was, that the parties had never once repented, or wiſhed themſelves unmarried again.

Bacon (Roger), a Franciſcan friar of great genius and learning, was born near Ilcheſter in Somerſetſhire, in the year 1214. He began his ſtudies at Oxford; though in what ſchool or college is uncertain. In 1240, returning after a long reſidence at Paris, he aſſumed the Franciſcan habit, and ſtudied experimental philoſophy with unremitting ardor and aſſiduity. In 1278, through the envy and malice of his illiterate fraternity, who found no difficulty in poſſeſſing the vulgar with a notion of Bacon's dealing with the devil, he was reſtrained from reading lectures: his writings were confined to his convent; and finally, he himſelf impriſoned in his cell, when 64 years old. Nevertheleſs, during a confinement of 10 years, he went on in the rational purſuit of knowledge, corrected his former labours, and wrote ſeveral curious pieces. He died in the year 1294, in the 80th year of his age, and was buried in the Franciſcan church. His works are, 1. *Epiſtola fratris Rogeri Baconis de ſecretis operibus artis et naturæ, et de nullitate magiæ*. Paris, 1542, 4to. Baſil, 1593, 8vo. 2. *Opus majus*. Lond. 1733, fol. publiſhed by Dr. Jebb. 3. *Theſaurus chemicus*. Franef. 1603, 1620. This great luminary of the 13th century was a great linguiſt and grammarian; was well verſed in the theory and practice of perſpective; underſtood the uſe of convex and concave glaſſes, and the art of making them; knew the great error in the kalendar, aſſigned the cauſe, and propoſed the remedy. He was alſo an adept in chemiſtry, and was really the inventor of gunpowder; poſſeſſed great knowledge in the medical art; and was an able mathematician; logician, metaphyſician, and theologiſt.

Bacon (Francis), lord high chancellor of England under King James I. was ſon of Sir Nicholas Bacon lord keeper of the great ſeal in the reign of Queen Elizabeth, by Anne daughter of Sir Anthony Cook, eminent for her ſkill in the Latin and Greek tongues. He was born in 1560; and ſhowed ſuch marks of genius, that he was particularly taken notice of by Queen Elizabeth when very young. He was educated at Trinity-college, Cambridge; and made ſuch incredible progreſs in his ſtudies, that, before he was 16, he had not only run through the whole circle of the liberal arts as they were then taught, but began to perceive thoſe imperfections in the reigning philoſophy, which he afterwards ſo effectually expoſed, and thereby not only overturned that tyranny which prevented the progreſs of true knowledge, but laid the foundation of that free and uſeful philoſophy which has ſince opened a way to ſo many glorious diſcoveries. On his leaving the univerſity, his father ſent him to France; where, before he was 19 years of age, he wrote a general view of the ſtate of Europe: but Sir Nicholas dying, he was obliged ſuddenly to return to England; when he applied himſelf to the ſtudy of the common law, at Gray's-inn. At this period the famous Earl of Eſſex, who could diſtinguiſh merit, and who paſſionately loved it, entered into an intimate friendſhip with him; zealouſly attempted, though without ſucceſs, to procure him the office of queen's ſolicitor; and, in order to comfort his friend under the diſappointment, conferred on him a preſent of land to the value of 1800l. Bacon, notwithſtanding the friendſhip of ſo great a perſon; notwithſtanding the number and power of his own relations; and, above all, notwithſtanding the early poſſeſſion of her majeſty in his favour, met with many obſtacles to his preferment during her reign. In particular, his enemies repreſented him as a ſpeculative man, whoſe head was filled with philoſophical notions, and therefore more likely to perplex than forward public buſineſs. It was not without great difficulty that lord treaſurer Burleigh obtained for him the reverſion of regiſter to the ſtar-chamber, worth about 1600l. a-year, which place fell to him about 20 years after. Neither did he obtain any other preferment all this reign; though if obedience to a ſovereign in what muſt be the moſt diſagreeable of all offices, viz. the caſting reflections on a deceaſed friend, entitled him, he might have claimed it. The people were ſo clamorous even againſt the Queen herſelf on the death of Eſſex, that it was thought neceſſary to vindicate the conduct of the adminiſtration. This was aſſigned to Bacon, which brought on him univerſal cenſure, nay his very life was threatened. Upon the acceſſion of King James, he was ſoon raiſed to conſiderable honours; and wrote in favour of the union of the two kingdoms of Scotland and England, which the king ſo paſſionately deſired. In 1616, he was ſworn of the privy-council. He then applied himſelf to the reducing and recompoſing the laws of England. He diſtinguiſhed himſelf, when attorney-general, by his endeavours to reſtrain the cuſtom of duels, then very frequent: and, in 1617, was appointed lord keeper of the great ſeal. In 1618, he was made lord chancellor of England, and created Lord Verulam. In the midſt of theſe honours and applauſes, and multiplicity of buſineſs, he forgot not his philoſophy; but, in 1620, publiſhed his great work entitled *Novum Organum*. We find by ſeveral let-

ters of his, that he thought convening of parliaments was the beſt expedient for the king and people. In 1621, he was advanced to the dignity of Viſcount St. Albans, and appeared with the greateſt ſplendour at the opening of the ſeſſion of parliament. But he was ſoon after ſurpriſed with a melancholy reverſe of fortune. For, about the 12th of March, a committee of the houſe of commons was appointed to inſpect the abuſes of the courts of juſtice. The firſt thing they fell upon was bribery and corruption, of which the lord chancellor was accuſed. For that very year complaints being made to the houſe of commons of his lordſhip's having received bribes, thoſe complaints were ſent up to the houſe of lords; and new ones being daily made of a like nature, things ſoon grew too high to be got over. The King found it was impoſſible to ſave both his chancellor, who was openly accuſed of corruption, and Buckingham his favourite, who was ſecretly and therefore more dangerouſly attacked as the encourager of whatever was deemed moſt illegal and oppreſſive. He therefore forced the former to abandon his defence, giving him poſitive advice to ſubmit himſelf to his peers, and promiſing upon his princely word to ſcreen him in the laſt determination, or, if that could not be, to reward him afterwards with ample retribution of favour. The chancellor, though he foreſaw his approaching ruin if he did not plead for himſelf, reſolved to obey; and the houſe of peers, on the 3d of May 1621, gave judgment againſt him, "That he ſhould be fined 40,000l. and remain priſoner in the tower during the King's pleaſure; that he ſhould for ever be incapable of any office, place, or employment, in the ſtate or commonwealth; and that he ſhould never ſit in parliament, or come within the verge of the court." The fault which, next to his ingratitude to Eſſex, thus tarniſhed the glory of this illuſtrious man, is ſaid to have principally proceeded from an indulgence to his ſervants, who made a corrupt uſe of it. One day, during his trial, paſſing through a room where ſeveral of his domeſtics were ſitting, upon their riſing up to ſalute him, he ſaid, "Sit down, my maſters; your riſe hath been my fall." *Stephens*, p. 54. And we are told by Ruſhworth in his hiſtorical collections, "That he treaſured up nothing for himſelf or family, but was over-indulgent to his ſervants, and connived at their takings, and their ways betrayed him to that error; they were profuſe and expenſive, and had at their command whatever he was maſter of. The gifts taken were for the moſt part for interlocutory orders; his decrees were generally made with ſo much equity, that though gifts rendered him ſuſpected for injuſtice, yet never any decree made by him was reverſed as unjuſt." It was peculiar to this great man (ſay the authors of the Biogr. Brit.) to have nothing narrow and ſelfiſh in his compoſition: he gave away without concern whatever he poſſeſſed; and believing other men of the ſame mould, he received with as little conſideration. He retired, after a ſhort impriſonment, from the engagements of an active life, to which he had been called much againſt his genius, to the ſhade of a contemplative one, which he had always loved. The King remitted his fine, and he was ſummoned to parliament in the firſt year of King Charles I. It appears from the works compoſed during his retirement, that his thoughts were ſtill free, vigorous, and noble. The laſt five years of his life he devoted wholly to his ſtudies. In his receſs he compoſed the greateſt part of his Engliſh and Latin works. He expired on the 9th of April 1626; and was buried in St. Michael's church at St. Albans, according to the direction of his laſt will, where a monument was erected to him by Sir Thomas Meautys formerly his ſecretary, and afterward clerk of the privy-council under two kings. A complete edition of this great man's works was publiſhed at London in the year 1740. Addiſon has ſaid of him, That he had the ſound, diſtinct, comprehenſive knowledge of Ariſtotle, with all the beautiful light graces and embelliſhments of Cicero. The honourable Mr. Walpole calls him the *Prophet of Arts*, which Newton was afterwards to reveal; and adds, that his genius and his works will be univerſally admired as long as ſcience exiſts. "As long as ingratitude and adulation are deſpicable, ſo long ſhall we lament the depravity of this great man's heart. Alas! that he who could command immortal fame, ſhould have ſtooped to the little ambition of power!"

BACTROPERATA, an ancient appellation given to philoſophers by way of contempt, denoting a man with a ſtaff and a budget. Poſſibly it is of the ſame people that Pauchaſias Radbertus ſpeaks under the corrupt name of *Bacoperitæ* or *Bacchionitæ*, whom he deſcribes as philoſophers who had ſo great a contempt for all earthly things, that they kept nothing but a diſh to drink out of; and that one of this order ſeeing a peaſant ſcooping up the water in his hand, threw away his cup as a ſuperfluity: which is nothing but the old ſtory of Diogenes the Cynic.

BACULE, in fortification, a kind of porteullis, or gate, made like a pit-fall with a counterpoiſe, and ſupported by two great ſtakes.

BACULOMETRY, the art of meaſuring acceſſible or inacceſſible heights, by the help of one or more baculi, ſtaves, or rods.

BADAGSHAN, a very ancient city of Great Bukharia, in the province of Balkh, ſituated at the foot of thoſe high mountains which ſeparate Indoſtan from Great Tartary.

BADAJOZ, a large and ſtrong town, capital of Eſtremadura in Spain. It is ſeated on the river Guadiana. W. long. 7. 3. N. Lat. 38. 35.

BADELONA, a town of Catalonia in Spain, ſeated on the Mediterranean. E. long. 2. 20. N. lat. 41. 12.

BADEN (the diſtrict of), in Swiſſerland, has three cities, Baden, Keifers Stoul, and Klingnaw, beſides a town that paſſes for a city, named *Zurzach*. It is one of the fineſt countries in Swiſſerland; and is watered with three navigable rivers, the Limmet, Ruſs, and Are. It extends on one ſide to the Are, as far as the place where it falls into the Rhine, and on the other ſide beyond the Rhine, where there are ſome villages which are dependent on it. BADEN, the capital, is an agreeable city, moderately large, ſeated on the ſide of the Limmet, in a plain flanked by two high hills, between which the river runs. This city owes its riſe to its baths, which were famous before the Chriſtian æra. E. long. 8. 25. N. lat. 47. 27.

BADEN (the Margravate of), in the circle of Swabia in Germany, is bounded by the Palatinate of the Rhine, on the N.; by the Black Foreſt, on the E.; by Switzerland, on the S.; and by the Rhine, which divides it from Alſace on the E.: and is about 90 miles in length, from N. to S.; but not above 20 in breadth, where it is wideſt. BADEN, the chief city of the above Margravate, is famous for its baths, the ſprings of which are ſaid to be above 300, ſome of them hot, and partaking of ſalt, alum, and ſulphur. E. long. 9. 24. N. lat. 48. 50.

BADEN, a town of Germany, in the arch-duchy of Auſtria, ſeated on the little Succhat, is a neat little walled town. E. long. 17. 10. N. lat. 48. 0.

BADEN-WEILLER, a town of Germany, belonging to the lower Margravate of Baden. E. long. 7. 50. N. lat. 47. 55.

BADGE, in naval architecture, ſignifies a ſort of ornament placed on the outſide of ſmall ſhips, very near the ſtern, containing either a window for the convenience of the cabin, or a repreſentation of it. It is commonly decorated with marine figures, martial inſtruments, or ſuch-like emblems.

BADGER, in zoology, the Engliſh name of a ſpecies of urſus. See URSUS.

BADGER, in old law-books, one that was licenſed to buy corn in one place and carry it to another to ſell, without incurring the puniſhment of an engroſſer.

BADIAGA, in the materia medica, the name of a ſort of ſpongy plant, common in the ſhops in Moſcow, and ſome other northern kingdoms. The uſe of it is to take away livid marks from blows or bruiſes, which the powder of this plant is ſaid to do in a night's time.

BADIANE, or BANDIAN, the ſeed of a tree which grows in China, and ſmells like aniſeed. The Chineſe, and the Dutch in imitation of them, ſometimes uſe the badiane to give their tea an aromatic taſte.

BADIGEON, a mixture of plaſter and free-ſtone, well ground together, and ſifted; uſed by ſtatuaries to fill up the little holes, and repair the defects in ſtones, whereof they make their ſtatues and other work. The ſame term is alſo uſed by joiners for ſaw-duſt mixed with ſtrong glue, wherewith they fill up the chaps and other defects in wood after it is wrought.

BADIS, a fortreſs of Livonia, ſubject to Ruſſia. E. long. 23. 10. N. lat. 59. 15.

BÆCKEA, in botany; a genus of the octandria order, belonging to the monogynia claſs of plants. The calyx is a permanent perianthium, conſiſting of a ſingle funnel-ſhaped leaf, cut into five ſegments at the brim; the corolla conſiſts of five roundiſh ſpreading petals inſerted into the calyx; the pericarpium is a globoſe capſule, made up of four valves, and containing four cells, in which are a few roundiſh angular ſeeds.

BÆTYLIA, anointed ſtones, worſhipped by the Phœnicians, by the Greeks before the time of Cecrops, and by other barbarous nations. They were commonly of a black colour, and conſecrated to ſome god, as Saturn, Jupiter, the Sun, &c. Some are of opinion that the true origin of theſe idols is to be derived from the pillar of ſtone which Jacob erected at Bethel, and which was afterwards worſhipped by the Jews.—Theſe *bætylia* were much the object of the veneration of the ancient heathens. Many of their idols were no other. In reality, no ſort of idol was more common in the eaſtern countries, than that of oblong ſtones erected, and hence termed by the Greeks, λιθοι, *pillars*. In ſome parts of Egypt they were planted on both ſides of the highways. In the temple of Heliogabulus, in Syria, there was one pretended to have fallen from heaven. There was alſo a famous black ſtone in Phrygia, ſaid to have fallen from heaven. The Romans ſent for it and the prieſts belonging to it with much ceremony, Scipio Naſika being at the head of the embaſſy.

BÆZA, a city of Andaluſia in Spain, 3 miles from the Guadalquiver. E. long. 3. 15. N. lat. 37. 45.

BAFFETAS, or BASTAS, a cloth made of coarſe white cotton thread, which comes from the Eaſt Indies. That of Surat is the beſt.

BAFFIN's BAY, a gulph of North America, running north-eaſt from Cape Farewell in Weſt Greenland, from 60° to 80° of north latitude.

BAFFO, a conſiderable town in the iſland of Cyprus, with a fort built near ancient Paphos, of which ſome conſiderable ruins yet remain, particularly ſome broken columns, which probably belonged to the temple of Venus. E. long. 32. 20. N. lat. 34. 50.

BAG, in commerce, a term ſignifying a certain quantity of ſome particular commodity: a bag of almonds, for inſtance, is about 300lb. weight; of aniſeeds, from 300 to 400, &c.—Bags are alſo uſed in moſt countries to put ſeveral ſorts of coin in, either of gold, ſilver, braſs, or copper. Bankers, and others, who deal much in current caſh, label their bags of money, by tying a ticket or note at the mouth of the bag, ſignifying the coin therein contained, the ſum total, its weight, and of whom it was received. Tare is allowed for the bag.

BAG, among farriers, is when, in order to retrieve a horſe's loſt appetite, they put certain medicines into a bag, and tie it to the bit, keeping him bridled for two hours, ſeveral times in the courſe of a day. This practice is at leaſt uſeful in diſeaſes of the mouth or throat.

BAGAUDÆ, or BACAUDÆ, an ancient faction of peaſants, or malecontents, who ravaged Gaul. The Gauls being oppreſſed with taxes, roſe about the year of Chriſt 290, under the command of Amand and Elian; and aſſumed the name *bagaudæ*, which, according to ſome authors, ſignified in the Gallic language *forced rebels*; according to others, *tribute*; according to others, *robbers*; which laſt ſignification others allow the word had, but then it was only after the time of the *bagaudæ*, and doubtleſs took its riſe from them.

BAGDAD, a large and populous city, the capital of Irac-Arabia (the ancient Chaldæa), a province of Turkey in Aſia. It is ſeated on the Tigris, and is inhabited by Chriſtians, Turks, and other religious. It has a ſtrong caſtle on the banks of the river; and over-againſt it, on the other ſide, are the ſuburbs. It has a conſiderable trade, being annually viſited by the Smyrna, Aleppo, and Weſtern caravans. It was the capital of the Saracen empire, till taken by the Turks in the 13th century: ſince which it has been taken and retaken ſeveral times by the Turks and Perſians; and laſt of all by the Turks, in 1638. Kouli Khan beſieged this place, but in vain. It is 250 miles N. by W. of Buſſarah. Lon. 43. 52. E. Lat. 33. 20. N.

BAGGAGE, in military affairs, denotes the clothes, tents, utenſils of divers ſorts, proviſions, and other neceſſaries, belonging to an army. Before a march, the waggons with the baggage are marſhalled according to the rank which the ſeveral regiments bear in the army; being ſometimes ordered to follow the reſpective columns of the army, ſometimes to follow the artillery, and ſometimes to form a column by themſelves. The general's baggage marches firſt; and each waggon has a flag, ſhowing the regiment to which it belongs.

Packing up the BAGGAGE, *vaſa colligere*, was a term among the Romans, for preparing to go to war, or to be ready for an expedition. They diſtinguiſhed two ſorts of baggage; a *greater* and *leſs*. The leſſer was carried by the ſoldier on his back, and called *farcina*; conſiſting of the things moſt neceſſary to life, and which he could not do without. Hence *colligere farcinas*, packing up the baggage, is uſed for decamping, *caſtra movere*. The greater and heavier was carried on horſes and vehicles, and called *onera*. Hence *onera vehiculorum*, *farcinæ hominum*. The baggage-horſes were denominated *ſagmentarii equi*.

The Roman ſoldiers in their marches were heavily loaden; inſomuch that they were called by way of jeſt *muli mariani*, and *arumnæ*. They had conſtantly four ſorts of luggage, viz. corn or *buccellatum*, utenſils, valli, and arms. Cicero obſerves, that they uſed to carry with them above half a month's proviſions; and we have inſtances in Livy, where they carried proviſions for a whole month. Their utenſils comprehended thoſe proper for gathering fuel, dreſſing their meat, and even for fortification or intrenchment; and what is more, a chain for binding captives. For arms, the foot carried a ſpear, ſhield, ſaw, baſket, rutrum, hatchet, lorum, falx, &c. Alſo ſtakes or pales, *valli*, for the ſudden fortifying a camp; ſometimes ſeven or even twelve of theſe pales were carried by each man, though generally, as Polybius tells us, only three or four. On the Trajan column we ſee ſoldiers repreſented with this ſardle of corn, utenſils, pales, &c. gathered into a bundle and laid on their ſhoulders. Thus inured to labour, they grew ſtrong,

and able to undergo any fatigue in battle; the greateſt heat of which never tired them, or put them out of breath. In after-times, when diſcipline grew ſlack, this luggage was thrown on carriages and porters ſhoulders.—The Macedonians were not leſs inured to hardſhip than the Romans: when Philip firſt formed an army, he forbad all uſe of carriages; yet, with all their load, they would march, in a ſummer's day, 20 miles in military rank.

BAGLANA, or Bocklana, a country of Hindooſtan in the Deccan. It extends the whole way from the Surat river to Poonah, and is bounded on the N. by Candeiſh, on the S. W. by Viſiapour, and on the S. E. by Dowlatabad.

BAGLIVI (George), a moſt illuſtrious phyſician of Italy, was a native of Apulia, and born about the year 1668. He ſtudied at Padua, where he became doctor; and then went to Rome, where he was choſen profeſſor of anatomy. He was a man of moſt uncommon force of underſtanding, of which he gave ample proofs in many curious and accurate productions, philoſophical as well as medicinal. He died at Rome 1706, in the flower of his age, and when he was no more than 38. A collection of his works were printed firſt in 1710, quarto; and have ſince been reprinted, in the ſame ſize, at various places. His *Praxis Medica*, and *De Fibra Matricis*, are the principal pieces. He wrote a Diſſertation upon the Anatomy, Bite, and Effects, of the Tarantula, which is the production of his country; and gave a particular account of the earthquake at Rome and the adjacent cities in 1703. His works are all in Latin.

BAGNAGAR, a town of Aſia, in the dominions of the Great Mogul, and capital of the kingdom of Golconda in the peninſula on this ſide the Ganges. The inhabitants within the town are the better ſort; the merchants and meaner people inhabiting the ſuburbs, which is three miles long. It is chiefly remarkable for a magnificent reſervoir of water, ſurrounded with a colonnade ſupported by arches. It is ſeated on the river Newa, in E. long. 96. 0. N. lat. 15. 30.

BAGNARA, a ſea-port town of Italy in the kingdom of Naples. E. long. 16. 8. N. lat. 38. 15.

BAGNAREA, a town of Italy in the territory of Orvieta. E. long. 12. 10. N. lat. 42. 36.

BAGNERES, a town of France in the department of the Upper Pyrénées, and late province of Bigorre, ſeated on the river Adour, in E. long. 0. 12. N. lat. 43. 3.

BAGNIALACK, a large town of Turkey in Europe, in the province of Boſnia. E. long. 18. 10. N. lat. 44. 0.

BAGNIO, an Italian word, ſignifying *a bath*. We uſe it for a houſe with conveniences for bathing, cupping, ſweating, and otherwiſe cleanſing the body; and ſometimes for worſe purpoſes. In Turkey it is become a general name for the priſons where the ſlaves are incloſed, it being uſual in theſe priſons to have baths.

BAGNOLS, a town of France, in the department of Herault and late province of Languedoc, 8 miles S. W. of Pont St. Eſprit. Lon. 4. 43. E. Lat. 44. 10. N.

BAGNOLIANS, or Bagnolanses, in church-hiſtory, a ſect of heretics, who in reality were Manichees, though they ſomewhat diſguiſed their errors. They rejected the Old Teſtament, and part of the New; held the world to be eternal; and affirmed that God did not create the ſoul when he infuſed it into the body.

BAGOI, among the ancient Perſians, were the ſame with thoſe called by the Latins *ſpadones*, *viz.* a ſpecies of eunuchs, in whom the canal of the penis was ſo contorted by a tight vinculum, that they could not emit the ſemen.

BAG-PIPE, a muſical inſtrument, of the wind kind, chiefly uſed in Scotland and Ireland. The peculiarity of the bagpipe, and from which it takes its name, is, that the air which blows it is collected into a leathern bag, from whence it is preſſed out by the arm into the pipes. Theſe pipes conſiſt of a baſs, and tenor or rather treble: and are different according to the ſpecies of the pipe. The baſs part is called the *drone*, and the tenor treble part the *chanter*. In all the ſpecies, the baſs never varies from its uniform note, and therefore very deſervedly gets the name of *drone*; and the compaſs of the chanter is likewiſe very limited. There is a conſiderable difference between the Highland and Lowland bag-pipe of Scotland; the former being blown with the mouth, and the latter with a ſmall bellows; though this difference is not eſſential, every ſpecies of bag-pipe being capable, by a proper conſtruction of the reeds, of producing muſic either with the mouth or bellows.

As to the origin of bag-pipe muſic, ſome are of opinion that it is to be derived from the Danes; but Mr. Pennant thinks differently, and derives it from Italy. He has determined however that the bag-pipe was introduced at a very early period into Britain; whence it is probable that both Iriſh and Danes might borrow the inſtrument from the Caledonians, with whom they had ſuch frequent interconrſe. Ariſtides Quintilianus informs us, that it prevailed in the Highlands in very early ages; and indeed the genius of the people ſeems to render the opinion highly probable. The attachment of that people to their muſic called *pibrachs* is almoſt incredible, and on ſome occaſions is ſaid to have produced effects little leſs marvellous than thoſe aſcribed to the ancient muſic. At the battle of Quebec in 1760, while the Britiſh troops were retreating in great diſorder, the general complained to a field officer in Fraſer's regiment of the bad behaviour of his corps. "Sir (ſaid he with ſome warmth), you did very wrong in forbidding the pipers to play this morning: nothing encourages the Highlanders ſo much in the day of action. Nay, even now they would be of uſe."—"Let them blow like the devil, then (replies the general), if it will bring back the men." The pipers were then ordered to play a favourite martial air; and the Highlanders, the moment they heard the muſic, returned and formed with alacrity in the rear. In the late war in India, Sir Eyre Coote, aware of the attachment of the Highlanders to their favourite inſtrument, gave them fifty pounds to buy a pair of bag-pipes after the battle of Porto Nuovo.

Formerly there was a kind of college in the iſland of Skye where the Highland bag-pipe was taught; the teachers making uſe of pins ſtuck in the ground inſtead of muſical notes. This college, however, was entirely diſſolved, and the uſe of the Highland pipe became much leſs general than before. At laſt a ſociety of gentlemen, unwilling to allow the ancient martial muſic of the country to decline, reſolved to revive it by giving an annual prize to the beſt performers on the inſtrument. Theſe competitions were firſt held at Falkirk, but for ſeveral years at Edinburgh; where the only ſurviving member of the ancient college of Skye is now *profeſſor* of bagpipe muſic.

The Lowland pipe, as has been already obſerved, is an inſtrument eſſentially different from the Highland pipe; it was reformed and the muſic improved by George Mackie, who is ſaid to have attended the college of Skye ſeven years. He had before been the beſt performer on that inſtrument in that part of the country where he lived: but, while attending the college at Skye, he adapted the graces of the Highland muſic to the Lowland pipe. Upon his return, he was heard with aſtoniſhment and admiration; but unluckily, not being able to commit his improvements to writing, and indeed the nature of the inſtrument ſcarce admitting of it, the knowledge of this kind of muſic hath continued to decay ever ſince, and will probably ſoon be loſt.

BAGUETTE, in architecture, a ſmall round moulding,

leſs than an aſtragal, and ſo called from the reſemblance it bears to a ring.

BAHAMA, or LUCAYA, ISLANDS, are the eaſternmoſt of the Antilles, lying in the Atlantic ocean. They are ſituated to the ſouth of Carolina, between 22 and 27 degrees N. lat. and 73 and 81 degrees W. long. They extend along the coaſt of Florida quite down to the iſle of Cuba, and are ſaid to be 500 in number, ſome of them only mere rocks; but twelve of them large and fertile: all are, however, uninhabited except Providence. Theſe iſlands were the firſt fruits of Columbus's diſcoveries.

BAHAR, or BARRE, in commerce, weights uſed in ſeveral places in the Eaſt Indies. There are two of theſe weights; one the great bahar, with which they weigh pepper, cloves, nutmegs, ginger, &c. and contains 550 pounds of Portugal, or about 524 lb. 9 oz. avoirdupois weight. With the little bahar, they weigh quickſilver, vermilion, ivory, ſilk, &c. It contains about 437 lb. 9 oz. avoirdupois weight.

BAHAREN, an iſland in the Perſian gulf, ſituated in E. long. 50. 0. N. lat. 26. 0. This iſland is chiefly remarkable for its pearl-fiſhery.

BAHI, a province of Lucon or Manila, one of the Philippine iſlands in the Eaſt Indies, belonging to Spain.

BAHIA, DE TODOS LOS SANCTOS, a province of Braſil in South America, belonging to the Portugueſe. The capital, called *St. Salvador*, or *Cividad de Bachir*, is populous and magnificent. It ſtands on a bay in S. lat. 12. 11.

BAHIR, a Hebrew term ſignifying *famous* or *illuſtrious*; but particularly uſed for a book of the Jews, treating of the profound myſteries of the cabbala, being the moſt ancient of the rabbinical works.

BAHUS, a ſtrong town of Sweden, and capital of a government of the ſame name, ſeated on a rock in a ſmall iſland, in E. long. 11. 10. N. lat. 57. 52.

BAJA, a populous town of Hungary, ſeated on the Danube, in E. long. 19. 50. N. lat. 46. 40.

BAIÆ, an inconſiderable town of the kingdom of Naples; but famous, in the time of the ancient Romans, for its hot baths and elegant palaces, of which there are ſome ruins remaining. It is ſeated on the ſea-coaſt, in the Terra di Lavora, 12 miles W. of Naples. Long. 14. 5. E. Lat. 40. 51. N.

BAJADOR, a cape on the W. coaſt of Africa, S. of the Canary iſlands. W. long. 15. 20. N. lat. 27. 0.

BAIKAL, a great lake in Siberia, on the road from Muſcovy to China. There are a great many ſeals in it of a blackiſh colour, and ſturgeons of a monſtrous ſize. The river Angara runs out of this lake to the N. N. W.

BAIL, BALLIUM, from the French *bailler*, which comes of the Greek βαλλειν, and ſignifies to deliver into hands; is uſed in our common law for the freeing or ſetting at liberty of one arreſted or impriſoned upon any action, either civil or criminal, on ſurety taken for his appearance at a day and place certain. The reaſon why it is called *bail*, is becauſe by this means the party reſtrained is delivered into the hands of thoſe that bind themſelves for his forthcoming, in order to a ſafe keeping or protection from priſon; and the end of bail is to ſatisfy the condemnation and coſts, or render the defendant to priſon.

With reſpect to bail in *civil caſes*, it is to be obſerved, that there is both common and ſpecial bail. Common bail is in actions of ſmall concernment, being called *common*, becauſe any ſureties in that caſe are taken; whereas in cauſes of greater weight, as actions upon bonds, or ſpecialty, &c. where the debt amounts to 10l. *ſpecial* bail or ſurety muſt be taken, ſuch as ſubſidy men at leaſt, and they according to the value. The commitment of a perſon being only for ſafe cuſtody, wherever bail will anſwer the ſame intention, it ought to be taken; as in moſt of the inferior crimes: but in felonies, and other offences of a capital nature, no bail can be a ſecurity equivalent to the actual cuſtody of the perſon. For what is there that a man may not be induced to forfeit to ſave his own life? and what ſatisfaction or indemnity is it to the public, to ſeize the effects of them who have bailed a murderer, if the murderer himſelf be ſuffered to eſcape with impunity? Upon a principle ſimilar to this, the Athenian magiſtrates, when they took a ſolemn oath never to keep a citizen in bonds that could give three ſureties of the ſame quality with himſelf, did it with an exception to ſuch as had embezzled the public money, or been guilty of treaſonable practices.

Bail may be taken either in court, or, in ſome particular caſes, by the ſheriff or other magiſtrate; but moſt commonly by juſtices of the peace. To refuſe or delay to bail any perſon bailable, is an offence againſt the liberty of the ſubject, in any magiſtrate, by the common law; as well as by the ſtatute Weſtm. 1. 3 Edw. I. c. 15. and the *habeas corpus* act, 31 Car. II. c. 2. And, leſt the intention of the law ſhould be fruſtrated by the juſtices requiring bail to a greater amount than the nature of the caſe demands, it is expreſsly declared by ſtatute 1 W. and M. ſt. 2. c. 1. that exceſſive bail ought not to be required; though what bail ſhall be called *exceſſive*, muſt be left to the courts, on conſidering the circumſtances of the caſe, to determine. And on the other hand, if the magiſtrate takes inſufficient bail, he is liable to be fined, if the criminal doth not appear.

In *civil* caſes, every defendant is bailable. But it is otherwiſe in *criminal* matters. Regularly, all offences, either againſt the common law or act of parliament, that are below felony, the offender ought to be admitted to bail, unleſs it be prohibited by ſome ſpecial act of parliament. By the ancient common law, before and ſince the conqueſt, all felonies were bailable, till murder was excepted by ſtatute: ſo that perſons might be admitted to bail almoſt in every caſe. But the ſtatute Weſt. 1. 3 Ed. I. c. 15 takes away the power of bailing in treaſon, and in divers inſtances of felony. The ſtatutes 23 Hen. VI. c. 9. and 1 and 2 Ph. & Mar. c 13. gave farther regulations in this matter: and upon the whole we may collect, that no juſtices of the peace can bail—1. Upon an accuſation of treaſon: nor, 2. Of murder: nor 3. In caſe of manſlaughter, if the priſoner be clearly the ſlayer, and not barely ſuſpected to be ſo; or if any indictment be found againſt him: nor, 4. Such as, being committed for felony, have broken priſon; becauſe it not only carries a preſumption of guilt, but is alſo ſuperadding one felony to another: 5. Perſons outlawed: 6. Such as have abjured the realm: 7. Perſons taken with the mainour, or in the fact of felony: 8. Perſons charged with arſon: 9. Excommunicated perſons, taken by writ *de excommunicato capiendo*: all which are clearly not admiſſible to bail by the juſtices. Others are of a dubious nature; as, 10. Thieves openly defamed and known: 11. Perſons charged with other felonies, or manifeſt and enormous offences, not being of good fame: and, 12. Acceſſories to felony, that labour under the ſame want of reputation. Theſe ſeem to be in the diſcretion of the juſtices, whether bailable or not. The laſt claſs are ſuch as *muſt* be bailed upon offering ſufficient ſurety: as, 13. Perſons of good fame, charged with a bare ſuſpicion of manſlaughter, or other infamous homicide. 14. Such perſons being charged with petit larceny or any felony, not before ſpecified; or, 16. with being acceſſory to any felony. Laſtly, it is agreed, that the court of king's bench (or any judge thereof in time of vacation) may bail for any crime whatſoever, be it treaſon, murder, or any other offence, according to the circumſtances of the caſe. And herein the wiſdom of the law is very manifeſt. To allow bail to

be taken commonly for ſuch enormous crimes, would greatly tend to elude the public juſtice; and yet there are caſes, though they rarely happen, in which it would be hard and unjuſt to confine a man in priſon, though accuſed even of the greateſt offence. The law has therefore provided one court, and only one, which has a diſcretionary power of bailing in any caſe: except only even to this high juriſdiction, and of courſe to all inferior ones, ſuch perſons as are committed by either houſe of parliament, ſo long as the ſeſſion laſts; or ſuch as are committed for contempts by any of the king's ſuperior courts of juſtice.

Clerks of the BAILS, is an officer belonging to the court of the King's bench: he files the bail-pieces taken in that court, and attends for that purpoſe.

BAIL, or BALE, in the ſea-language. The ſeamen call throwing the water by hand out of the ſhip or boat's hold, *bailing*. They alſo call thoſe hoops that bear up the tilt of a boat, its *bails*.

BAILIE, in Scots law, a judge anciently appointed by the king over ſuch lands not erected into a regality as happened to fall to the crown by forfeiture or otherwiſe, now aboliſhed. It is alſo the name of a magiſtrate in royal boroughs, and of the judge appointed by a baron over lands erected into a barony.

BAILIFF, *ballivus*, from the French word *bayliff*, that is, *præfectus provinciæ*; and as the name, ſo the office itſelf was anſwerable to that formerly in France; which had eight parliaments, that were high courts from whence there lay no appeal; and within the precincts of the ſeveral parts of that kingdom which belonged to each parliament there were ſeveral provinces in which juſtice was adminiſtered by certain officers called *bailiffs*; and in England there are ſeveral counties in which juſtice hath been adminiſtered to the inhabitants by the officer who is now called *ſheriff* or *viſcount* (one of which names deſcends from the Saxons, the other from the Normans); and though the ſheriff is not called *bailiff*, yet it is probable that was one of his names alſo, becauſe the county is often called *balliva*. And in the ſtatute of Magna Charta, cap. 28. and 14 Ed. III. c. 9. the word *bailiff* ſeems to compriſe as well ſheriffs as bailiffs of hundreds. As the realm is divided into counties, ſo every county is divided into hundreds; within which in ancient times the people had juſtice miniſtered to them by the officers of every hundred. But now the hundred courts, except certain franchiſes, are ſwallowed in the county-courts; and the bailiff's name and office are grown into contempt, they being generally officers to ſerve writs, &c. within their liberties. Though, in other reſpects, the name is ſtill in good eſteem: for the chief magiſtrates in divers towns are called *bailiffs* or *bailies*; and ſometimes the perſons to whom the king's caſtles are committed are termed *bailiffs*, as the *bailiff of Dover Caſtle*, &c.

Of the ordinary bailiffs there are ſeveral ſorts, *viz.* ſheriff's bailiffs, bailiffs of liberties, &c. *Sheriff's bailiffs*, or ſheriff's officers, are either bailiffs of hundreds, or ſpecial bailiffs. Bailiffs of hundreds are officers appointed over thoſe reſpective diſtricts by the ſheriffs, to collect fines therein; to ſummon juries; to attend the judges and juſtices at the aſſiſes and quarter-ſeſſions; and alſo to execute writs and proceſs in the ſeveral hundreds. But as theſe are generally plain men, and not thoroughly ſkilful in this latter part of their office, that of ſerving writs, and making arreſts and executions, it is now uſual to join ſpecial bailiffs with them; who are generally mean perſons employed by the ſheriffs on account only of their adroitneſs and dexterity in hunting and ſeizing of their prey.

Bailiffs of liberties are thoſe bailiffs who are appointed by every lord within his liberty, to execute proceſs, and do ſuch offices therein as the bailiff errant doth at large in the county; but bailiffs errant or itinerant, to go up and down the county to ſerve proceſs, are out of uſe. There are alſo *bailiffs of foreſts*, and *bailiffs of manors*, who direct huſbandry, fell trees, gather rents, pay quit-rents, &c.

Water-BAILIFF, an officer appointed in all port-towns, for the ſearching of ſhips, gathering the toll for anchorage, &c. and arreſting perſons for debt, &c. on the water.

BAILIWICK, that liberty which is exempted from the ſheriff of the county, over which liberty the lord thereof appoints his own bailiff, with the like power within his precinct as an under ſheriff exerciſes under the ſheriff of the county: Or, it ſignifies the precinct of a bailiff, or the place within which his juriſdiction is terminated.

BAILLEUL, a town of France, in the department of the North and late French Flanders, 9 miles S. W. of Ypres. Lon. 2. 55. E. lat. 50. 45. N.

BAILMENT, in law, is a delivery of goods in truſt, upon a contract, expreſſed or implied, that the truſt ſhall be faithfully executed on the part of the bailee. As if cloth be delivered, or (in our legal dialect) bailed, to a taylor to make a ſuit of clothes, he has it upon an implied contract to render it again when made, and that in a workmanly manner. If money or goods be delivered to a common carrier to convey from Oxford to London, or from London to Edinburgh, &c. he is under a contract in law to pay, or carry them to the perſon appointed. If a horſe or other goods be delivered to an inn-keeper or his ſervants, he is bound to keep them ſafely, and reſtore them when his gueſt leaves the houſe. If a man takes in a horſe, or other cattle, to graze and depaſture in his grounds, which the law calls *agiſtment*, he takes them upon an implied contract to return them on demand to the owner. If a pawnbroker receives plate or jewels as a pledge or ſecurity for the repayment of money lent thereon at a day certain, he has them upon an expreſs contract or condition to reſtore them if the pledger performs his part by redeeming them in due time; for the due execution of which contract, many uſeful regulations are made by ſtatute 30 Geo. II. c. 24. And ſo, if a landlord diſtrains goods for rent, or a pariſh officer for taxes, theſe for a time are only a pledge in the hands of the diſtrainers; and they are bound by an implied contract in law to reſtore them on payment of the debt, duty, and expences, before the time of ſale; or, when ſold, to render back the overplus. If a friend delivers any thing to his friend to keep for him, the receiver is bound to reſtore it on demand: and it was formerly held, that in the mean time he was anſwerable for any damage or loſs it might ſuſtain, whether by accident or otherwiſe; unleſs he expreſsly undertook to keep it only with the ſame care as his own goods, and then he ſhould not be anſwerable for theft or other accidents. But now the law ſeems to be ſettled on a much more rational footing; that ſuch a general bailment will not charge the bailee with any loſs, unleſs it happens by groſs neglect, which is conſtrued to be an evidence of fraud: but if the bailee undertakes ſpecially to keep the goods ſafely and ſecurely, he is bound to anſwer all perils and damages that may befal them for want of the ſame care with which a prudent man would keep his own.

BAILO; thus they ſtyle at Conſtantinople the ambaſſador of the republic of Venice, who reſides at the Porte. This miniſter, beſides his political charge, acts there the part of a conſul of Venice.

BAIOCAO, a copper-coin, current at Rome, and throughout the whole ſtate of the church, ten of which make a julio, and an hundred a Roman crown.

BAIRAM, or BEIRAM, a Turkiſh word which ſignifies a ſolemn feaſt. The Mahometans have two Bairams, the *Great* and the *Little*. The *Little* Bairam is properly that held at the cloſe of the faſt Ramazan, beginning with the firſt full moon in the following month Shawal. This is called in Arabic *Id*

al Fetz, or *the Feaſt of breaking the Faſt*; by European writers, *the Turkiſh Eaſter*, becauſe it ſucceeds Ramazan, which is their Lent, more uſually the *Great Bairam*, becauſe obſerved with great ceremony and rejoicing at Conſtantinople, and through Turkey, for three days, and in Perſia for five or ſix days, at leaſt by the common people, to make themſelves amends for the mortification of the preceding month. The feaſt commencing with the new moon, the Mahometans are very ſcrupulous in obſerving the time when the new moon commences; to which purpoſe, obſervers are ſent to the tops of the higheſt mountains, who the moment they ſpy the appearance of a new moon, run to the city, and proclaim *Muzhaaluk*, "welcome news;" as it is the ſignal for beginning the feſtivity. The *Great Bairam* is properly that held by the pilgrims at Mecca, commencing on the tenth of Dhu Ihajia, when the victims are ſlain, and laſting three days. This is called by the Arabs, *Id al adha*, that is, *the feaſt of ſacrifice*, as being celebrated in memory of the ſacrifice of Abraham, whoſe ſon God redeemed with a great victim. By European writers it is called the *Leſſer Bairam*, as being leſs taken notice of by the generality of the people, who are not ſtruck with it, becauſe the ceremonies, it is obſerved withal, are performed at Mecca, the only ſcene of the ſolemnity. On the feaſt of Bairam, after throwing little ſtones, one after another, into the valley of Mina, they uſually kill one or more ſheep, ſome a goat, bullock, or even a camel; and after giving a part thereof to the poor, eat the reſt with their friends. After this, they ſhave themſelves. The ſecond is a day of reſt, and on the third they ſet out on their return home

BAIT, among fiſhermen, implies a ſubſtance proper to be faſtened to a hook, in order to catch the different ſorts of fiſh. See FISHING.

BAITING, the act of ſmaller or weaker beaſts attacking and haraſſing greater and ſtronger. In this ſenſe we hear of the baiting of bulls or bears by maſtiffs or bull-dogs with ſhort noſes, that they may take the better hold. The plea of utility is made in juſtification of *bull-baiting*, as a bull is rarely killed without being firſt baited. But the fleſh, though tenderer and more digeſtible, is in reality more diſpoſed to putrefaction, and perhaps on this account is ſcarcely ſo wholeſome. But it is in fact a ſpirit of barbariſm that keeps up the ſport: bulls are kept on purpoſe, and exhibited as ſtanding ſpectacles for the public entertainment. The poor beaſts have not fair play: they are not only tied down to a ſtake, with a collar about their necks, and a ſhort rope, which allows them only about four or five yards play; but they are diſarmed too, and the tips of their horns cut off, or covered with leather, to prevent their hurting the dogs. In this ſport, the chief aim of the dog is to catch the bull by the noſe, and hold him down: to which end he will even creep on his belly. The bull's aim, on the contrary, is, with equal induſtry, to defend his noſe: in order to which, he thruſts it cloſe to the ground, where his horns are alſo in readineſs to toſs the dog. Bull-baiting was firſt introduced into England as an amuſement in the reign of King John, about the year 1209.

BAJULUS, an ancient officer in the court of the Greek emperors. There were ſeveral degrees of bajuli: as, the grand *bajulus*, who was preceptor to the emperor; and the ſimple *bajuli*, who were ſub-preceptors. The word is derived from the Latin verb *bajulare*, "to carry or bear a thing on the arms or on the ſhoulders;" and the origin of the office is thus traced by antiquaries. Children, and eſpecially thoſe of condition, had anciently, beſide their nurſe, a woman called *gerula*, as appears from ſeveral paſſages of Tertullian; when weaned, or ready to be weaned, they had men to carry them about and take care of them, who were called *geruli* and *bajuli, a gerendo et bajulando*. Hence it is, that governors of princes and great lords were ſtill denominated *bajuli*, and their charge or government *bajulatio*, even after their pupils were grown too big to be carried about. The word paſſed in the ſame ſenſe into Greece.

BAJULUS is alſo uſed by Latin writers in the ſeveral different ſenſes wherein BAILIFF is uſed among us.

BAJULUS was alſo the name of a conventual officer in the ancient monaſteries, to whom belonged the charge of gathering and diſtributing the money and legacies left for maſſes and obits; whence he was alſo denominated *bajulus obituum novorum*.

BAKAN, a large and handſome town of Aſia, in the kingdom of Ava. E. long. 98. 0. N. lat. 19. 35.

BAKER (Sir Richard), author of the *Chronicle of the Kings of England*, was born at Seſſingherſt, in Kent, about the year 1568. After going through the uſual courſe of academical learning at Hart-hall, in Oxford, he travelled into foreign parts; and upon his return home was created maſter of arts, and ſoon after, in 1603, received from king James I. the honour of knighthood. In 1620, he was high ſheriff of Oxfordſhire; but engaging to pay ſome of the debts of his wife's family, he was reduced to poverty, and obliged to betake himſelf for ſhelter to the Fleet priſon, where he compoſed ſeveral books; among which are, 1. Meditations and Diſquiſitions on the Lord's Prayer. 2. Meditations, &c. on ſeveral of the Pſalms of David. 3. Meditations and Prayers upon the ſeven Days of the Week. 4. *Cato Variegatus*, or Cato's Moral Diſtichs varied, &c. Mr. Granger obſerves, that his Chronicle of the Kings of England was ever more eſteemed by readers of a lower claſs than by ſuch as had a critical knowledge of hiſtory. The language of it was, in this reign, called polite; and it long maintained its reputation, eſpecially among country gentlemen. The author ſeems to have been ſometimes more ſtudious to pleaſe than to inform, and with that view to have ſacrificed even chronology itſelf to method. In 1658, Edward Philips, nephew to Milton, publiſhed a third edition of this work, with the addition of the reign of Charles I. It has been ſeveral times reprinted ſince, and is now carried as low as the reign of George I. Sir Richard alſo tranſlated ſeveral works from the French and Italian; and died very poor, in the Fleet priſon, on the 18th of February 1645.

BAKER, a perſon whoſe occupation or buſineſs is to bake bread. (See the articles BAKING and BREAD.) The learned are in great doubt about the time when baking firſt became a particular profeſſion and bakers were introduced. It is however generally agreed, that they had their riſe in the eaſt, and paſſed from Greece to Italy after the war with Pyrrhus, about the year of Rome 583; till which time, as in the farm-houſes in England, every houſewife was her own baker; for the word *piſtor*, which we find in Roman authors before that time, ſignified a perſon who ground or pounded the grain in a mill or mortar to prepare it for baking, as Varro obſerves. According to Athenæus, the Cappadocians were the moſt applauded bakers, after them the Lydians, then the Phœnicians. To the foreign bakers brought into Rome, were added a number of freed men, who were incorporated into a body, or, as they called it, a *college*; from which neither they nor their children were allowed to withdraw. They held their effects in common, and could not diſpoſe of any part of them. Each bakehouſe had a patronus, who had the ſuperintendency thereof; and theſe patroni elected one out of their number each year, who had ſuperintendence over all the reſt, and the care of the college. Out of the body of the bakers every now and then one was admitted among the ſenators. To preſerve honour and honeſty in the college of bakers, they were expreſsly prohibited all alliance with comedians and gladiators; each had his ſhop or bakehouſe, and they were diſtributed into fourteen regions of the city. They were excuſed from guardianſhips

and other offices, which might divert them from their employment. By our ſtatutes bakers are declared not to be handicrafts. No man for uſing the myſteries and ſciences of baking, brewing, ſurgery, or writing, ſhall be interpreted a handicraft. The bakers were a brotherhood in England before the year 1155, in the reign of king Henry II. though the white bakers were not incorporated till 1407, by king Edward III. and the brown bakers not till 1621, in king James I.'s time. Their hall is in Harp-lane, Thames-ſtreet; and their court-day on the firſt Monday of the month. They make the 19th company; and conſiſt of a warden, 4 maſters, 30 aſſiſtants, and 140 men on the livery, beſides the commonalty. The French had formerly a great baker, *grand panetier de France*, who had the ſuperintendency of all the bakers of Paris.

BAKEWELL, a pretty large town of Derbyſhire in England, ſeated on the river Wye, on the north-ſide of the Peak. W. long. 2. 30. N. lat. 55. 15.

BAKING, the art of preparing bread, or reducing meals of any kind, whether ſimple or compound, into bread. (See the article BREAD.) The various forms of baking among us may be reduced into two, the one for unleavened, the other for leavened bread. For the firſt, the chief is manchet-baking; the proceſs whereof is as follows: The meal, ground and boulted, is put into a trough; and to every buſhel are poured in about three pints of warm ale, with barm and ſalt to ſeaſon it. This is kneaded well together with the hands through the brake; or, for want thereof, with the feet, through a cloth: after which, having lain an hour to ſwell, it is moulded into manchets; which, ſcored in the middle, and pricked at the top, to give room to riſe, are baked in the oven by a gentle fire. For the ſecond, ſometimes called *cheat-bread baking*, it is thus: Some leaven (ſaved from a former batch) filled with ſalt, laid up to ſour, and at length diſſolved in water, is ſtrained through a cloth into a hole made in the middle of the heap of meal in the trough; then it is worked with ſome of the flour into a moderate conſiſtence: this is covered up with meal, where it lies all night; and in the morning the whole heap is ſtirred up, and mixed with a little warm water, barm, and ſalt, by which it is ſeaſoned, ſoftened, and brought to an even leaven: it is then kneaded, moulded, and baked, as before.

To raiſe a buſhel of flour with a tea-ſpoonful of yeaſt.—We will ſuppoſe you want to bake a buſhel of flour, and have but one tea ſpoonful of barm. Put your flour into the kneading-trough; then take about three quarters of a pint of warm water, and take the tea-ſpoonful of thick ſteady barm and put it into the water, ſtir it until it is thoroughly mixed with the water. Then make a hole in the middle of the flour large enough to contain two gallons of water, pour in your ſmall quantity; then take a ſtick about two feet long (which you may keep for that purpoſe), and ſtir in ſome of the flour, until it is as thick as you would make batter for a pudding; then ſtrew ſome of the dry flour over it, and go about your uſual buſineſs for about an hour. Then take about a quart of warm water more, and pour in; for in one hour you will find that ſmall quantity raiſed ſo, that it will break through the dry flour which you ſhook over it; and when you have poured in the quart of warm water, take your ſtick as before, and ſtir in ſome more flour, until it is as thick as before; then ſhake ſome more dry flour over it, and leave it for two hours more, and then you will find it riſe and break through the dry flour again; then you may add three quarts or a gallon of water more, and ſtir in the flour and make it as thick as at firſt, and cover it with dry flour again; in about three or four hours more you may mix up your dough, and then cover it up warm; and in four or five hours more you may put it into the oven, and you will have as light bread as though you had put a pint of barm. It does not take above a quarter of an hour more time than the uſual way of baking, for there is no time loſt but that of adding water three or four times. The author of this method conſtantly bakes this way in the morning about ſix or ſeven o'clock, puts the flour out, and puts this ſmall quantity of barm into the before-mentioned quantity of water; in an hour's time ſome more, in two hours more a greater quantity; about noon makes up the dough, and about ſix in the evening it is put into the oven, and he has always good bread, never heavy nor bitter.

When you find the whole maſs of mixed flour ſpunged large enough, before you put in the reſt of your water, you ſhould, with both your hands, mix that which is ſpunged and the dry flour all together, and then add the remainder of warm water, and your dough will riſe the better and eaſier. The reaſon why people make heavy bread is, not becauſe they have not barm enough, but becauſe they do not know that barm is the ſame to flour as fire is to fuel; that, as a ſpark of fire will kindle a large body by only blowing of it up, ſo will a thimble-full of barm, by adding of warm water, raiſe or ſpunge any body of flour; for warm water gives freſh life to that which is before at work: ſo that the reaſon of making bread heavy is, becauſe the body ſpunged is not large enough, but was made up and put into the oven before it was properly fermented.

In regard to the difference of ſeaſons, he directs, that in the ſummer you ſhould put your water blood-warm; and in winter, in cold froſty weather, as warm as you can bear your hand in it without making it ſmart; making ſure to cover up your dough very warm in the winter, and your covering of it with dry flour every time you add warm water, will keep in the heat. When you have added ſix or eight quarts of warm water, as before mentioned, in ſuch a gradual way, you will find all that body of flour which is mixed with the warm water, by virtue of that one tea-ſpoonful of barm, brought into great agitation, and fermenting in the moſt favourable manner imaginable.

BAKOU, or BAKU, a town of Perſia, in the province of Shirivan, ſituated at the extremity of the gulf of Ghilan on the Caſpian Sea. E. long. 51. 30. N. lat. 40. 20.

BALAAM, a prophet and diviner of the city of Pethor upon the Euphrates, whoſe practices with Balak king of the Moabites are recorded in the book of Numbers, chap. xxii. It is a queſtion much debated among divines, whether Balaam was a true prophet of God, or no more than a magician or fortune-teller, as the Jews, as well as the ancient fathers ſuppoſed him. It cannot be denied, however, that the ſcripture expreſsly calls him a prophet (Pet. ii. 5.); and therefore ſome later writers have imagined that he had once been a good man and true prophet, till loving the wages of iniquity, and proſtituting the honour of his office to covetouſneſs, he apoſtatized from God, and betaking himſelf to idolatrous practices, fell under the deluſion of the devil, of whom he learnt all his magical enchantments, though at this juncture, when the preſervation of his people was concerned, it might be conſiſtent with God's wiſdom to appear to him, and vouchſafe his revelations. As to what paſſed between him and his aſs, when that animal was miraculouſly enabled to ſpeak to its maſter; commentators are divided in their opinions concerning this fact, whether it really and literally happened as Moſes relates it; or whether it be an allegory only, or the mere imagination or viſion of Balaam. This indeed is ſo wonderful an inſtance, that ſeveral of the Jewiſh doctors, who upon other occaſions are fond enough of miracles, ſeem as if they would hardly be induced to aſſent to this. Philo, in his *Life of Moſes*, paſſes it over in ſilence; and Maimonides pretends that it happened to Balaam in a prophetic viſion only. But St. Peter (2 Pet. ii. 16.) ſpeaks of this fact as literal and certain, and ſo all inter-

preters explain it. St. Auſtin, who underſtands it exactly according to the letter, finds nothing in the whole account more ſurpriſing than the ſtupidity of Balaam, who heard his aſs ſpeak to him, and anſwered it as if he talked with a reaſonable perſon. He is of opinion, that this diviner was accuſtomed to prodigies like this, or that he was ſtrangely blinded by his avarice, not to be ſtopped by an event of ſo extraordinary a nature. Le Clerc thinks, that Balaam might probably have imbibed the doctrine of tranſmigration of ſouls, which was certainly very common in the eaſt; and from thence he might be the leſs aſtoniſhed at hearing a brute ſpeak. And Dr. Patrick thinks that Balaam was in ſuch a rage and fury at the ſuppoſed perverſeneſs of his beaſt cruſhing his foot, that for the preſent he could think of nothing elſe; though the conciſeneſs of Moſes's relation, who muſt be preſumed to have omitted many circumſtances, which if rightly known would diſpel this and many more difficulties that may be imagined in this tranſaction, does certainly furniſh us with a better and more ſatisfactory anſwer. St. Auſtin is of opinion, that God had not given the aſs a reaſonable ſoul; but permitted it to pronounce certain words, in order to reprove the prophet's covetouſneſs. Gregory of Nyſſa ſeems to think that the aſs did not utter any word articulately or diſtinctly; but that, having brayed as uſual, the diviner, whoſe practice it had been to draw preſages from the cries of beaſts and ſinging of birds, comprehended eaſily the aſs's meaning by its noiſe; Moſes, deſigning to ridicule this ſuperſtitious art of augurs and foothſayers, as if the aſs really ſpoke in words articulate.

We muſt own, ſays Calmet, that this is a miraculous fact related by an inſpired writer, whoſe authority we are not allowed to call in queſtion in the leaſt particular: but we ſhould ſtudy ſuch ways of explaining it as are moſt conformable to reaſon, and moſt proper to ſolve the difficulties of it, without attacking the truth of the hiſtory. Now it is very poſſible for God to make an aſs ſpeak articulately; it is indeed miraculous, and above the ordinary faculty of this animal, but not againſt the laws of nature.

BALA, a town of Merionethſhire in Wales. W. long. 3. 37. N. lat. 52. 54.

BALÆNA, or WHALE, in zoology, a genus of the mammalia claſs, belonging to the order of *cete*. The characters of this genus are theſe: The balæna, in place of teeth, has a horny plate on the upper jaw, and a double fiſtula or pipe for throwing out water. The ſpecies are four, viz.

1. The myſticetus, or common whale, which has many turnings and windings in its noſtrils, and has no fin on the back. This is the largeſt of all animals; it is even at preſent ſometimes found in the northern ſeas 90 feet in length; but formerly they were taken of a much greater ſize, when the captures were leſs frequent, and the fiſh had time to grow. Such is their bulk within the arctic circle; but in thoſe of the torrid zone, where they are unmoleſted, whales are ſtill ſeen 160 feet long. The head is very much diſproportioned to the ſize of the body, being one third the ſize of the fiſh: the under lip is much broader than the upper. The tongue is compoſed of a ſoft ſpongy fat, capable of yielding five or ſix barrels of oil. The gullet is very ſmall for ſo vaſt a fiſh, not exceeding four inches in width. In the middle of the head are two orifices, through which it ſpouts water, to a vaſt height, and with a great noiſe, eſpecially when diſturbed or wounded. The eyes are not larger than thoſe of an ox, and when the cryſtalline humour is dried, it does not appear larger than a pea. They are placed towards the back of the head, being the moſt convenient ſituation for enabling them to ſee both before and behind; as alſo to ſee over them, where their food is principally found. They are guarded by eye-lids and eye-laſhes, as in quadrupeds; and they ſeem to be very ſharp-ſighted.

Nor is their ſenſe of hearing in leſs perfection: for they are warned at great diſtances of any danger preparing againſt them. It would ſeem as if nature had deſignedly given them theſe advantages, as they multiply little, in order to continue their kind. It is true, indeed, that the external organ of hearing is not perceptible, for this might only embarraſs them in their natural element; but as ſoon as the thin ſcarf-ſkin after mentioned is removed, a black ſpot is diſcovered behind the eye, and under that is the auditory canal, that leads to a regular apparatus for hearing. In ſhort, the animal hears the ſmalleſt ſounds at very great diſtances, and at all times, except when it is ſpouting water; which is the time that the fiſhers approach to ſtrike it. What is called *whalebone*, adheres to the upper jaw, and is formed of thin parallel laminæ, ſome of the longeſt four yards in length: of theſe there are commonly 350 on each ſide, but in very old fiſh more; about 500 of them are of a length fit for uſe, the others being too ſhort. They are ſurrounded with long ſtrong hair, not only that they may not hurt the tongue, but as ſtrainers to prevent the return of their food when they diſcharge the water out of their mouths. The real bones of the whale are hard, porous, and full of marrow. Two great ſtrong bones ſuſtain the upper lip, lying againſt each other in the ſhape of an half-moon.

The tail is broad and ſemilunar; and when the fiſh lies on one ſide, its blow is tremendous. The tail alone is made uſe of to advance itſelf forward in the water; and it is ſurpriſing to ſee with what force and celerity its enormous bulk cuts through the ocean. The fins are only made uſe of for turning in the water, and giving a direction to the velocity impreſſed by the tail. The female indeed makes uſe of them, when purſued, to bear off her young, clapping them on her back, and ſupporting them by the fins on each ſide from falling. The whale varies in colour; the back in ſome being red, the belly generally white. Others are black, ſome mottled, others quite white; according to the obſervation of Martin, who ſays, that their colours in the water are extremely beautiful, and that their ſkin is very ſmooth and ſlippery. The outward or ſcarf-ſkin of the whale is no thicker than parchment; but this removed, the real ſkin appears, of about an inch thick, and covering the fat or blubber that lies beneath: this is from eight to twelve inches in thickneſs; and is, when the fiſh is in health, of a beautiful yellow. The muſcles lie beneath; and theſe, like the fleſh of quadrupeds, are very red and tough. The penis is eight feet in length, incloſed in a ſtrong ſheath. The teats in the female are placed in the lower part of the belly.

In copulation, the female joins with the male, as is aſſerted, *more humano*; and once in two years feels the acceſſes of deſire. Their fidelity to each other exceeds whatever we are told even of the conſtancy of birds. Some fiſhers, as Anderſon informs us, having ſtruck one of two whales, a male and a female, that were in company together, the wounded fiſh made a long and terrible reſiſtance: it ſtruck down a boat with three men in it with a ſingle blow of its tail, by which all went to the bottom. The other ſtill attended its companion, and lent it every aſſiſtance; till, at laſt, the fiſh that was ſtruck ſunk under the number of its wounds; while its faithful aſſociate, diſdaining to ſurvive the loſs, with great bellowing, ſtretched itſelf upon the dead fiſh, and ſhared his fate. The whale goes with young nine or ten months, and is then fatter than uſual, particularly when near the time of bringing forth. It is ſaid that the embryo, when firſt perceptible, is about 17 inches long, and white; but the cub, when excluded, is black, and about 10 feet long. She generally produces one young one, and never above two. When ſhe ſuckles her young, ſhe

throws herſelf on one ſide on the ſurface of the ſea, and the young one attaches itſelf to the teat.

Nothing can exceed the tenderneſs of the female for her offſpring; ſhe carries it with her wherever ſhe goes, and, when hardeſt purſued, keeps it ſupported between her fins. Even when wounded, ſhe ſtill claſps her young one; and when ſhe plunges to avoid danger, takes it to the bottom; but riſes ſooner than uſual, to give it breath again. The young ones continue at the breaſt for a year; during which time, they are called by the ſailors *ſhort-heads*. They are then extremely fat, and yield above 50 barrels of blubber. The mother at the ſame time is equally lean and emaciated. At the age of two years they are called *ſtints*, as they do not thrive much immediately after quitting the breaſt; they then ſcarcely yield above 20 or 24 barrels of blubber: from that time forward they are called *ſkull-fiſh*, and their age is wholly unknown.

Every ſpecies of whale propagates only with thoſe of its own kind, and does not at all mingle with the reſt: however, they are generally ſeen in ſhoals of different kinds together, and make their migrations in large companies from one ocean to another. They are gregarious animals; which implies their want of mutual defence againſt the invaſions of ſmaller, but more powerful, fiſhes. It ſeems aſtoniſhing, therefore, how a ſhoal of theſe enormous animals find ſubſiſtence together, when it would ſeem that the ſupplying even one with food would require greater plenty than the ocean could furniſh. To increaſe our wonder, we not only ſee them herding together, but uſually find them fatter than any other animals of whatſoever element. We likewiſe know that they cannot ſwallow large fiſhes, as their throat is ſo narrow, that an animal larger than an herring could not enter. How then do they ſubſiſt and grow ſo fat? A certain ſort of ſmall ſnail, or (as Linnæus ſays) the *meduſa* or ſea-blubber, is ſufficient for this ſupply. Content with this ſimple food, it purſues no other animal, leads an inoffenſive life in its element, and is harmleſs in proportion to its ſtrength to do miſchief.

As the whale is an inoffenſive animal, it is not to be wondered that it has many enemies, willing to take advantage of its diſpoſition and inaptitude for combat. There is a ſmall animal, of the ſhell-fiſh kind, called the *whale-louſe*, that ſticks to its body, as we ſee ſhells ſticking to the foul bottom of a ſhip. This inſinuates itſelf chiefly under the fins; and whatever efforts the great animal makes, it ſtill keeps its hold, and lives upon the fat, which it is provided with inſtruments to arrive at.

The ſword-fiſh, however, is the whale's moſt terrible enemy. "At the ſight of this little animal," ſays Anderſon," "the whale ſeems agitated in an extraordinary manner; leaping from the water as if with affright: wherever it appears, the whale perceives it at a diſtance, and flies from it in the oppoſite direction. I have been myſelf," continues he, "a ſpectator of their terrible encounter. The whale has no inſtrument of defence except the tail: with that it endeavours to ſtrike the enemy; and a ſingle blow taking place, would effectually deſtroy its adverſary: but the ſword-fiſh is as active as the other is ſtrong, and eaſily avoids the ſtroke; then bounding into the air, it falls upon its great ſubjacent enemy, and endeavours not to pierce it with its pointed beak, but to cut with its toothed edges. The ſea all about it is ſeen dyed with blood, proceeding from the wounds of the whale; while the enormous animal vainly endeavours to reach its invader, and ſtrikes with its tail againſt the ſurface of the water, making a report at each blow louder than the noiſe of a cannon." In calm weather, the fiſhermen lie upon their oars as ſpectators of this combat, until they perceive the whale at the laſt gaſp: then they row towards him; and his enemy retiring at their approach, they enjoy the fruits of the victory. This account, however, is different in ſeveral reſpects from that commonly given by ſeamen; who report that a fiſh called the *Threſher* (a ſpecies of SQUALUS) is in league with the *ſword-fiſh*; and that the former keeps on the back of the whale, while the latter wounds it underneath in the belly, which occaſions him to riſe to the ſurface of the water, and to give the threſher an opportunity of aſſiſting in the combat. This he does by throwing himſelf into an erect poſture; and like a *boy* tumbling neck over heels, falls down with aſtoniſhing force on the back of his prey: and thus they go on till the poor whale is deſtroyed. The grampus, and other large fiſhes of the cetaceous order, are attacked and deſtroyed by the ſame enemies in a ſimilar manner.—The whale has another deſperate enemy, a kind of ſhark, of different ſizes from one to three fathoms; ſo voracious, that it tears large pieces of fleſh from the whale, as if they had been dug with ſhovels.

2. The phyſalus, or fin-fiſh, is diſtinguiſhed from the common whale by a fin on the back, placed very low and near the tail. The length is equal to that of the common kind, but much more ſlender. It is furniſhed with whalebone in the upper jaw, mixed with hairs, but ſhort and knotty, and of little value. The blubber alſo on the body of this kind is very inconſiderable. Theſe circumſtances, added to its extreme fierceneſs and agility, which render the capture very dangerous, cauſe the fiſhers to neglect it. The natives of Greenland, however, hold it in great eſteem, as it affords a quantity of fleſh which to their palate is very agreeable. The lips are brown, and like a twiſted rope: the ſpout-hole is as it were ſplit in the top of its head, through which it blows water with much more violence, and to a greater height, than the common whale. The fiſhers are not very fond of ſeeing it, for on its appearance the others retire out of thoſe ſeas. Some writers conjecture this ſpecies to have been the φυσαλὼ, and *phyſeter*, or blowing-whale of Oppian, Ælian, and Pliny: but ſince thoſe writers have not left the leaſt deſcription of it, it is impoſſible to judge which kind they meant; for in reſpect to the faculty of ſpouting out water, or blowing, it is not peculiar to any one ſpecies, but common to all the whale kind. The phyſalus inhabits the European and American oceans; and feeds upon herrings and other ſmall fiſh.

3. The boops, or pike-headed whale, has a double pipe in its ſnout, three fins like the former, and a hard horny ridge on its back. The belly is full of longitudinal folds or rugæ. It frequents the northern ocean. The length of that taken on the coaſt of Scotland, as remarked by Sir Robert Sibbald, was 46 feet, and its greateſt circumference 20. This ſpecies takes its name from the ſhape of the noſe, which is narrower and ſharper-pointed than that of other whales.

4. The muſculus has a double pipe in its front, and three fins; the under jaw is much wider than the upper one. It frequents the Scotch coaſts, and feeds upon herrings.—Linnæus makes the *phyſeter* and *delphinus*, which are ranked among the whales by ſome writers, two diſtinct genera. See PHYSETER and DELPHINUS.

Whale fiſhery.—Theſe immenſe fiſh are chiefly caught in the North Seas. The largeſt ſort are found about Spitzbergen, ſome of them being there two hundred feet in length. Thoſe on the coaſts of America are about ninety or a hundred; and thoſe on the coaſts of Guyenne, and the Mediterranean, are the ſmalleſt of all.

The firſt perſons that ſeem to have been employed in the *whale-fiſhery* were the Norwegians; probably ſoon after their diſcovery of Greenland, about the year 837; for we find, that kind Alfred received information from Octher, a Norwegian, in 887 or 890, that the Norwegians were employed in this

fiſhery. He tells the king, that he ſailed along the Norway coaſt, as far North as the whale-hunters commonly uſe to travel; but it ſeems that all knowledge of this gainful employ was loſt, at leaſt in Britain, for almoſt ſeven centuries. The Biſcayners were alſo concerned in it, for the ſake not only of the oil, but alſo of the whale-bone, before the Engliſh; who, though their north-eaſt diſcoveries in 1553 had pointed out the way to the *whale-fiſhery* at Spitzbergen, were yet ſo ignorant of the buſineſs in 1575, as to be under a neceſſity of procuring information and aſſiſtance from Biſcay for this purpoſe. The firſt mention that occurs in the Engliſh hiſtory of whale-fins, or whale-bone, is in 1593, when eight hundred fins, part of the cargo of ſome Biſcay ſhips, that had been wrecked three years before, were brought to England from the bay of St. Laurence in America by an Engliſh ſhip; previous to which time, the ladies' ſtays, as Mr. Anderſon obſerves, muſt have been made of ſplit or ſome other tough and pliant wood; the *whale-fiſhery* being carried on for the ſake of oil long before the diſcovery of the uſe of the whale-bone, which was firſt brought to England, with the blubber or oil, in 1617. The Engliſh, having been accuſtomed to the Northern ſeas, by their repeated trials for a north-weſt and north-eaſt paſſage to China, in 1598 commenced their *fiſhery* for *whales* at or near Spitzbergen, where thoſe animals reſort in greater numbers than any where elſe. But the firſt Engliſh voyage for the purpoſe of killing *whales* was undertaken by the Ruſſian company in 1611, who ſent two ſhips thither, with ſix Biſcayners, expert in the buſineſs; the ſhips were loſt, though their men and boats, &c. were ſaved by a ſhip of Hull, then at Spitzbergen. In 1618, the Eaſt India adventurers joined ſtock with the Ruſſian company for purſuing the *whale-fiſhery*, and fitted out thirteen ſhips, but the voyage proved unſucceſsful. The manner of managing the whale-fiſhing, both by the Engliſh and Dutch, was then quite different from the preſent mode: the whales, having never been diſturbed, reſorted to the bays near the ſhore, ſo that their blubber was eaſily landed at Spitzbergen, where they erected cookeries, i. e. coppers, &c. for boiling their oil; and theſe they left ſtanding from year to year, and only brought home the purified oil and the whale-bone. The Engliſh, having been the firſt in that *fiſhery*, kept poſſeſſion of the beſt bays; the Hollanders, coming later, were obliged to find bays farther to the North; the Danes, who came later into this trade than the Dutch, got in between the Engliſh and Dutch; the Hamburghers came after the Danes, and after them came the French, and alſo the Biſcayners, the moſt ancient whale-fiſhers in Europe, except the Norwegians, and purſued the ſame method. But, ſince theſe times, the whales are leſs frequent in the bays, and are commonly among the openings of the ice farther from the land; ſo that the blubber is now cut from the whales after they are killed, in the manner deſcribed in the ſequel of this article, and brought home to be boiled and purified, and the whale-fins are alſo to be cleaned at home. This latter method of fiſhing, being dangerous to ſhipping, diſcouraged our Engliſh adventurers who traded in a company; ſo that they ſoon after, viz. in 1619, relinquiſhed the *fiſhery*. Some private adventurers proſecuted the trade with various ſucceſs in 1621, 1622, and 1623, when they were moleſted by the Dutch, who were then ſuperior in number of ſhips, and had the prince of Orange's commiſſion; for in 1622, the Dutch, for preventing of diſturbance in their *whale-fiſhery*, had erected an excluſive company, who, by their own power, might protect it: however, the *fiſhery* was laid open, in 1643, to all the inhabitants of the ſeven provinces. As to the claims which different European nations have alleged in favour of a monopoly of the *whale-fiſhery* at Spitzbergen, it has been urged by the Engliſh that they were the firſt diſcoverers, by Sir Hugh Willoughby in 1553; by the Dutch, who deny his having been ſo far north as Spitzbergen, and maintain their having firſt diſcovered it in 1596; by the Danes, that Spitzbergen is a part of Old Greenland, poſſeſſed in early times by them. But all nations have now wiſely given up their excluſive pretenſions, and that part of the world remains now alike free to all nations for this *fiſhery*. In 1636, king Charles I. confirmed, by his proclamation, the Greenland *whale-fiſhery* ſolely to the Ruſſia company, who ſoon relinquiſhed it. In 1672 an attempt was made for reviving this *fiſhery*, when an act was paſſed for the encouragement of it; and this act was continued in 1690, but without any great effect. A corporation was eſtabliſhed by act of parliament, in 1693, for carrying on this *fiſhery*, called the GREENLAND *Company*.

In 1725 the Engliſh South-ſea company revived this trade: but, after great loſſes, were obliged to diſcontinue it in 1733. At this time a bounty of 20*s*. per ton was granted by parliament to Britiſh ſhips of two hundred tons and upwards, fitted out for the *whale-fiſhery*, which bounty was not only continued in 1740, but an additional bounty of 10*s*. per ton was granted during the war with Spain, in which we were then engaged; and in 1749, a farther bounty or allowance of 20*s*. over and above that of 1733, was granted to all Britiſh whale-fiſhing ſhips, and extended to ſhips of the Britiſh American colonies; and, in 1755, this bounty was extended to ſhips under two hundred tons burthen; and, as a farther encouragement to this *fiſhery*, foreign proteſtants ſerving three years in it were naturalized on certain conditions. See Hackluyt's Coll. of Voyages, and Anderſon's Hiſtory of Commerce.

But, notwithſtanding the great importance and numerous advantages of this trade to England, and the encouragement which the legiſlature has given it, the Dutch have carried it on with much greater ſucceſs than the Engliſh; and it is even eſteemed one of the principal branches of their flouriſhing trade. The chief merchants of the ſeveral provinces aſſociate themſelves into a body for carrying it on, and ſend every year a great fleet of veſſels to the North Seas for that purpoſe. They attempted to make their firſt eſtabliſhments in Greenland; but not ſucceeding, they have ſince fixed their *fiſhery* about the weſtern coaſt of Spitzbergen, from the latitude of 76 deg. 40 min. to 80 deg. and from eaſt to weſt about eighty-nine leagues.

To give ſome idea of the manner and importance of this trade, we ſhall here ſubjoin the diſcipline for a long time obſerved in the *whale-fiſhery*; the method of fiſhing; the cargo and equipage of a veſſel; and the produce thereof.

The diſcipline is adjuſted by a ſtanding regulation, conſiſting of twelve articles; the principal whereof are:

That in caſe a fiſhing-veſſel be ſhipwrecked and the captain and crew ſaved, the next veſſel they meet ſhall take them in; and the ſecond veſſel take half of them from the firſt; but that no veſſel ſhall be obliged to take any of the loading of a veſſel ſhipwrecked; that the effects of a ſhipwrecked veſſel, which are abſolutely relinquiſhed, and which another captain ſhall find, and take up, upon his arrival in Holland, he ſhall account for one half of them to the proprietors of the ſhipwrecked veſſel, clear of all expences; that if the crew deſert a ſhipwrecked veſſel they ſhall have no claim to any of the effects ſaved, but the whole ſhall go to the proprietor; but if they be preſent when the effects are ſaved, and aſſiſt therein, they ſhall have one fourth thereof; that if a perſon kill a fiſh on the ice, it ſhall be reputed his own, ſo long as he leaves any perſon with it; but the minute he leaves it, it becomes the due of the firſt captain that comes that way; but that, if a fiſh be tied to an anchor, or a rope faſtened to the ſhore, it ſhall remain to its firſt proprietor, though he leave it alone; that if any perſon be wounded or lamed in the ſervice, the commiſ-

ſioners of the *fiſhery* undertake to procure him a reaſonable ſatisfaction, to which the whole fleet ſhall contribute.

Beſides this general regulation, to the obſervance of which all the captains, pilots, and maſters of veſſels, are obliged to ſwear before they put to ſea, there is alſo a particular one for each ſhip's crew, which they are all ſworn to execute, in preſence of one of the commiſſioners, who goes aboard every ſhip, to receive the oath.

This regulation is a kind of charter-party, importing, that they will attend prayers morning and evening, on pain of an amercement, at the diſcretion of the captain; that they will not get drunk, nor draw their knives, on forfeiture of half of their wages; nor fight, on forfeiture of the whole; that no one ſhall lay wagers on the good or ill ſucceſs of the fiſhing, nor buy or ſell on theſe conditions, in caſe we take one or more fiſh, on penalty of twenty-five florins; that they will be contented with the proviſions allowed them; and that they will never light fire, candle, or match, by night or day, without the captain's leave, on the like penalty.

After the reading of this regulation, the crew are all called, to receive the cuſtomary gratuity before their ſetting out, with an aſſurance of another ſum at their return in proportion to the ſucceſs of the fiſhing.

The captain, on this occaſion, receives from a hundred to a hundred and fifty florins; the pilot from forty to ſixty; each harpooner from forty to fifty florins; the other officers from twenty-ſix to thirty-ſix florins; the elder ſailors twenty; and the younger twelve.

The fleet, which conſiſts moſtly of fluyts from two to three hundred tons, and from thirty ſix men to forty-two, uſually ſets ſail about the beginning of April, and takes its courſe by the iſles of Iceland, from 60 to 61 degrees of latitude; after which, leaving them to the weſt, it ſteers northward, through 73, 74, and 75 deg. of latitude, where they begin to find the ice.

It is among theſe huge heaps of ice, wherewith the whole quarter is filled, that they firſt begin to ſpy the whales; and there moſt of the veſſels fix their abode for the fiſhing. But as the fiſh are larger and fatter the farther north they go, ſome captains will venture as far as 80 or 82 deg. of north lat. Each veſſel of three hundred tons has ſix ſhalloops; and each ſhalloop has ſix harpooners, with five ſeamen to row it. To every ſhalloop there are ſeven lines, of three inches circumference; five of them in the hind part of the veſſel, and two before. The hind lines together make ſix hundred fathoms, and, with the addition of the other two, eight hundred and eighty. If the *whale* dive deeper, or run farther underneath the ice than this ſtint, the line muſt be cut, leſt the ſhalloop be drawn after it.

In the Engliſh *whale-fiſhery* every ſhip has ſix or ſeven boats; each of which has one harpooner, one boat-ſteerer, one manager of the line, and four ſeamen to row it. In each boat there are two or three harpoons, ſeveral lances, and ſix lines faſtened together, each line being a hundred and twenty fathoms long. To each harping iron is faſtened a ſtrong ſtick, about ſix feet long, and a ſoft pliable line, about ſix fathoms long, called the fore-gauger, which is faſtened to the lines in the boat. When more line is wanted, the lines of a ſecond boat are faſtened to thoſe of the firſt.

The inſtrument, wherewith the *whale* is ſtruck, is a HARPING-*iron*, or javelin, five or ſix feet long, pointed with ſteel, in a triangular ſhape, like the barb of an arrow.

The harpooner, upon ſight of the fiſh, from one end of the ſhalloop where he is placed, flings the harping iron with all his might againſt his back; and, if he be ſo happy as to make it penetrate the ſkin and fat into the fleſh, he lets go a ſtring faſtened to the harping-iron, at the end whereof is a dry-gourd, which ſwimming on the water, diſcovers whereabout the *whale* is; for the minute he is ſtruck, he plunges to the bottom, commonly ſwimming againſt the wind.

If the *whale* return to breathe in the air, the harpooner takes occaſion to give him a freſh wound, till, fainting by the loſs of blood, the men have an opportunity of approaching him, and, thruſting a long ſteeled lance under his gills into his breaſt, and through the inteſtines, ſoon diſpatch him; and when the carcaſe begins to float, they cut holes in the fins and tail; and, tying a rope in theſe holes, they tow him to the veſſel, where he is faſtened along the larboard ſide of the ſhip, floating upon his back almoſt level with the ſea. They then begin to take the blubber or fat, and the fins, as they are called, or *whale-bone*.

In order to this, ſeveral men ſtand upon the fiſh, with a kind of iron calkers, or ſpurs, to prevent their ſlipping; and cut off the tail, which is hoiſted upon deck, and then cut out ſquare pieces of blubber, weighing two or three thouſand pounds, which are hoiſted on board with the capſtan, where each piece is again cut into ſmaller pieces, each of two or three hundred pounds weight; and theſe are thrown into the hold, and left to drain for three or four days. When all the blubber is cut from the belly of the fiſh, it is turned on one ſide, by means of a piece of blubber left in the middle, called the *cant*, or turning-piece; and then they cut out this ſide in large pieces, called *hockies*, as before, and alſo the whale-bones with the gums, which are preſerved entire, and hoiſted on deck, where the blades are cut and ſeparated, and left till they have time to clean and ſcrape them. The fiſh is next turned on its back and the blubber cut out from the back and crown bone; and laſt of all they cut the blubber from the other ſide as before. They then cut out the two large jaw-bones, ſituate in the under-lip, which are hoiſted on deck, cleanſed and faſtened to the ſhrouds, and tubs are placed under them to receive the oil which they diſcharge; this oil belongs to the captain, and likewiſe the tail and fins. The carcaſe is left to float, and ſupplies food for Greenland birds, called mallemucks, &c. In three or four days, they hoiſt the pieces of blubber out of the hold, chop them, and put ſmall pieces through the bung-holes into their caſks. A *whale*, the longeſt blade of whoſe mouth is nine or ten feet, generally fills thirty butts with blubber; but one of the largeſt fiſh will fill ſeventy butts and more. A good large *whale* is valued at about 1000l. ſterling. A full ſhip of three hundred tons is worth, clear of all expence, at leaſt 5000l. There is a premium aſſigned to every perſon in the ſhip for every *whale*: the captain has three guineas; the mate, one; each harpooner, one; the ſurgeon, one; carpenter, one; cook and boat-ſteerers, half-a-guinea each; a common man, a crown; and each boy, half-a-crown. The captain and harpooners have no wages; but the captain is allowed twenty-five pounds, and the harpooners, nine guineas each. In a ſucceſsful voyage they have ſix ſhillings for every ton of oil boiled in Greenland-dock; but the reſt of the ſhip's company have monthly wages, beſides the fiſh-money, but no oil-money.—Nothing now remains, but to ſail homewards, where the fat is to be boiled, and melted down into train-oil.

The *whale-fiſhery* of the Caroline iſlands is more eaſy and agreeable than that of all other places, and, beſides the great profit, affords a pleaſant ſpectacle to multitudes of people on the ſhores.

There are ten or twelve of theſe iſles diſpoſed in form of a circle, ſo that they make a ſort of port, in which the ſea is perpetually calm and pleaſant.

When a *whale* appears in this gulf, the people all get into their canoes, and, rowing toward the ſea, keep between the creature and its retreat, and drive him forwards towards the iſles at the bottom of the port. They drive him in this man-

ner before them into the ſhallows, where they plunge into the water themſelves, and ſome get ropes and chains about him, while others dart him with their ſpears. Their agility and addreſs are wonderful in this. The creature can never get away when they have once got him faſtened, but is ſoon killed, and got to the ſhore.

Produce of one year's whale-fiſhery. To ſtate the produce, we make choice of the *fiſhery* of 1697, as being one of the greateſt, and moſt fortunate, that ever was known; to which we ſhall add that of the year 1725.

In the year 1697, there were a hundred and eighty-nine veſſels of divers nations; whereof a hundred and twenty-one were Dutch, forty-ſeven Hamburghers, two Swediſh, four Daniſh, twelve of Bremen, two of Embden, and one of Lubeck; who caught in all 1968 fiſh.

In the year 1725, there were two hundred and twenty-ſix veſſels; whereof one hundred and forty-four were Dutch, twelve Engliſh, forty-three Hamburghers, twenty-three of Bremen, two of Berghen, two of Flenſburg. Their captures were 349 fiſh.

In 1697, the following were the number of puncheons of blubber produced, viz.

By the Dutch captures	41,344
The Hamburghers	16,414
The Swedes	540
The Danes	1710
The Bremeners	3790
The Embdeners	68

The Engliſh captures in 1725, produced 1000 puncheons of blubber, and 20 tons of whale-bone. Now, eſtimating the puncheon of blubber at thirty florins Dutch, or 2l. 15s. Engliſh, the current price in the year 1697, the total produce of the year's *fiſhing*, amounts to 175,631l. 10s. ſterling. As to fins, or *whale-bones*, ſetting them at two thouſand weight per *whale*, and an hundred weight at 4l. 4s. they will yield 165,312l. which, added to the former ſum, amounts to 340,943l. 10s.

Mr. Anderſon, in his Hiſtory of Commerce, vol. ii. p. 350, obſerves, from an account of the Dutch *whale-fiſhing* for forty-ſix years, ending anno 1721, that in this time they had employed 5886 ſhips, and caught 32907 whales, which valued one with another at 500l. give an amount for the whole value of above 16 millions ſterling, gained out of the ſea moſtly by the labour of the people, deducting the expence of the wear and tear of ſhipping, the caſks, and the proviſions. The *whale-fiſhery* begins in May, and continues through the months of June and July; but whether the ſhips have had good or bad ſucceſs, they muſt come away and get clear of the ice by the end of Auguſt; ſo that in the month of September at fartheſt they may be expected home; but the more fortunate ſhips may return in June or July.

BALAGATE, a province of the Mogul empire, and the largeſt of the three that compoſe the kingdom of Dekkan. It has Kandiſh and Barar to the north, Tillinga to the eaſt, Baglana with part of Guzerat to the weſt, and Viſiapour to the ſouth. It is a fruitful and pleaſant country, abounding with cotton and ſugar. Here they have ſheep without horns; but ſo ſtrong, that when bridled and ſaddled they will carry boys of ten years of age. Its preſent capital is Aurengabad, but formerly was Dowlet Abad; and from the latter the whole province is ſometimes called *Dowlet-Abad*.

BALAGATE *Mountains*, a chain of mountains which divides the coaſt of Malabar from that of Coromandel, running almoſt the whole length of the peninſula on this ſide the Ganges. Some parts of them are covered with fine red earth, which is blown by the ſtrong weſt winds as far as the iſland of Ceylon; and when the rays of the ſun are reflected from theſe mountains, they ſeem to be all on fire. They make ſurpriſing alterations in the ſeaſons; for on the north ſide of Cape Comorin, it is winter in May, June, July, Auguſt, and September, in which months it is ſummer on the ſouth ſide of the cape; on one ſide there are continual tempeſts, thunder and lightning, while the other enjoys a conſtant ſerenity. When black clouds are gathered about the mountains, they are followed by ſudden rain, which cauſes the overflowing of the rivers, and chokes them up with ſand, inſomuch that they are unnavigable for ſome time afterwards. The buildings and clothes of the inhabitants are ſcarce ſufficient to defend them from the weather. They live upon rice, milk, roots, and herbs, with very little meat: they have likewiſe a ſort of ſmall arrac, but are never given to drunkenneſs; nor do they import foreign vices, for they never travel abroad.

BALAGNIA, a town of Muſcovy in the province of Little Novogorod, ſeated on the Wolga. E. long. 45. 5. N. lat. 50. 36.

BALAGUER, a city of Catalonia in Spain, ſeated on the north bank of the river Segra, at the foot of a high mountain, on which there was formerly a fortreſs. E. long. 0. 48. N. lat. 41. 38.

BALAMBUAN, or PADAMBUAN, a ſtrong town of Aſia in the Indies, on the eaſt end of the iſland of Java, and capital of a territory of the ſame name. E. long. 115. 30. S. lat. 7. 50.

BALANCE, or BALLANCE, one of the ſix ſimple powers in mechanics, principally uſed in determining the equality or difference of weights in heavy bodies, and conſequently their maſſes or qualities of matter.

The balance is of two kinds: the ancient and the modern. The ancient or Roman, called alſo the *ſtatera Romana*, or ſteel-yard, conſiſts of a lever or beam, moveable on a centre, and ſuſpended near one of its extremities. The bodies to be weighed are applied on one ſide of the centre; and their weight is ſhown by the diviſion marked on the beam, where the weight, which is moveable along the lever, keeps the ſteel-yard *in equilibrio*. This balance is ſtill frequently uſed in weighing heavy bodies, ſuch as butchers meat, &c.

The modern balance now generally uſed conſiſts of a lever or beam ſuſpended exactly in the middle, having ſcales or baſons hung to each extremity. The lever is called the *jugum* or *beam*; and the two moieties thereof on each ſide the axis, the *brachia* or *arms*. The line on which the beam turns, or which divides its brachia, is called the *axis*; and when conſidered with regard to the length of the brachia, is eſteemed a point only, and called the *centre of the balance*; the handle whereby it is held, or by which the whole apparatus is ſuſpended, is called *trutina*; and the ſlender part perpendicular to the beam, whereby either the equilibrium or preponderance of bodies is indicated, is called the *tongue* of the balance.

It follows, from what has been obſerved, therefore, that in the Roman balance, the weight uſed for a counterpoiſe is the ſame, but the point of application varies; in the common balance the counterpoiſe is various, and the point of application the ſame. The principle on which each is founded, may be very eaſily underſtood from the following obſervations, and the general properties of the lever. See LEVER.

The beam, fig. 1. in Pl 45, is a lever of the firſt kind; but inſtead of reſting on a fulcrum, it is ſuſpended by ſomething faſtened to its centre of motion: conſequently the mechaniſm of the balance depends on the ſame theorems as the lever.

Now, as the quantity of matter in known weight is to its diſtance from the centre of motion, ſo is the diſtance of the unknown weight to its quantity of matter; and hence the nature and uſe of the ſteel-yard is eaſily known. Let AB (fig. 1.)

repreſent an inſtrument of this kind; *a*, the trutina or handle on which the beam turns; *k*, a ring on which the balance may be ſuſpended on a nail or hook; *f*, the hook on which the body to be weighed is hung; *c*, a collar or guard by which the hook *f* is faſtened to the beam; *g*, a moveable collar; *h*, a ſwivel; *i*, the counterpoiſe. From what has been ſaid it evidently follows, that if the body to be weighed be faſtened to the hook *f*, and the whole ſuſpended by the ring *k*, the diviſion on which the counterpoiſe is placed to maintain an equilibrium in the balance, will ſhow the weight of the body required; provided the weight of the counterpoiſe *i* be known, and the large diviſions, 1, 2, 3, &c. be equal to the diſtance between the centre of the balance and the ſcrew which faſtens the guard *c* to the ſhorter arm of the balance. It will alſo be neceſſary that the ſteel-yard itſelf, with its whole apparatus, excluſive of the counterpoiſe, be *in equilibrio*, when ſuſpended on the ring *k*. If the body to be weighed be heavier than the diviſions on the longer arm will indicate, the balance is turned the lower ſide upwards, and ſuſpended on the other ring *b*; by which means the diviſions become ſhorter, becauſe the diſtance between the trutina *d*, and the ſcrew on which the guard *c* moves, is leſs: the diviſions in the figure on this ſide extending to 17, whereas they extend only to 6 on the other. It will be unneceſſary perhaps to obſerve, that the ſame precaution, with regard to the centre of gravity when the balance is ſuſpended, is alſo neceſſary when this ſide of the balance is uſed, as we before mentioned with regard to the other.

We have already obſerved, that in the common ſcales the two brachia or arms of the balance are equal to each other, and conſequently equal weights placed in the two ſcales will be *in equilibrio* when the balance is ſuſpended on its centre. But if either of the arms of a pair of common ſcales be made longer than the other, equal weights will not balance them. Thus,

The Deceitful BALANCE, or that which cheats by the inequality of its brachia, is founded on the ſame principle as the ſteel-yard. Let there be, for example, a balance ſo conſtructed, that both the brachia with their ſcales ſhall equiponderate, but that the length of the one arm ſhall be to that of the other as 10 to 9. In this caſe, a weight of nine pounds put into the longeſt arm will counterpoiſe one of ten pounds put into the ſhorter one: but the cheat is immediately diſcovered by ſhifting the weight from one ſcale to the other; in which caſe, the balance will no longer remain *in equilibrio*.

Aſſay-BALANCE, a very nice balance uſed in docimaſtical operations, to determine exactly the weight of minute bodies; ſee fig. 2. This balance ſhould be made of the beſt ſteel, and of the hardeſt kind; becauſe that metal is not ſo eaſily ſpoiled with ruſt as iron; and it is more fit than any other to take a perfect poliſh, which at the ſame time prevents ruſt.

The ſtructure of the aſſayer's ſcale is little different from that of common ſcales, otherwiſe than by its nicety and ſmallneſs. The longer the beam of it is, the more exact may the weight of a body be found; however, 10 or 12 inches are a ſufficient length. Let the thickneſs of it be ſo little, that two drams may hardly be hung at either of its extremities without its bending; for the largeſt weight put upon it ſeldom exceeds one dram. The whole ſurface of this beam muſt be altogether without ornaments, which only increaſe the weight and gather duſt, &c. The beam is ſuſpended in a fork, the two legs of which are ſteel ſprings joined at top, but kept together below with a braſs pliant claſp, parallel, and two lines and a half diſtant from each other. This claſp being taken off, and the legs of the fork being ſtretched out, the axis of the beam may be put into two holes made for that purpoſe at the ends of the legs, or be taken away from them. Let a very ſharp needle be fixed in the head of the fork, ſtanding perpendicularly downwards, if the fork is ſuſpended, and ſo long, as that it may almoſt touch the top of the tongue of the beam put into the fork when in equilibrio. This needle is the mark of the equilibrium; and that the artiſts may be able to obſerve this, the legs of the fork muſt be broader in that place, and have an opening two or three lines wide; this fork may be adorned at pleaſure, provided the motion of the balance is not hindered by ſuch ornaments: then take two ſcales made of thin plate of ſilver, one inch and a half in diameter, hanging on three ſmall ſilk ſtrings, almoſt as long as the beam, tied together at top, with a ſilver hook in form of an S, and hang them to the extremities of the beam: a ſmaller ſilver or blued ſteel diſh, ſomewhat leſs than one inch in diameter, belongs to each of theſe ſcales. You firſt put into theſe diſhes, with a pair of pincers, the bodies to be weighed, or with a ſpoon or a ſmall ſhovel, when they are powders, and then you put them into the ſcales; therefore the ſmall diſhes muſt be perfectly equal in weight. Theſe are uſed, that bodies may be more conveniently put into and out of the ſcales, and that the latter, which are vaſtly thin, may not be bent or ſoiled, and thence rendered falſe by wiping.

This balance is ſuſpended on a moveable braſs or copper ſupport, which conſiſts of a pedeſtal, and of a column ſet upon it about 20 inches high, at the top of which comes out at right angles an arm one inch long. At the extremity of this arm, is a ſmall pulley three lines in diameter, another at the top of the column, and a third near the bottom of it; all which pullies ſhould turn very eaſily on their axes. At the diſtance of one inch and a half below the upper arm, another arm one inch and a half long comes out of the column at right angles, having a hole through it two lines long, a quarter of a line broad, and placed perpendicularly below the pulley of the upper arm, to receive a ſmall plate, one inch and a half long; and of ſuch breadth and thickneſs, as that it may freely move up and down, and yet not have too much play within the hole. This plate muſt alſo have a ſmall hook at each extremity. And as ſuch a balance will hardly ſtand ſtill in the open air, and becomes falſe when covered with duſt; it muſt be put, together with its ſupport, into a ſmall caſe as repreſented in fig. 2. having glaſſes, *a*, *a*, *a*, at top, and all round it, that you may ſee what is within.

Manner of uſing the Aſſay-BALANCE. Paſs a ſilk ſtring over the three pullies of the ſupport, and tie it at its upper extremity to the ſmall hook introduced into the hole of the inferior arm; then put the ſupport in the middle of the ſmall caſe, and paſs the other extremity of the ſilk ſtring below, through a hole bored in the middle of the lower part of the frame, containing the window in the forepart of the caſe, and faſten it to a ſmall weight of a cubic form. Suſpend the fork of the balance on the inferior hook of the plate. By this means if you move backwards and forwards the weight faſtened to the ſtring, placed upon the top of the drawer jutting out beyond the forepart of the caſe, the balance within is either lifted up or let down. But you muſt put the bodies to be weighed, and the weights themſelves, into the ſmall ſilver diſhes; and theſe, when loaded, into the ſcales, through the ſide-windows, which muſt be opened for that purpoſe. When any thing is to be added to or taken out of them, it is done with the ſmall pincers; or, if it is powder, with the ſmall ſhovel or ſpoon: but you muſt let the balance down every time any thing is to be added or taken away, that the ſcales may reſt upon the bottom of the caſe; and ſhut the windows before the balance is lifted up again, eſpecially if the air is not perfectly calm.

Hydroſtatic BALANCE, an inſtrument contrived to determine accurately the ſpecific gravity of both ſolid and fluid bodies. It is conſtructed in various forms; but we ſhall content ourſelves here with deſcribing that which appears of all others the

moſt accurate. In Plate 46, fig. 15, VCG is the ſtand or pillar of this hydroſtatic balance, which is to be fixed in a table. From the top A, hangs, by two ſilk ſtrings, the horizontal bar B B, from which is ſuſpended by a ring *i*, the fine beam of a balance *b*; which is prevented from deſcending too low on either ſide by the gently ſpringing piece *t x y z*, fixed on the ſupport M. The harneſs is annulated at *o*, to ſhow diſtinctly the perpendicular poſition of the examen, by the ſmall pointed index fixed above it.

The ſtrings by which the balance is ſuſpended, paſſing over two pullies, one on each ſide the piece at A, go down to the bottom on the other ſide, and are hung over the hook at *v*; which hook, by means of a ſcrew P, is moveable about one inch and a quarter, backward and forward, and therefore the balance may be raiſed or depreſſed ſo much. But if a greater elevation or depreſſion be required, the ſliding piece S, which carries the ſcrew P, is readily moved to any part of the ſquare braſs rod VK, and fixed by means of a ſcrew.

The motion of the balance being thus adjuſted, the reſt of the apparatus is as follows. H H is a ſmall board, fixed upon the piece D, under the ſcales d and e, and is moveable up and down in a low ſlit in the pillar above C, and faſtened at any part by a ſcrew behind. From the point in the middle of the bottom of each ſcale hangs, by a fine hook, a braſs wire *a d* and *a c*. Theſe paſs through two holes *m m* in the table. To the wire *a d* is ſuſpended a curious cylindric wire *r s*, perforated at each end for that purpoſe: this wire *r s* is covered with paper, graduated by equal diviſions, and is about five inches long.

In the corner of the board at E, is fixed a braſs tube, on which a round wire *b l* is ſo adapted as to move neither too tight nor too free, by its flat head I. Upon the lower part of this moves another tube Q, which has ſufficient friction to make it remain in any poſition required: to this is fixed an index T, moving horizontally when the wire *b l* is turned about, and therefore may be eaſily ſet to the graduated wire *r s*. To the lower end of the wire *r s* hangs a weight L; and to that a wire *p n*, with a ſmall braſs ball *g* about one-fourth of an inch diameter. On the other ſide, to the wire *a c*, hangs a large glaſs bubble R, by a horſe-hair.

Let us firſt ſuppoſe the weight L taken away, and the wire *p n* ſuſpended from S: and, on the other ſide, let the bubble R be taken away, and the weight F, ſuſpended at *c*, in its room. This weight F we ſuppoſe to be ſufficient to keep the ſeveral parts hanging to the other ſcale in equilibrium; at the ſame time that the middle point of the wire *p n* is at the ſurface of the water in the veſſel O. The wire *p n* is to be of ſuch a ſize, that the length of one inch ſhall weigh four grains.

Now it is evident, ſince braſs is eight times heavier than water, that for every inch the wire ſinks in the water it will become half a grain lighter, and half a grain heavier for every inch it riſes out of the water: conſequently, by ſinking two inches below the middle point, or riſing two inches above it, the wire will become one grain lighter or heavier. Therefore, if, when the middle point is at the ſurface of the water in equilibrium, the index T be ſet to the middle point *a* of the graduated wire *r s*, and the diſtance on each ſide *a r* and *a s* contains 100 equal parts; then, if in weighing bodies the weight is required to the hundredth part of a grain, it may be eaſily had by proceeding in the following manner.

Let the body to be weighed be placed in the ſcale d. Put a weight into the ſcale e; and let this be ſo determined, that one grain more ſhall be too much, and one grain leſs too little. Then the balance being moved gently up or down, by the ſcrew P, till the equilibrium be nicely ſhown at *a*; if the index T be at the middle point *a* of the wire *r s*, it ſhows that the weights put into the ſcale e are juſt equal to the weight of the body. By this method we find the abſolute weight of the body: the relative weight is found by weighing it hydroſtatically in water, as follows.

Inſtead of putting the body in the ſcale e, as before, let it hang with the weight F, at the hook *c*, by a horſe-hair, as at R, ſuppoſing the veſſel N of water were away. The equilibrium being then made, the index T ſtanding between *a* and *r*, at the 36 diviſion, ſhows the weight of the body put in to be 1095,36 grains. As it thus hangs, let it be immerſed in the water of the veſſel N, and it will become much lighter: the ſcale e will deſcend till the beam of the balance reſt on the ſupport *z*. Then ſuppoſe 100 grains put into the ſcale d reſtore the equilibrium preciſely, ſo that the index T ſtand at the 36 diviſion above *a*; it is evident that the weight of an equal bulk of water would, in this caſe, be exactly 100 grains. After a like manner this balance may be applied to find the ſpecific gravity of liquids, as is eaſy to conceive from what has been already ſaid.

BALANCE *of Trade* denotes an equality between the value of commodities bought of foreigners, and the value of the native productions tranſported into other nations. It is neceſſary that this *balance* be kept in trading nations; and if it cannot be made in commodities, it muſt in ſpecie. By this it is, that we know whether a nation gains or loſes by foreign trade, or any branch thereof; and conſequently, whether that nation grows richer or poorer. There are various *methods of arriving at this knowledge*.

1. By taking a ſtrict ſurvey of what proportion the value of the commodities exported bears to thoſe imported. If the exports exceed the imports, it is concluded that nation is in a gaining way, it being ſuppoſed that the overplus is imported in bullion, and ſo increaſes the treaſure of the nation. But this method is very uncertain, on account of the difficulty of obtaining a true ſtatement either of the exports or imports. For, in the firſt place, cuſtom-houſe books are no rule in this caſe; becauſe of the ſmuggling of goods, eſpecially many fine commodities of ſmall bulk, but great value; as point, lace, ribbands, ſilk, jewels, fine linens, &c. alſo wines, brandies, teas, &c. &c. To this may be added, various accidents which affect the value of the ſtock either ſent out or brought in; as loſſes at ſea, markets, bankrupts, ſeizures, &c. Then, as to particular trades, there are ſeveral countries to which the manufactures we ſend out are inconſiderable, yet the goods we import are neceſſary to the carrying on our trade in general; as the trade to Norway, &c. for timber and naval ſtores. So of the Eaſt India company, whoſe imports much exceed their exports; yet is their trade highly advantageous to the nation; as we ſell many of theſe imports to foreigners, and wear others, *e. g.* callicoes and ſilks, in lieu of linens and ſilks from other countries, which would coſt us dearer.

2. The ſecond method is, by obſerving the courſe of exchange, which, if generally above the intrinſic value or par of the coins of foreign countries, ſhews that we not only loſe by ſuch exchanges, but that we loſe by the general courſe of our trade. But this method is imperfect; ſince we trade to many countries, with which there is no ſettled courſe of exchange.

3. A third way is, by obſerving the increaſe and diminution of our coin and bullion. But this is the leaſt obvious and palpable of any; for the money ſeems to vulgar eyes moſt plentiful when there is the leaſt occaſion for it; and more ſcarce as the occaſions for employing it are more numerous and advantageous: by which means we ſeem to have moſt money when we have leaſt trade. Thus, *e. g.* when the Eaſt India Company have a great ſale to make, money is generally found to be ſcarce in London; becauſe the occaſion engages people to employ quantities which they had provided for that purpoſe. So, a high rate of intereſt will make money ſeem ſcarce, becauſe

every man, as ſoon as he makes up a ſmall ſum, employs it in the purchaſe of ſtock.

4. The fourth method (which is Sir Joſ. Child's) is derived from the increaſe, or the diminution, of our trade and ſhipping in general; for if theſe diminiſh, whatever profit particular men may make, the nation loſes; and *vice verſa*. He lays it down as an infallible rule, that in all parts of the world wherever trade is great, and continues ſo, and grows daily greater, and the ſhipping increaſes for a ſucceſſion of ages, that trade muſt be nationally profitable. Even in the caſe of a merchant, who, by driving a great trade, ruins himſelf; though he loſe, what a multitude are gainers by him, as the king, and cuſtom-houſe officers; beſides ſhipwrights, butchers, brewers, bakers, rope-makers, porters, carmen, manufacturers, mariners, &c.

BALANCE *of a Clock, or Watch*, is that part which regulates the beats. See CLOCK-*Making*.

BALANCER, in the hiſtory of inſects, a ſtyle, or oblong body, ending in a protuberance or head, found under each wing of the two-winged flies; theſe ſerve to poiſe the body of the fly.

BALANCING, among ſeamen, the contracting a ſail into a narrower compaſs, in a ſtorm, by retrenching, or folding up a part of it at one corner: this method is uſed in contradiſtinction to reefing, which is common to all the principal ſails; whereas balancing is peculiar to a few, ſuch as the mizen of a ſhip, and the main-ſail of thoſe veſſels wherein it is extended by a boom. (See BOOM and REEF). The balance of the mizen is thus performed: the mizen yard is lowered a little, then a ſmall portion of the ſail is rolled up at the peek or upper corner, and faſtened to the yard about one-fifth inward from the outer end or yard-arm towards the maſt. (See MIZEN). A boom main-ſail is balanced, after all its reefs are taken in, by rolling up a ſimilar portion of the hindmoſt or aftmoſt lower corner called the *clue*, and faſtening it ſtrongly to the boom, having previouſly wrapped a piece of old canvaſs round the part (which is done in both caſes) to prevent the ſail from being fretted by the cord which faſtens it.

BALANI, in natural hiſtory, the name of a genus of ſhell-fiſh, belonging to the claſs of multivalves, approaching to the ſhape of an acorn (βαλανος), and uſually growing to the ſhells of the larger ſort of ſea ſhell-fiſh: they are commonly called in Engliſh, centre ſhells. See a repreſentation of the Lepas anatifera of Linnæus in plate 48.

It is a very common error to miſtake the names of the multivalve ſhells ſo far as to confound the *balani* and *conchæ anatiferæ*, as they are called, together; though they be extremely different. The *balani* are found affixed in cluſters to a thouſand different ſubmarine bodies, ſuch as the harder ſea plants, all ſorts of teſtaceous and cruſtaceous ſea-animals, rocks, and timber. They may be arranged under the two ſubdiſtinctions of wide and narrow mouthed, including ſeveral ſpecies. The ſmall fiſh which nature has covered with this ſhell, is of a very admirable ſtructure. Leewenhoeck acknowledges, that he never met with any animal, in which ſo many objects of wonder lay open to the naked eye as in this. It has twelve legs or arms which are crooked, and garniſhed with a great number of hairs: theſe twelve they elevate on all occaſions; and, beſide theſe, they have eight others, which are much ſmaller, and ſtand lower. Their body is, in all reſpects, like that of the *concha anatifera*. It is cartilaginous and mucous, and of an ill taſte. The ſhell ſhapes itſelf, at the baſe, to the figure of the ſurface of whatever it grows to, and ſticks very firmly to it. The *balanus*, in the Linnæan ſyſtem, is a ſpecies of the LEPAS.

BALANITES, in natural hiſtory, a name given by the ancients to a ſtone, ſeeming to have been of the ſemipellucid gems. They deſcribe two ſpecies of it; the one of which was yellow, and the other green, but each having veins of a flame colour. Their deſcriptions are too ſhort for us to be able to aſcertain what ſtones, among thoſe known at this time, they meant. Some think the *balanites* to have been the *lapis Judaicus*, on account of its acorn-like figure and ſize.

BALAUSTINES, in botany. See PUNICA.

BALAYAN, a province in the iſland of Manila in the Eaſt Indies, belonging to the Spaniards. It lies next to the city of Manila, and extends along the coaſt on the eaſt ſide of the iſland, a little beyond the bay of Batangas. There were formerly gold mines in it, but they have been long ſince abandoned. It is inhabited by about 2500 tributary Indians, is well cultivated, and abounds in cotton, rice, and palm-trees.

BALBASTRO, an epiſcopal town of Spain, in the kingdom of Arragon, and capital of a diſtrict of the ſame name. E. long. 0. 20. N. lat. 41. 50.

BALBEC, the ancient Heliopolis, a town of Aſia, in Syria, at the foot of Mount Libanus. It is agreeably ſeated to the N. E. extremity of the valley of Bocat. On the E. ſide are magnificent ruins, particularly thoſe of the temple dedicated to the Sun. The portico of this temple is inexpreſſibly ſuperb, though diſfigured by two Turkiſh minarets. To the weſt of it is another, of a circular form, diſfigured by Turkiſh houſes and moſques, built out of the ruins. Theſe, which have been copiouſly deſcribed by Meſſrs. Wood and Dawkins, and M. Volney, diſplay, according to the opinion of the beſt judges, the boldeſt plan that ever was attempted in architecture.

When we conſider the extraordinary magnificence of the temple of Balbec, we cannot but be aſtoniſhed at the ſilence of the Greek and Roman authors. Mr. Wood, who has carefully examined all the ancient writers, has found no mention of it except in a fragment of John of Antioch, who attributes the conſtruction of this edifice to Antoninus Pius. Indeed the inſcriptions which remain corroborate this opinion, which perfectly accounts for the conſtant uſe of the Corinthian order, ſince that order was not in general uſe before the third age of Rome. Balbec is chiefly inhabited by Chriſtians of the Greek church, and is 37 miles N. of Damaſcus. Lon. 37. 20. E. Lat. 34. 22. N.

BALBOA (Vaſco Nugnes de), a Caſtilian; a celebrated navigator, and one of the firſt diſcoverers of South America. He was beheaded by the Spaniſh governor of St. Mary, through jealouſy of his growing reputation, in 1517, aged 42.

BALCONY, from the French *balcon*, in architecture. Balconies are a kind of open galleries without the walls of buildings, contrived chiefly for the convenience of looking around, ſeeing proceſſions, cavalcades, &c. Where there is but one it is uſually in the middle of the front of the edifice, and level with the firſt floor. Sometimes they are made of wood, ſometimes of caſt iron; the former ſurrounded with a rail, or baluſtrade, the latter wrought in various figures in *demi-relievo*. Some are alſo made of bar iron, faſhioned in crail-work, or flouriſhes of divers fancies. They are lately become faſhionable, particularly in the metropolis, where few newly-erected houſes of any degree of elegance are without them.

BALCONY, in a ſhip, denotes a gallery either covered or open, made abaft, either for ornament, or convenience of the captain's cabin.

BALDACANIFER, corruptly alſo written *balcanifer*, denotes a ſtandard-bearer; chiefly in the ancient order of Knights Templars.

BALDACHIN, or BALDAQUIN, in architecture, a building in form of a canopy, ſupported by pillars, and frequently uſed as a covering to inſulated altars. Some alſo uſe the term *baldachin* for the ſhell over a door.

BALDACHIN, or BALDAKIN, or BALDEKIN, popularly BAU-

DERIN, in middle age writers, denotes a rich kind of cloth made of gold warp and silk woof, variously figured. It took the denomination from its being formerly brought into these countries from *Baldacio*, or Babylon.

BALDIVIA, or VALDIVIA, a sea-port town of Chili, in America, belonging to the Spaniards. It is situated between the rivers Callaculles and Portero, where they fall into the South Sea. W. long. 80. 5. S. lat. 40. 5. It was built in 1551 by the Spanish general Baldivia, from whom it takes its name. We may judge of its importance from the sum granted annually by the king for maintaining the garrison and keeping the fortifications in repair, being no less than 300,000 pieces of eight; and its being defended by four strong castles, mounting 100 pieces of fine brass cannon.

BALDMONIE, an old English name for gentian, the root of which is used in medicine; some also have called the *meum*, or spignel, by this name.

BALDNESS, *calvities*, a defect of hair, chiefly on the sinciput. It differs from *alopecia*, *area*, *ophiasis*, and *tinea*, as these all arise from some disease; whereas *baldness* arises simply from the defect of that nourishment which the blood usually affords to the roots of the hair. When the eye-lids shed their hair, it is called a *ptilosis*. Among the causes of baldness, immoderate venery is reputed by some as one of the chief: but this is seldom the cause; old age usually brings it on of course. Some will have the proximate cause of baldness to be the dryness of the brain, and its shrinking from the cranium; it having been pretended, that in bald persons there is always a vacuity or empty space between the skull and the brain; but these suggestions are idle and unfounded. *Calvus*, *bald-pate*, was a frequent term of reproach among the Romans; among whom this defect was in great discredit. Hence originated the different arts to conceal it, as false hair, or a *galericulus* contrived on purpose. The later Romans, however, seem to have been reconciled to baldness; for we find among them a kind of officers, or servants, called *glabratores* or *glabrarii*, whose business was to take off the hair from all parts, even from the head. In an ancient inscription, there is mention of one Diophantus; TI. CÆSARIS ORNATOR GLABR. that is, *Ornator Glabratorius*.

BALDOC, a town of Hertfordshire, in England, chiefly noted for its trade in malt. W. long. 0. 10. N. lat. 51. 55.

BALE, in commerce, a term denoting a quantity of merchandize wrapped or packed up in cloth, and corded round very tight, after having been well secured with hay or straw, to keep it from breaking, or to preserve it from the weather. Most of the merchandize, capable of this kind of package, that are sent to fairs, or intended for exportation, ought to be in bales; and too much care cannot be taken in packing them, to secure them from damage. To sell goods in the bale is to sell them in the lump, on shewing a specimen, without unpacking or taking off the cordage. Thus it is the East India Company and others sell their bale-goods.

BALE-*Goods*, in the East India trade, the bulky goods, as salt-petre, pepper, red-earth, tea, &c. Bale goods stand opposed to piece-goods.

BALES *of camlet*, at Smyrna, are called *tables*, on account of their flat square figure. A bale of cotton yarn is from three to four hundred weight: of raw silk, it is from one to four hundred; of lockram or dowlas, either three, three and a half, or four pieces, &c.

BALE *of paper*, denotes a certain number of reams packed together in a bundle. There are bales of more and fewer reams. Those sent from Marseilles to Constantinople usually contain twelve reams. A bale or ballon of crown paper, manufactured in some parts of Provence, consists of fourteen reams, and is sold in the Levant for Venice paper.

BALE *of dice*, denotes a little packet, or paper, containing some dozens of dice for playing with.

BALENGER, BALENGARIA, in middle age writers, a kind of vessel of war, but what in particular seems not well known. Blount says, that by the stat. 28 Hen. VI. cap. 5. balenger seems to have been a kind of barge.

BALESTRA, in ichthyology, a name by which Salvian and some other authors have called the fish more usually known by the name of CAPRISCUS.

BALI, an island of Asia, in the East Indies, forming the north side of the straits of Java, through which the East India ships sometimes return from China to Europe: but the passage is commonly difficult on account of contrary winds. The island is extremely populous, and abounds in rice and other productions proper to the climate. The inhabitants are Pagans, and very warlike. E. long. 115. 30. S. lat. 9. 0.

BALIOL, or BALLIOL, (Sir John de), founder of Baliol college in Oxford, was the son of Hugh Baliol, of Bernard's castle, in the diocese of Durham; and was a person very eminent for his power and riches. During the contests and wars between king Henry III. and his barons, he firmly adhered to the king. In 1263, he began the foundation and endowment of Baliol college, which was afterwards perfected by his widow. He died in the year 1269.

BALISORE, a sea port town of Asia, in the East Indies, to the north-west of the bay of Bengal. It is about four miles from the sea by land, but 20 by the river; seated in a very fruitful soil, producing rice, wheat, aromatic seeds, tobacco, &c. The inhabitants make several sorts of stuffs of cotton, silk, and a kind of grass. The English, French, and Dutch, have factories here; but they are now of no great account. E. long. 85. 20. N. lat. 21. 30.

BALISTA. See BALLISTA.

BALISTES, in ichthyology, a genus of fishes belonging to the order of amphibia nantes. The characters are these: The head is flat; there are eight teeth in each side, and the two anterior ones are longest; in the place of gills, the balistes has an aperture immediately above the pectoral fins; the body is flat, the scales are joined together by the skin, and the belly is keeled. The species of this genus are eight: *viz.* 1. The monocros, whose head-fin consists of but one ray, and the tail rays are carinated. It is called the *unicorn-fish* by Catesby; who informs us, that the guts of this fish are full of small shells and coralline substances, which by the strength and hardness of its jaws it is enabled to grind very small. These fish, he adds, are not eaten, being accounted poisonous. They most frequent those seas, amongst the Bahama islands, where the corals are in greatest plenty. 2. The hispidus, whose head-fin is uniradiated; and there is a round black spot in the tail-fin. The body is rough, and bristly towards the tail. The spine or horn is situated between the eyes; the snout is subulated; and instead of a belly-fin it has a jagged sharp spine. This species is a native of Carolina. 3. The tomentosus, whose head-fin is biradiated, and the body of it towards the hind part is hairy. It is a native of America. 4. The papillosus, has a biradiated back-fin, and a papillous body. 5. The verrucosus, has a triradiated back-fin; and the tail is full of little warts. In the place of a belly-fin, this species has a large, thick, warty ray. It has 25 small reversed sharp spines at the side of the tail, disposed in four rows. It is a native of India. 6. The aculeatus has a triradiated back-fin; and the spines of the tail lean upon each other. It is also a native of India. 7. The vetula, or old-wife, has a triradiated back-fin; the belly-fin is longitudinal, and somewhat carinated; and the tail-fin is forked. It is found at Ascension island. 8. The ringens, has a triradiated back-fin; there are three folds on each side of the head, and the tail-fin is forked. This species is likewise found at Ascension island.

BALIVO AMOVENDO, in law, was a writ for removing a bailiff from his office, for want of having sufficient land in his

bailiwick to anſwer the king and his people, according to the ſtatute of Weſtminſter. 2. reg. Orig. 78.

BALK, among builders, is ſometimes uſed for the ſummer-beam of a houſe; ſometimes for the poles and rafters, which ſupport the roofs of barns, &c.; and ſometimes for the beams uſed in making ſea-holds.

Balk, or *Balkh*, a province of Great Bukharia in Aſia, about 360 miles long and 250 broad, ſituated to the ſouth of the province of Samarkand, and to the eaſt of Bukharia Proper. It is the leaſt of the three provinces that make up what is called *Great Bukharia;* but being extremely fertile and well cultivated, the prince draws a great revenue from it. The country particularly abounds with ſilk, of which the inhabitants make pretty manufactures. The Uzbecks ſubject to the khan of Balkh are the moſt civilized of all the Tartars inhabiting Great Bukharia, owing probably to their commerce with the Perſians; they are likewiſe more induſtrious, and more honeſt, than the reſt: but in other reſpects have the ſame cuſtoms with the reſt of the Tartars. The province is ſubdivided into ſeveral counties; the moſt remarkable of which are Khotlan or Katlan, Tokhareſtan, and Badagſhan. Its chief cities are Balk, Bariyab, Talkhan, Badagſhan, and Anderab.

Balk, the capital of the above-mentioned province, ſituated on the frontiers of Perſia, in E. long. 65. 20. N. lat. 37. 0. It is probably the ancient Bactra, capital of the kingdom of Bactra; and is ſaid by the Perſians to have been founded by Kay-umaraz the firſt king of Perſia, becauſe he met his brother upon the ſpot where it ſtood after he had been loſt for a long time; *balkhiden*, or *balghiden*, in the Perſic language, ſignifying to receive and embrace a friend. The firſt kings of Perſia who reſided in the province of Media or *Aderbijan*, conſidered this city as one of their principal frontiers on the ſide of Scythia. In the 27th year of the Hegira, of Chriſt 647, Balk was reduced by the Arabs, under the command of Abdallah Ebn Amer. It continued ſubject to Arab princes till the year of the Hegira 432, of Chriſt 1041; when it was reduced by Togrol Beg, the Tangrolipix of the Greeks, and prince of the Seljukian dynaſty. It was taken by Jenghiz Khan, A. D. 1221, who with his uſual and unparalleled cruelty cauſed all the inhabitants to be brought without the walls and maſſacred without mercy. In 1369, Sultan Hoſein, the laſt of the race of Jenghiz Khan, was driven from Balkh by Tamerlane, whoſe ſucceſſors were driven out by the Uzbecks in the 15th century. It was afterwards redeemed by Shah Iſmael Suſi; but finally wreſted out of his hands by the Uzbeck Tartars, between whom and the Perſians it is the occaſion of almoſt continual wars. It was not long ſince the reſidence of a khan of Tartars. It is the moſt conſiderable city poſſeſſed in theſe parts by the Mahometan Tartars; is large, well built, and populous, the houſes conſiſting for the moſt part of ſtone or brick. The fortifications conſiſt of bulwarks of earth, fenced without with a ſtrong wall high enough to cover the ſoldiers employed in defence of thoſe fortifications. As this place is the reſort of all the buſineſs tranſacted between the Indies and Great Bukharia, trade flouriſhes extremely at Balk; eſpecially as it has a fine river paſſing through its ſuburbs, which is of vaſt ſervice to the town. This river falls into the Amu, in N. lat. 38. 30. upon the confines of Great Bukharia and Kowarazm. The khan's palace, or caſtle, is a large edifice built after the oriental manner; and conſiſts almoſt entirely of marble, of which there are fine quarries in the neighbourhood. The khan of Balk, however, was obliged in 1739 to ſubmit to the Perſians under Khouli Kan; but ſince that time has moſt probably regained his independence.

BALKERS, in the fiſhery, perſons placed on rocks and eminences at ſea to ſpy the herring droves, and give notice to the fiſhermen, by waving boughs, what way they go, and where they may be found.

BALL, in a general ſenſe, is a ſpherical and round body, whether naturally ſo, or formed into that figure by art. The term, when uſed in the *military art*, comprehends all ſorts of bullets for fire arms, from the cannon to the piſtol. Cannon-balls are made of iron; muſket-balls, piſtol-balls, &c. are of lead. The experiment has been tried of iron balls for piſtols and fuſees; but they are juſtly rejected, not only on account of their lightneſs, which prevents them from flying ſtraight, but becauſe they are apt to furrow the barrel of the piſtol, &c.

Ball *of a Pendulum*, the weight at the bottom. In ſhorter pendulums this is called the *bob*.

Ball, in pyrotechnics, is alſo a compoſition of various combuſtible ingredients, ſerving to burn, ſmoke, give light, &c. In this ſenſe we read of fire-balls, light-balls, ſmoke-balls, ſtink-balls, ſky-balls, water-balls, land-balls.

Ball, among the Corniſh miners, ſignifies a tin-mine.

Ball, among printers, a kind of wooden tunnel ſtuffed with wool, contained in a leather cover, which is nailed to the wood, with which the ink is applied on the forms to be wrought off. See Printing.

Horſe-Balls, among farriers. Horſes have a very nice taſte; it is therefore proper to give the more diſagreeable drugs in the form of balls, and to make drenches of the more palatable. Balls ſhould be of an oval ſhape, not exceeding the ſize of a pullet's egg: and ſhould be dipped in ſweet oil to make them ſlip down the eaſier. Some horſes have a ſtrait gullet, which makes them very averſe to a ball being thruſt down their throats; ſuch horſes had better have drenches given them, or their medicines may be mixed with bran, or in their maſhes. See Farriery.

Ball *Vein*, in mineralogy, a name given by the miners of Suſſex to a ſort of iron ore common there, and wrought to conſiderable advantage. It yields not any great quantity of metal, but what it has runs freely in the fire; it is uſually found in looſe maſſes, not in the form of a ſtratum, and is often covered with one or more cruſts. It generally contains ſome ſparkling particles; and is uſually of a circular form in the perfect maſſes, thickeſt in the middle, and gradually thinner as it approaches the ſides. The ores of Suſſex in general are poor, but they require very little trouble in the working; ſo that a conſiderable profit is made annually from them.

Ball *and Socket* is an inſtrument made of braſs, with a perpetual ſcrew, ſo as to move horizontally, vertically, and obliquely; and is generally uſed for the managing of ſurveying and aſtronomical inſtruments.

Puff-Ball, in botany, the Engliſh name of the *lycoperdon*, which is a genus of the natural order of fungi, belonging to the cryptogamia claſs of plants. The fungus is roundiſh, and full of farinaceous ſeeds. There are 10 ſpecies, of which the following are the moſt remarkable:

1. The tuber, truffles, or ſubterraneous puff-balls, is a native of woods both in England and Scotland. It is a ſubterraneous fungus, growing generally in cluſters three or four inches under ground, without any viſible root. The figure of it is nearly ſpherical, the ſize that of a potatoe; the exterior coat at firſt white, afterwards black, and ſtudded with pyramidical or polyhedrous tubercles; the internal ſubſtance ſolid and callous, of a dirty-white or pale-brown colour, grained like a nutmeg with ſerpentine lines; in which, according to Micheli, are imbedded minute oval capſules, containing each from two to four round warted ſeeds. The truffles of Great Britain ſeldom exceed three or four ounces in weight; but in Italy, and ſome other parts of the continent, they are ſaid to have been found of the enormous ſize of 8 and even 14 pounds. They are received at our tables, either freſh and roaſted like potatoes, or dried and ſliced into ragouts. They have a

volatile and ſomewhat urinous ſmell, and are reputed to be aphrodiſiaeal. Dogs are with much pain taught to hunt for them by the ſcent, and to ſcratch up the ground under which they lie.

2. The boviſta, or common puff-ball, is frequently in meadows and paſtures in the autumn. It varies exceedingly in ſize, figure, ſuperficies, and colour. In general, it conſiſts of a ſack or bag, having a root at its baſe, and the bag compoſed of three membranes, an epidermis, a tough white ſkin, and an interior coat which adheres cloſely to the central pith. The pith in the young plants is of a yellowiſh colour, at firſt firm and ſolid, but ſoon changes into a cellular ſpongy ſubſtance, full of a dark dull-green powder, which diſcharges itſelf through an aperture at the top of the fungus, which aperture is formed of lacerated ſegments, in ſome varieties reflexed. The powder is believed to be the ſeeds, which through a microſcope appear of a ſpherical form, and to be annexed to claſtic hairs. See *Haller's Hiſt. Helvet. n.* 2172.

Among the numerous varieties of this fungus, the glabrum is moſt remarkable. It is a ſmooth ſeſſile kind, of a nearly ſpherical form, puckered or contracted at the root. This ſometimes grows to an enormous ſize. It has been found in England as big as a man's head; and at Carraria, near Padua in Italy, ſpecimens have been gathered, weighing 25 pounds, and meaſuring two yards in circumference: but its more ordinary ſize is that of a walnut or an apple.

The varieties of this ſpecies have no limits, being frequently found to run into one another; the ſcaly, warty, and echinated coats turning ſmooth as the plants grow old, and the neck of the fungus having no determinate length. The natural colour of the puff-ball is either white, grey, or aſh-colour: but it is ſometimes found yellowiſh, tawny, and browniſh. The internal ſpongy part of it, bound upon wounds, is eſteemed good to ſtop bleedings. Preſſed and dried in an oven, the puff-ball becomes a kind of tinder, the ſmoke of which is ſaid to intoxicate bees. See *Gent. Mag.* July 1766. The Italians fry the great ones, and indeed any of the others when young, and eat them with ſalt and oil, according to the account given by Marſigli.

Martial Balls, in pharmacy, a mixture of filings of iron and cryſtals of tartar, formed into a ball, which is uſed to impregnate water or other liquids with iron diſſolved by the tartareous acid. To make theſe balls, one part of filings of iron and two parts powdered cream of tartar are mixed well together, and put into an earthen or iron veſſel with ſome water. This mixture is to be ſtirred from time to time, till it becomes almoſt dry; and then it is to receive more water, and to be ſtirred as before. This treatment is to be continued till it acquires, when nearly dry, ſomewhat of the conſiſtence and tenacity of ſoftened roſin. Then it is to be rolled up in the form of a ball, which is generally kept tied up in a rag; and when intended to be uſed, it is to be infuſed in water, till it gives ſome colour to that liquid. The infuſion of martial balls has formerly been in uſe as a tonic, and employed both internally and externally; but the modern pharmacopœias have rejected it.

Mercurial Balls, in pharmacy, an amalagam of quickſilver and tin, ſufficiently ſolid to be moulded, and to preſerve a given form. The method of making them is by adding mercury to melted tin, and pouring the fluid maſs into a round hollow mould. Theſe balls have been employed to purify water, in which they are directed to be boiled; and for this purpoſe ſome travellers have carried them abroad with them. Nothing, however, can be more fallacious than ſuch a practice.

Balls *of Silk-worms and Spiders*, are little caſes or cones of ſilk, wherein thoſe inſects depoſit their eggs. Spiders are extremely tender of their balls, which they carry about with them, adhering to the papillæ about their anus. Grew mentions balls or bags of a ſpecies of ſilk-worms in Virginia as big as hens eggs, and containing each four aurelias. Zoologiſts alſo ſpeak of a ſort of balls of hair covered over with a ſmooth ſhining coat or ſhell, found in the ſtomachs of oxen, cows, calves, horſes, ſheep, and goats. See the article Bezoar.

Balls of Fire, in meteorology, a kind of luminous bodies generally appearing at a great height above the earth, with a ſplendour ſurpaſſing that of the moon; and ſometimes equalling her apparent ſize. They generally proceed in this hemiſphere from north to ſouth with vaſt velocity, frequently breaking into ſeveral ſmaller ones, ſometimes vaniſhing with a report, ſometimes not.

Theſe luminous appearances no doubt conſtitute one part of the ancient prodigies, blazing ſtars or comets, which laſt they ſometimes reſemble in being attended with a train; but frequently they appear with a round and well defined diſk. The firſt of theſe of which we have any accurate account, was obſerved by Dr. Halley and ſome other philoſophers at different places, in the year 1719. From the ſlight obſervations they could take of its courſe among the ſtars, the perpendicular height of this body was computed at about 70 miles from the ſurface of the earth. The height of others has alſo been computed, and found to be various; though in general it is ſuppoſed to be beyond the limits aſſigned to our atmoſphere, or where it loſes its refractive power. The moſt remarkable of theſe on record appeared on the 18th of Auguſt 1783, about nine o'clock in the evening. It was ſeen to the northward of Shetland, and took a ſoutherly direction for an immenſe ſpace, being obſerved as far as the ſouthern provinces of France, and one account ſays that it was ſeen at Rome alſo. During its courſe it appears frequently to have changed its ſhape; ſometimes appearing in the form of one ball, ſometimes of two or more; ſometimes with a train, ſometimes without one. It paſſed over Edinburgh nearly in the zenith, and had then the appearance of a well defined round body, extremely luminous, and of a greeniſh colour; the light which it diffuſed on the ground giving likewiſe a greeniſh caſt to objects. After paſſing the zenith, it was attended by a train of conſiderable length, which continually augmenting, at laſt obliterated the head entirely; ſo that it looked like a wedge, flying with the obtuſe end foremoſt. The motion was not apparently ſwift, by reaſon of its great height; though in reality it muſt have moved with great rapidity, on account of the vaſt ſpace it travelled over in a ſhort time. In other places its appearance was very different. At Greenwich we are told, that "two bright balls parallel to each other led the way, the diameter of which appeared to be about two feet; and were followed by an expulſion of eight others, not elliptical, ſeeming gradually to mutilate, for the laſt was ſmall. Between each two balls a luminous ſerrated body extended, and at the laſt a blaze iſſued which terminated in a point. Minute particles dilated from the whole. The balls were tinted firſt by a pure bright light, then followed a tender yellow, mixed with azure, red, green, &c.; which, with a coalition of bolder tints, and a reflexion from the other balls, gave the moſt beautiful rotundity and variation of colours that the human eye could be charmed with. The ſudden illumination of the atmoſphere, and the form and ſingular tranſition of this bright luminary, tended much to make it awful: nevertheleſs the amazing vivid appearance of the different balls, and other rich connective parts not very eaſy to delineate, gave an effect equal to the rainbow in the full zenith of its glory."

Dr. Blagden, in a paper on this ſubject in the 74th volume of the Philoſophical Tranſactions, has not only given a particular account of this and other meteors of the kind, but added ſeveral conjectures relating to the probable cauſes of them.

The firſt thing which occurred to philoſophers on this ſubject was, that the meteors in queſtion were burning bodies riſing from the ſurface of the earth, and flying along the atmoſphere with great rapidity. But this hypotheſis was ſoon abandoned, on conſidering that there was no power known by which ſuch bodies could either be raiſed to a ſufficient height, or projected with the velocity of the meteors. The next hypotheſis was, that they do not conſiſt of one ſingle body, but of a train of ſulphureous vapours, extending a vaſt way through the atmoſphere, and being kindled at one end, diſplay the luminous appearances in queſtion by the fire running from one end of the train to the other. To this hypotheſis, which was invented by Dr. Halley, Dr. Blagden objects that no juſt explanation is given of the nature of the vapours themſelves, the manner in which they are raiſed up, or in which they can be regularly arranged in ſtraight lines of ſuch vaſt extent; or how they can be ſuppoſed to burn in ſuch rarefied air. "Indeed (ſays he) it is very difficult to conceive how vapours could be prevented, in thoſe regions where there is in a manner no preſſure, from ſpreading out on all ſides in conſequence of their natural elaſticity, and inſtantly loſing that degree of denſity which ſeems neceſſary for inflammation. Beſides, it is to be expected, that ſuch trains would ſometimes take fire in the middle, and thus preſent the phænomenon of two meteors at the ſame time, receding from one another in a direct line."

For theſe and other reaſons this hypotheſis of Dr. Halley was abandoned, and another ſubſtituted in its place. This was, that the meteors we ſpeak of are permanent ſolid bodies, not riſing from the earth, but revolving round it in very eccentric orbits, and thus in their perigion moving with inconceivable rapidity. But the Doctor ſhews, that even on this ſuppoſition, the velocity of ſuch bodies muſt ſcarce be one-third of that with which fire-balls move, and which has been calculated at upwards of 1000 miles per minute. The hypotheſis is likewiſe liable to a number of other objections which cannot be anſwered, particularly from the variations in their appearance; for it is impoſſible to ſhew in what manner one ſolid and permanent body could aſſume the appearance of eight or ten, as was the caſe with the meteor of 1783; nor can it be ſhown why a body, which in paſſing over Edinburgh appeared with a diſk evidently leſs than that of the ſun, ſhould, in paſſing over Greenwich, aſſume the appearance of *two* bodies, each of which had a diſk conſiderably larger than the apparent diſk of that luminary. To obviate, in ſome meaſure, objections of this kind, it has been ſuppoſed that the revolving bodies are ſurrounded by a kind of electrical atmoſphere by which they are rendered luminous; "but (ſays the Doctor) I think, whoever carefully peruſes the various accounts of fire-balls, and eſpecially ours of the 18th of Auguſt, when it divided, will perceive that their phænomena do not correſpond with the idea of a ſolid nucleus involved in a ſubtle fluid, any more than with the idea of another learned gentleman, that they become luminous by means of a contained fluid, which occaſionally explodes through the thick ſolid outer ſhell."

Another hypotheſis, which Dr. Blagden has not mentioned, is, that the meteors in queſtion are a kind of bodies which take fire as ſoon as they come within the atmoſphere of the earth. But this cannot be ſuppoſed without implying a previous knowledge of theſe bodies, which it is altogether impoſſible we can have. The only opportunity we have of ſeeing them is when they are on fire. Before that time they are in an inviſible and unknown ſtate; and it is ſurely improper to argue concerning them in this ſtate, or pretend to determine any one of their properties, when we have it not in our power to ſee or inveſtigate them in the leaſt. As the meteors therefore never manifeſt themſelves to our ſenſes but when they are on fire, the only rational concluſion we can draw from thence is, that they have no exiſtence in any other ſtate; and conſequently that their ſubſtance muſt be compoſed of that fluid which, when acting after a certain manner, becomes luminous and ſhows itſelf as fire; remaining inviſible, and eluding our reſearches in every other caſe. On this hypotheſis we muſt conclude that the fire-balls are great bodies of electric matter, moving from one part of the heavens where, to our conception, it is ſuperabundant, to another where it is deficient. This opinion is adopted by Dr. Blagden, for the following reaſons:

1. On account of their prodigious velocity, which is not leſs than 1200 miles in a minute, and ſeems incompatible with any other ſubſtance we know beſides the electric fluid. "This (ſays he) is perhaps the only caſe in which the courſe or direction of that fluid is rendered perceptible to our ſenſes, in conſequence of the large ſcale on which theſe meteors move."

2. Various electrical phænomena have been obſerved to attend them, ſuch as lambent fires ſettling upon men, horſes, &c. and ſparks coming from them, "or the whole meteor itſelf (adds our author), it is ſaid, has damaged ſhips, houſes, &c. after the manner of lightning." This laſt circumſtance, however, we can believe only of another kind of fire-balls, of which we ſhall preſently treat, which keep at a ſmall diſtance from the earth, or run along its ſurface; for the great meteors of which we can ſpeak, flying at the diſtance of 50 or 60, or more miles from the ſurface of the earth, cannot be leſs from their apparent ſize than a mile or a mile and a half in diameter. Such an immenſe body of electric matter deſcending on the earth, would by its exploſion ruin a large tract of country; and there is no probability that when engendered in ſuch a rare atmoſphere it could break through the whole body of groſs and denſe air which lies between theſe regions and the earth, and which we know reſiſts the paſſage of the electric fluid very ſtrongly. Notwithſtanding this, there is no impoſſibility that the atmoſphere may be electrified to a great degree by ſuch a meteor paſſing over it; and thus electrical appearances may attend theſe bodies without any actual emiſſion of their ſubſtance, as Dr. Blagden ſuppoſes. "If there be really (ſays he) any hiſſing noiſe heard while the meteors are paſſing, it ſeems explicable on no other ſuppoſition than that of ſtreams of electric matter iſſuing from them, and reaching the earth with a velocity equal to that of the meteor, namely, in two or three ſeconds. Accordingly, in one of our late meteors, the hiſſing was compared to that of electricity iſſuing from a conductor. The ſparks flying off ſo perpetually from the body of fire-balls may poſſibly have ſome connection with theſe ſtreams. In the ſame manner the ſound of exploſions may perhaps be brought to us quicker than if it were propagated to us by the air alone. Should theſe ideas be well founded, the change of direction, which meteors ſeem at times to undergo, may poſſibly be influenced by the ſtate of the ſurface of the earth over which they are paſſing, and to which the ſtreams are ſuppoſed to reach. A ſimilar cauſe may occaſion the apparent exploſion, the opening of more channels giving new vent and motion to the electric fluid. May not the deviation and exploſion which appear to have taken place in the fire-ball of the 18th of Auguſt over Lincolnſhire, have been determined by its approach towards the fens, and an attraction produced by that large body of moiſture?"

The exploſion mentioned by our author over Lincolnſhire does not ſeem to have been the only one which happened during the courſe of this meteor. Several people heard reports after it had vaniſhed; and theſe were ſometimes ſingle and ſometimes double. At Edinburgh two reports were heard, the one immediately following the other, at the diſtance of ſix or ſeven minutes after the meteor had paſſed. Theſe reports no doubt indicated a temporary diſſolution of the body; but it is by no means probable that the diſſolution could have

taken place either on account of the ſtate of the earth or atmoſphere. We muſt conſider that both earth and atmoſphere are always full of electric fluid; and if there happens to be what is called a *deficiency* in one of them, the other inſtantly ſupplies it. It is impoſſible, therefore, that either the earth or atmoſphere could receive ſuch an immenſe additional quantity in one part without a vent being provided for it ſomewhere elſe. In thunder-ſtorms we naturally conclude that a vaſt quantity of electrical matter is put in motion; but from the effects of lightning it appears that this quantity muſt be very trifling in compariſon with what the meteor we now ſpeak of contained. A violent flaſh of lightning has been known to perforate a looking-glaſs, and make only a hole of about an inch diameter. Now we have no reaſon to ſuppoſe that the flaſh, tremendous as it might appear to our eyes, was any other than an electric ſpark of an inch in diameter. The meteor, on the other hand, appears not to have been leſs than a mile in diameter; ſo that the diſproportion betwixt it and a ſingle flaſh of lightning appears almoſt beyond calculation; and we may reaſonably conclude that it could not have been equalled by 10,000 thunder-ſtorms. Had this amazing body of electric fire deſcended through the atmoſphere and diſſipated itſelf on the fens of Lincolnſhire, it muſt have produced the moſt violent and unheard-of effects, not only in that place, but probably throughout the whole iſland. Its diſſipation muſt therefore have been in the higher regions, where there was ample ſpace to receive it; and where its exploſion, whatever concuſſion it might make among the ethereal matter itſelf, could not affect our earth or atmoſphere in any remarkable degree. Its re-appearance was owing to the ſame tendency in the fluid to circulate which had originally produced it; and which probably was the violent earthquake in Calabria and the eruption which happened in Iceland.

3. Another argument adduced by Dr. Blagden in favour of the electrical origin of fire-balls, is their connection with the aurora borealis, and the reſemblance they bear to theſe phænomena, which are now almoſt univerſally allowed to be electrical. "Inſtances (ſays he) are recorded, where northern lights have been ſeen to join, and form luminous balls, darting about with great velocity, and even leaving a train behind them like the common fire-balls. This train I take to be nothing elſe but the rarefied air left in ſuch an electrified ſtate as to be luminous; and ſome ſtreams of the northern lights are very much like it." The aurora borealis appears to occupy as high, if not a higher region above the ſurface of the earth, as may be judged from the very diſtant countries to which it has been viſible at the ſame time: indeed the great accumulation of electric matter ſeems to lie beyond the verge of our atmoſphere, as eſtimated by the ceſſation of twilight. Alſo with the northern lights a hiſſing noiſe is ſaid to be heard in ſome very cold climates: Gmelin ſpeaks of it in the moſt pointed terms, as frequent and very loud in the north-eaſtern parts of Siberia; and other travellers have related ſimilar facts.

4. Our author thinks that the ſtrongeſt argument for the electrical origin of theſe meteors is the direction of their courſe, which is conſtantly either from the north or north-weſt quarter of the heavens, or towards it; or, as our author thinks, nearly in the direction of the magnetical meridian. Such a courſe, however, ſeems only to belong to the very large fire-balls of which we now ſpeak; the ſmaller ones, called *Falling* STARS, being moved in all directions; "perhaps (ſays the Doctor), becauſe they come further within the verge of our atmoſphere, and are thereby expoſed to the action of extraneous cauſes. That the ſmaller ſort of meteors, ſuch as ſhooting ſtars, are really lower down in the atmoſphere, is rendered very probable by their ſwifter apparent motion: perhaps it is this very circumſtance which occaſions them to be ſmaller, the electric fluid being more divided in more reſiſting air. But as thoſe maſſes of electric matter which move where there is ſcarce any reſiſtance, ſo generally affect the direction of the magnetic meridian, the ideas which have been entertained of ſome analogy between theſe two obſcure powers of nature ſeem not altogether without foundation. If the foregoing conjectures be juſt, diſtinct regions are allotted to the electrical phænomena of our atmoſphere. Here below we have thunder and lightning, from the unequal diſtribution of the electric fluid among the clouds; in the loftier regions, whither the clouds never reach, we have the various gradations of falling ſtars; till, beyond the limits of our corpuſcular atmoſphere, the fluid is put into motion in ſufficient maſſes to hold a determined courſe, and exhibit the different appearances of what we call *fire-balls*; and probably at a ſtill greater elevation above the earth, the electricity accumulates in a lighter and leſs condenſed form, to produce the wonderfully diverſified ſtreams and coruſcations of the aurora borealis."

The paper from whence theſe extracts are taken was written before Mr. Morgan's account of the non-conducting power of a perfect vacuum made its appearance. An abſtract of his arguments on this ſubject is given under the article ELECTRICITY, and their inſufficiency to prove the point intended, is very obviouſly demonſtrated under the ſame article. Under that article, we have only mentioned the *deficiency* in Mr. Morgan's argument, without adducing any poſitive proof to the contrary. Such a proof, however, is offered by the meteor in queſtion, or by others of the ſame nature. Dr. Halley, ſpeaking of the fire-ball of 1719, the height of which he calculated at very little leſs than 70 miles, expreſſes his ſurpriſe that ſound ſhould be propagated through a medium near 300,000 times rarer than the common air, and the next thing to a perfect vacuum. Now it remains, and for ever will remain, to be proved, that Mr. Morgan's moſt perfect vacuum, formed by boiling quickſilver in a tube ever ſo long, contains a medium *more* than 300,000 times rarer than the common atmoſphere. From Mr. Cavallo's experiments it appears, that when air is only rarefied 1000 times, the electric light is exceſſively weak; ſo that there is not the leaſt probability that in an aërial medium 300,000 times rarer than the preſent, if indeed ſuch a medium can exiſt, there could be any light made viſible in the ordinary experiments. We ſee, however, by the many examples of meteors which have occurred at prodigious heights in the atmoſphere, that the electric light in ſuch a rarefied atmoſphere is not only viſible, but acts as vigorouſly in every reſpect as if it were on the ſurface of the earth. This circumſtance therefore affords a complete demonſtration of the fallacy of Mr. Morgan's argument, and a direct proof that the electric fluid pervades ſpace as completely diveſted of air as the beſt artificial vacuum we can make; nay, where it is generally believed by mathematicians that the atmoſphere has ceaſed altogether. His other arguments drawn *à priori* are ſtill more inconcluſive than that we have juſt mentioned. He tells us, that if a vacuum was a conductor, the whole quantity of electric matter contained in the earth and atmoſphere would be perpetually flying off through the regions of infinite ſpace, as being ſurrounded by a boundleſs conductor. But even this does not follow, though we ſhould ſuppoſe theſe regions to be an abſolute vacuity; for we know that electricity does not fly to a conducting ſubſtance merely becauſe it is a conductor, but becauſe it gives a paſſage to ſome place whither it has a tendency to go though the conductor was not there. Now, on the preſent hypotheſis, as the conductor would lead to *no place* to which the electric matter had any previous tendency, we cannot aſſign any reaſon why it ſhould acquire a tendency to fly off merely on account of the neighbourhood of a conductor, even though boundleſs. His other objection (that, on

the ſuppoſition of a vacuum being capable of conducting electricity, the whole ſpace in the univerſe would be filled with electric fluid) may be admitted in its fulleſt extent, without any detriment whatever to ſcience: and indeed, if we allow the electric fluid to be only a modification of the light of the ſun, as is rendered very probable by what is ſaid under the articles ELECTRICITY and FIRE, and many others in various places of this work, we muſt own that the whole univerſe is filled with it. The meteors in queſtion then will be no other than diſcharges of electricity from one part of the celeſtial ſpaces to another, ſimilar to the diſcharges between the poſitive and negative ſide of an electriſied bottle; thus intimating, that a circulation has taken place in the fluid, which the meteor at once completes and puts an end to. See the article METEOROLOGY.

Beſides thoſe we have mentioned of ſuch vaſt magnitude, there are others much ſmaller and nearer the ſurface of the earth, rolling upon it, or falling upon it, exploding with violence, as is the caſe with thoſe which appear in the time of thunder, and frequently produce miſchievous effects. One of theſe is mentioned by ſome authors as falling in a ſerene evening in the iſland of Jamaica; exploding as ſoon as it touched the ſurface of the ground, and making a conſiderable hole in it. Another is mentioned by Dr. Prieſtley, as rolling along the ſurface of the ſea, then riſing and ſtriking the top-maſt of a man of war, exploding, and damaging the ſhip. In like manner we hear of an electriſied cloud at Java in the Eaſt Indies; whence, without any thunder ſtorm, there iſſued a vaſt number of fire-balls, which did incredible miſchief. This laſt phænomenon points out to us the true origin of balls of this kind, viz. an exceſſive accumulation of electricity in one part, or a violent tendency to circulate, when at the ſame time the place where the motion begins is at ſo great a diſtance, or meets with other obſtacles of ſuch a nature, that it cannot eaſily get thither. Urged on, however, by the vehement preſſure from behind, it is forced to leave its place; but being equally unable to diſplace the great quantity of the ſame fluid, which has no inclination to move the ſame way with itſelf, it is collected into balls, which run hither and thither, according as they meet with conductors capable of leading them, into ſome part of the circle. This is even confirmed by an experiment related at the end of Dr. Prieſtley's fifth volume on Air. He relates, that a gentleman having charged, with a very powerful machine, a jar, which had the wire ſupporting the knob of a conſiderable length, and paſſed through a glaſs-tube, a globe of fire was ſeen to iſſue out of it. This globe gradually aſcended up the glaſs-tube till it came to the top of the knob, where it ſettled, turning ſwiftly on its axis, and appearing like a red-hot iron ball of three quarters of an inch diameter. On continuing to turn the machine, it gradually deſcended into the jar; which it had no ſooner done, than there enſued a moſt violent exploſion and flaſh, the jar being diſcharged and broken at the ſame time. This experiment, however, is ſingular in its kind; for neither the gentleman who performed it, nor any other, has yet been able to repeat it. Single as it is, however, we may yet gather from it, that a fire-ball will be the conſequence of a very violent electrification of any ſubſtance, provided at the ſame time that the air be in a very non-conducting ſtate, ſo that the electricity may not evaporate into it as faſt as it is collected; for this would produce only lucid ſtreams and flaſhes, as in the common experiments with the Leyden phial: and it is probably an inattention to this circumſtance which has hitherto prevented the repetition of the experiment above-mentioned. The caſe is the ſame in thunder-ſtorms, where an exceſſive accumulation of electric matter always produces fire-balls, the moſt miſchievous kind of lightning, as is explained under that article.

With regard to the uſes which fire-balls ſerve in the ſyſtem of nature, it is plain that they are the means of preſerving the equilibrium in the electric fluid in the atmoſphere, which would otherwiſe produce the moſt dreadful tempeſts. Under the article AURORA *Borealis*, it is ſhown why there muſt be a conſtant current of electric matter through the bowels of the earth from the equator to the poles, and from the poles to the equator through the atmoſphere. The great meteors ſerve for keeping up the equilibrium in this great atmoſpherical current, while the ſmaller ones anſwer a like purpoſe in the general maſs of electric matter diſperſed over the ſurface of the earth, and therefore are ſeen to move in all directions, as the equilibrium happens to require them in different parts. With regard to thoſe which are obſerved in the lower regions of the earth, or rolling on the ſurface of the ground itſelf, they undoubtedly anſwer purpoſes of a ſimilar kind in theſe lower regions; for as fire-balls in general are produced by a great exceſs of electricity in one place, there muſt of courſe be an equal deficiency in another; and to reſtore the equilibrium, or, to ſpeak more properly, to prevent a dangerous commotion from taking place throughout the whole maſs of electric fluid, the fire-ball breaks forth, and either puts a ſtop at once to the diſturbance by an exploſion, or by a ſilent and inviſible evaporation. From ſome accounts indeed it would ſeem that even the large celeſtial meteors detached part of their ſubſtance to accompliſh this purpoſe; though, for the reaſons already given, it would ſeem more probable that they operated by electrifying the atmoſphere, or ſetting the fluid contained in it in motion, ſo as to produce ſmall fire-balls of itſelf, rather than by detaching any part of their own bodies to ſuch a diſtance. Dr. Blagden, in the paper above quoted, gives an account of an appearance of this kind. It was deſcribed in a letter to Sir Joſeph Banks from the Abbé Mann, director of the academy at Bruſſels. "It happened (ſays the Abbé) at Mariekercke, a ſmall village on the coaſt, about half a mile weſt of Oſtend. The curate of the village was ſitting in the duſk of the evening with a friend, when a ſudden light ſurpriſed them, and, immediately after a ſmall ball of light-coloured flame came through a broken pane of glaſs, croſſed the room where they were ſitting, and fixed itſelf on the chink of a door oppoſite to the window where it entered, and there died gradually away. It appeared to be a kind of phoſphoric light carried along by the current of air. The curate and his friend, greatly ſurpriſed at what they ſaw, apprehended fire in the neighbourhood; but going out, found that the fire which had come in through the window had been detached from a large meteor in its paſſage."

BALLS, in electricity, are two pieces of cork, or pith of elder, nicely turned in a lathe to the ſize of a ſmall pea, and ſuſpended by fine linen threads; intended as electrometers, and of excellent uſe to diſcover ſmall degrees of electricity, to obſerve the changes of it from poſitive to negative, and *vice verſa*; and to eſtimate the force of a ſhock before the diſcharge, ſo that the operator ſhould always be able to tell very nearly before the diſcharge, by knowing how high he has charged his jars, what the exploſion will be.

Fire-BALLS, in the military art, are bags of canvas filled with gun-powder, ſulphur, nitre, pitch, &c. to be thrown by the ſoldiers, or out of mortars, in order to fire the houſes that happen to incommode trenches, advanced poſts, or the like. The Greeks had many kinds of fire-balls, or Πυροβολοι λιθοι; one kind called, more particularly, σκυλαλια, or σκυλαλιδες, made of wood, ſometimes a foot or even a cubit long; their heads being armed with ſpikes of iron, beneath which were hemp, pitch, and other combuſtibles, which being ſet on fire, were caſt among the enemy. The preparations of fire-balls, among the moderns, conſiſt of ſeveral operations, viz. making the bag, preparing the compoſition, tying, and, laſtly, dipping,

the ball. 1. The bags for this purpoſe are either oval or round. 2. The compoſition wherewith fire-balls are filled is various; but the following may ſerve as inſtances. To ten pounds of meal gunpowder add two of nitre, one of ſulphur, and one of colophony; or to ſix pounds of gunpowder, add four of nitre, four of ſulphur, one of powdered glaſs, half a pound of antimony, as much camphor, an ounce of ſal-ammoniac, and four of common ſalt, all pulveriſed. Sometimes they even fill fire-balls with hand granadoes. 3. For tying the fire-balls, they prepare two iron rings, one fitted round the aperture, where the ball is to be lighted, the other near its baſe. A cord is tied to theſe rings in ſuch a manner, as that the ſeveral turns repreſent ſemicircles of the ſphere cutting the globe through the poles. Over the cords, extended according to the length of the ball, others are tied, cutting the former at right angles, and parallel to each other, making a knot at each interſection. Laſtly, after putting in a leaden-bullet, the reſt of the ſpace is filled with towe or paper. 4. Thus completed, the fire-ball remains to be dipped in a compoſition of melted pitch four pounds, colophony two, and oil of turpentine two; after dipping, they cover it round with towe and dip it again, till it be brought to the juſt diameter required.

Light-Balls, are ſuch as diffuſe an intenſe light around; or they are balls which, being caſt out of the hand or from a mortar, burn for ſome time, and illuminate the adjacent parts. 1. Luminous or light-balls for the hand are made of pulveriſed gunpowder, nitre, brimſtone, camphor, and borax, moulded together into a maſs; and this is wrapped up in towe, with a ſheet of ſtrong paper over it. To fire it, they make a hole into it with a bodkin, into which they put ſome priming that will burn ſlowly. Its uſe is to be caſt into any works they would diſcover in the night-time. 2. For the larger light-balls, or thoſe to be thrown to a greater diſtance, they melt equal quantities of ſulphur, turpentine, and pitch; and herein dip an earthen or ſtone-ball, of a diameter much leſs than that of the mortar out of which the fire-ball is to be caſt: then rolling it in gunpowder, and covering it round with gauze, they dip it again, and repeat the reſt till it come to fit the cavity of the mortar: laſtly, they ſprinkle it around with gunpowder. This, being once kindled, will ſtrongly illuminate all around the place where it is thrown, and not only give opportunity to examine it, but alſo to diſcover what the enemy are about.

Smoke or Dark-Balls, are thoſe which fill the air with ſmoke, and thus darken a place to prevent diſcoveries. To prepare a darkening ball, make an oval or ſpherical bag, melt roſin over the coals, and add an equal part of nitre, the ſame of ſulphur, and a fifth part of charcoal. The whole being well incorporated, put in ſome ſhred towe, and fill the bags with this compoſition, dipping it after the ſame manner as directed for the fire-ball.

Stink-Balls, are thoſe which yield a great ſtench when fired, ſo as to annoy an enemy. They are prepared thus: Melt ten pounds of pitch, ſix of roſin, twenty of nitre, eight of gunpowder, and four of colophony; to theſe add two of charcoal, ſix of parings of horn cut ſmall, three of aſſafœtida, one of ſtinking ſaracen, and any other offenſive ingredients. The reſt muſt be managed as in the former caſe.

Sky-Balls, are thoſe which are caſt on high out of mortars, and which, when arrived at their height, burſting like rockets, afford a beautiful ſpectacle. Sky-balls are made of a wooden ſhell, filled with various compoſitions, particularly that of the ſtars of a rocket. Theſe are ſometimes intermixed with crackers and other combuſtibles, making rains of fire, &c.

Water-Balls, thoſe which ſwim and burn a conſiderable time in the water, and at length burſt in it. Theſe are made in a wooden ſhell, the cavity of which is filled with nitre, ſulphur, ſaw-duſt ſoaked in a ſolution of nitre, and dried; to which ſometimes other ingredients are added, as iron filings, Greek pitch, amber duſt, powdered glaſs, and camphor. The ingredients are to be ground, mixed up, and moiſtened with linſeed oil, nut oil, olive oil, or hempſeed oil. At the bottom is placed an iron coffin, filled with whole gunpowder, that the ball may at laſt burſt with a greater noiſe: and, laſtly, the ball is, by the addition of lead or otherwiſe, made of the ſame ſpecific gravity with water.

Land-Balls or ſhells, are thoſe which, being thrown out of a mortar, fall to the ground, burn, and burſt there. The ingredients are much the ſame as in the *water-balls*, only the ſpecific gravity is not attended to.

BALLAD, a kind of popular ſong, adapted to the capacity of the lower claſs of people; who, being mightily taken with this ſpecies of poetry, are thereby not a little influenced in the conduct of their lives. It conſiſts uſually of the recital of ſome action, adventure, or intrigue.

The French confine their ballads to ſtricter terms. A ballad, according to Richelet, is a ſong conſiſting of three ſtrophes, or ſtanzas, of eight verſes each, beſides a half ſtrophe; the whole in rhime, of two, three, or four verſes, with a burthen repeated at the end of each ſtrophe, as well as of the half ſtrophe.

In the old Engliſh verſion of the Bible, the book of Canticles is intitled *the ballet of ballets*; which has given ſcandal to ſome Romiſh writers as countenancing the opinion of thoſe who hold that book a ballet of love, or a recital of the amours between Solomon and his concubine, as Caſtalio and ſome others have conceived it to be. Some have ſuggeſted that a collection of ballads is neceſſary to a miniſter, in order to learn the temper and inclinations of a people, which are here frequently uttered with great ſimplicity. The great Cecil, chief miniſter to Queen Elizabeth, is ſaid to have made a moſt ample collection of ballads, on this account. A very ingenious political writer, Mr. Fletcher of Saltoun, ſays, that if he could but make the ballads of a nation, he would care very little who made the religion of it. There is a very curious collection of old Engliſh and Scottiſh ballads, publiſhed in 3 vols. 8vo. by Dr. Percy; in which, and in a diſſertation prefixed to Dr. Aikin's Collection of Songs, &c. the curious in this way may find abundance of entertainment and information.

BALLAGHY, a town of Ireland, in the county of Sligo, 22 miles S. of Sligo. Lon. 8. 40. W. Lat. 53. 56. N.

BALLAN, a town of France, in the late dioceſe of Mons, with the title of a marquiſate, ſeated on the river Orne. L. long. 0. 20. N. lat. 48. 10.

BALLAST, any heavy matter, as ſtone, gravel, iron, &c. depoſited in the hold of a ſhip, in order to make her ſink a proper depth in the water, that ſhe may be capable of carrying a ſufficient quantity of ſail without overſetting.

There is often great difference in the proportion of ballaſt required to prepare ſhips of equal burden for a voyage; the quantity being always more or leſs according to the ſharpneſs or flatneſs of the ſhip's bottom, which ſeamen call the *floor*. The knowledge of ballaſting a ſhip with propriety, is certainly an article that deſerves the attention of the ſkilful mariner; for although it is known, that ſhips in general will not carry a ſufficient quantity of ſail till they are laden ſo deep that the ſurface of the water will nearly glance on the extreme breadth amidſhips, yet there is more than this general knowledge required; ſince, if ſhe has a great weight of heavy ballaſt, as lead, iron, &c. in the bottom, it will place the centre of gravity too low in the hold; and although this will enable her to carry a great ſail, ſhe will nevertheleſs ſail very heavily, and run the riſk of being diſmaſted by her violent rolling.

To ballaſt a ſhip, therefore, is the art of diſpoſing thoſe materials ſo that ſhe may be duly poiſed, and maintain a proper

equilibrium on the water, ſo as neither to be too ſtiff nor too crank, qualities equally pernicious: as in the firſt, although the ſhip may be fitted to carry a great ſail, yet her velocity will not be proportionably increaſed; whilſt her maſts are more endangered by her ſudden jerks and exceſſive labouring: and in the laſt, ſhe will be incapable of carrying ſail, without the riſk of overſetting. Stiffneſs, in ballaſting, is occaſioned by diſpoſing a great quantity of heavy ballaſt, as lead, iron, &c. in the bottom, which naturally places the centre of gravity very near the keel; and that being the centre about which the vibrations are made, the lower it is placed, the more violent will be the motion of rolling. Crankneſs, on the other hand, is occaſioned by having too little ballaſt, or by diſpoſing the ſhip's lading ſo as to raiſe the centre of gravity too high, which alſo endangers the maſt in carrying ſail when it blows hard: for when the maſts loſe their perpendicular height, they ſtrain on the ſhrouds in the nature of a lever, which increaſes as the ſine of their obliquity; and a ſhip that loſes her maſts is in great danger of being loſt. The whole art of ballaſting, therefore, conſiſts in placing the centre of gravity to correſpond with the trim and ſhape of the veſſel, ſo as neither to be too high nor too low; neither too far forward nor too far aft, and to lade the ſhip ſo deep, that the ſurface of the water may nearly riſe to the extreme breadth amidſhips; and thus ſhe will be enabled to carry a good ſail, incline but little, and ply well to windward.

Ships are ſaid to be in ballaſt when they have no other loading. Maſters of veſſels are obliged to declare the quantity of ballaſt they bear, and to unload it at certain places. They are prohibited unloading their ballaſt in havens, roads, &c. the neglect of which has ruined many excellent ports. Ships and veſſels taking in ballaſt in the river Thames, are required by law to pay ſo much a ton to Trinity-Houſe, Deptford; who ſhall employ ballaſtmen, and regulate them; and their lighters are to be marked, &c. on pain of 10l.

BALLATOONS, large heavy luggage boats uſed for carrying wood by the river from Aſtracan and the Caſpian ſea to Moſcow. Theſe will carry from 100 to 200 tons, and have from 100 to 120 men employed to row and tow them along.

BALLET, Balet or Balletto, a kind of dramatic poem, repreſenting ſome fabulous actions or ſubject divided into ſeveral entries; wherein ſeveral perſons appear, and recite things under the name of ſome feigned deity, or illuſtrious character.

Ballet is more particularly uſed for a kind of comic dance, conſiſting of a ſeries of ſeveral airs or different kinds of movements, which together repreſent ſome ſubject or action. They are performed chiefly by maſks repreſenting ſylvans, tritons, nymphs, ſhepherds, and the like; and conſiſt of three parts, the entry, figure, and the retreat. The word is of Greek origin, formed from βαλλειν *jacere*, to caſt, throw, or toſs; whence alſo in writers of the middle age, we find *ballationes* for *ſaltationes*, dancings; and *ballare* for *ſaltare*, to dance.

BALLIAGE, or Bailiage, in commerce, a ſmall duty paid to the city of London by aliens, and even denizens, for certain commodities exported by them.

BALLISTA, a machine uſed by the ancients for ſhooting darts; it reſembled in ſome meaſure our croſs-bow. The word is Latin, ſignifying a croſs-bow; and is derived from the Greek, βαλλω, *to ſhoot*, or *throw*. Vegetius informs us, that the balliſta diſcharged darts with ſuch rapidity and violence, that nothing could reſiſt their force; and Athenæus adds, that Agiſtratus made one of little more than two feet in length, which ſhot darts 500 paces. In Plate 45, is repreſented the balliſta uſed in ſieges, according to the chevalier Folard. Thus, *a*, *a*, ſhow the baſe of the balliſta; *b*, *c*, upright beams; *d*, *e*, tranſverſe beams; *f*, *f*, the two capitals in the upper tranſverſe beam (the lower tranſverſe beam has alſo two ſimilar capitals, which cannot be ſeen in this tranſverſe figure); *g*, *g*, two poſts or ſupports for ſtrengthening the tranſverſe beams; *h*, *h*, two ſkains of cords faſtened to the capitals; *i*, *i*, two arms inſerted between the two ſtands, or parts of the ſkains; *k*, a cord faſtened to the two arms; *l*, darts which are ſhot by the balliſta; *m*, *m*, curves in the upright beams, and in the concavity of which cuſhions are faſtened, to break the force of the arms which ſtrike againſt them with great force when the dart is diſcharged; *n*, the arbour of the machine, in which a groove or canal perfectly ſtraight is formed, and in which the darts are placed in order to their being ſhot by the balliſta; *o*, the nut of the trigger; *p*, the roll or windlaſs, about which the cord is wound; *q*, an hook, by which the cord is drawn towards the centre, and the balliſta cocked; *r*, a ſtage or table on which the arbor is in part ſuſtained.

BALLISTARII, or Ballistrarii, in Antiquity, ſlingers in the ancient armies, or ſoldiers who fought with the *balliſtæ*. There are two kinds of *balliſtarii milites*; the former caſt ſtones, and other miſſive weapons, with the hand, called *manuballiſtarii*, ſometimes ſimply *manuballiſtæ*; the latter called *carroballiſtarii*, ſometimes only *carroballiſtæ*, made uſe of a machine. Some ſpeak of a third kind, called *arcuballiſtarii*; but theſe are better reduced to the ſecond. The *balliſtarii* were ſcarce heard of before the age of Conſtantine. *Balliſtarius* is alſo uſed, in middle age writers, for a croſs bowman, or *arbaletier*.

BALLISTEUM, or Ballistræa, in Antiquity, a military ſong or dance uſed on occaſions of victory. Vopiſcus has preſerved the *balliſteum* ſung in honour of Aurelian, who, in the Sarmatian war, was ſaid to have killed 48 of the enemy in one day with his own hand. *Mille, mille, mille, mille, mille, mille, decollavimus: Unus homo mille, mille, mille, mille decollavit; mille, mille, mille vivat, qui mille, mille occidit. Tantum vini habet nemo, quantum fudit ſanguinis.* The ſame writer ſubjoins another popular ſong of the ſame kind: *Mille Francos, mille Sarmatas, ſemel occidimus; mille, mille, mille, mille, mille Perſas quærimus.* It took the denomination *balliſteum* from the Greek βαλλω, *jacio*, or *jacto*, to caſt or toſs, on account of the motions uſed in this dance, which was attended with great elevations and ſwingings of the hands. The *balliſtea* were a kind of popular ballads, compoſed by poets of the lower claſs, without much regard to the laws of metre.

BALLISTICA, Ballistics, is uſed for the art of throwing heavy bodies. F. Marſennus has publiſhed a treatiſe on the projection of bodies, under this title.

BALLOON, or Ballon, in a general ſenſe, ſignifies any ſpherical hollow body, of whatever matter it be compoſed, or for whatever purpoſes it be deſigned. Thus, with chemiſts, balloon denotes a round ſhort-necked veſſel, uſed to receive what is diſtilled by means of fire; in architecture, a round globe on the top of a pillar; and among engineers, a kind of bomb made of paſteboard, and played off, in fire-works, either in the air or on the water, in imitation of a real bomb.

Air-Balloon. See Aerostation.

Balloon alſo denotes a kind of game ſomething reſembling tennis. The balloon is played in the open field, with a great round ball of double leather blown up with wind, and thus driven to and fro with the ſtrength of a man's arm, fortified with a brace of wood.

Balloon, or Balloen, is more particularly uſed among voyagers for the ſtate barges of Siam. The balloons are a kind of brigantine, managed with oars, of very odd figures, as ſerpents, ſea-horſes, &c. but, by their ſharpneſs and number of oars, of incredible ſwiftneſs. The balloons are ſaid to be made of a ſingle piece of timber, of uncommon length; they are raiſed high, and much decorated with carving at head and

ftern: ſome are gilt over, and carry 120 or even 150 rowers on each ſide. The oars are either plated over with ſilver, or gilt, or radiated with gold; and the dome or canopy in the middle, where the company is placed, is ornamented with ſome rich ſtuff, and furniſhed with a balluſtrade of ivory, or other coſtly matter, enriched with gilding. The edges of the balloon juſt touch the water, but the extremities riſe with a ſweep to a great height. Some are adorned with a variety of figures, made of pieces of mother of pearl inlaid. The richer ſort, inſtead of a dome, carry a kind of ſteeple in the middle; ſo that, conſidering the ſlenderneſs of the veſſel, which is uſually 100 or 120 feet long, and ſcarce ſix broad, the height of the two ends, and of the ſteeple, with the load of decorations, it is a kind of miracle they are not overſet.

Balloon, in the French paper-trade, is a term for a quantity of paper, containing 24 reams.

Balloon, Ballon, or Ballot, in the French glaſs-trade, ſignifies a certain quantity of glaſs-plates, ſmaller or greater according to their quality. The ballon of white glaſs contains 25 bundles, of ſix plates per bundle; but the ballon of coloured glaſs is only of 12½ bundles, and of three plates to a bundle.

BALLOTA, white horehound; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The calyx has 5 teeth, with 10 ſtriæ; and the upper lip of the corolla is crenated. It is a common weed growing on the ſides of banks in moſt parts of England, as alſo in footways near towns and villages in Scotland; ſo is ſeldom admitted into gardens. The flowers grow in whorls, upon branched peduncles, and lean on one ſide of the ſtalk; they are commonly of a dull red colour, but ſometimes white. It was formerly uſed in hyſteric caſes, but is now fallen into neglect. The Swedes reckon it almoſt an univerſal remedy in the diſeaſes of their cattle. Horſes, cows, ſheep, and goats, refuſe to eat it.

BALLOTADE, in the menage, the leap of a horſe between two pillars, or upon a ſtraight line, made with juſtneſs of time, with the aid of the hand and the calves of the legs: and in ſuch a manner, that when his fore feet are in the air, he ſhows nothing but the ſhoes of his hinder feet without yerking out.

BALLOTING, a method of voting at elections, &c. by means of little balls uſually of different colours, by the French called *ballots*; which are put into a box, and the party voting gives his ſuffrage privately.

BALLS, or Ballets, in heraldry, a frequent bearing in coats of arms, uſually denominated, according to their colour, bezants, plates, hurts, &c.

BALLUSTER, a ſmall kind of pillar uſed for balluſtrades.

BALLUSTRADE, a ſeries or row of balluſters, joined by a rail; ſerving as well for reſt to the elbows as for a fence or incloſure to balconies, altars, ſtaircaſes, &c. See Architecture.

BALLYCONNEL, a town of Ireland, in the county of Cavan, and province of Ulſter. W. long. 7. 45. N. lat. 54. 6.

BALLYSHANNON, a large town of Ireland, in the county of Donegal, or Tyrconnel, with a good haven. W. long. 8. 25. N. lat. 54. 25.

BALM, in botany. See Melissa.

Balm, or Balsam. See Balsam.

Balm *of Gilead*. See Balsam and Amyris.

BALNEARII servi, in antiquity, ſervants or attendants belonging to the baths. Some were appointed to heat them, called *fornicatores*; others were denominated *capſarii*, who kept the clothes of thoſe that went into them; others *aliptæ*, whoſe care it was to pull off the hair; others *unctuarii*, who anointed and perfumed the body.

BALNEARIUS fur, in antiquity, a kind of thief who practiſed ſtealing the clothes of perſons in the baths; ſometimes alſo called *fur balnearum*. The crime of thoſe thieves was a kind of ſacrilege; for the hot baths were ſacred: hence they were more ſeverely puniſhed than common thieves who ſtole out of private houſes. The latter were acquitted with paying double the value of the thing ſtolen; whereas the former were puniſhed with death.

BALNEUM, a term uſed by chemiſts to ſignify a veſſel filled with ſome matter, as ſand, water, or the like, in which another veſſel is placed containing ſubſtances that require a more gentle heat than that of the naked fire.

BALONICH, in the *Materia Medica* of the ancients, a name given by Avicenna, Averrhoes, and others, to a kind of camphor, which they deſcribe as coarſe, brown, and of leſs value than the other ſorts. This is probably the ſame with our rough camphor, as brought over to us from the Eaſt Indies.

BALSAM, Balsamum, a name given to certain oily, reſinous, and odorous ſubſtances, procured by making inciſions in the outer bark of trees or plants. They are originally liquid, but ſomewhat thick, and in ſome inſtances flow ſpontaneouſly from the plant which produces them. Theſe are called natural balſams, to diſtinguiſh them from pharmaceutical or chemical compoſitions that bear the ſame name.

Balſams are only resins in their liquid ſtate, though they are often found to be combined with a conſiderable proportion of gum, in which ſtate they are called *gum reſins*. Reſins not ſo combined are only ſoluble in vinous ſpirits and oils. They cannot be diſſolved by water, nor are they volatile in the heat of boiling water; but they are fuſible in a ſmall degree of heat, and readily inflammable on the contact of any flaming or ignited body. Balſams which are of the nature of gum-reſins can only be diſſolved by a mixture of ſpirit and water.

Balſams, by the yolk of eggs, are rendered ſoluble in water; more elegantly ſtill by ſugar; and moſt elegantly, as eſſential oils alſo are, by the intervention of gums and mucilages. Solutions prepared in the latter way are moſt permanent, as gum is the medium employed by Nature herſelf to unite the reſinous with the watery juices of vegetables. Of themſelves, balſams have no ſmell; but they often retain a part of the odorous principle; and in fact they derive both their liquidity and ſmell from a greater or leſs quantity of eſſential oil, which they contain, and which may be ſeparated from them by diſtillation. According to Neumann and other chemiſts, balſams may even be conſidered as true eſſential oils, which have loſt ſome of their odoriferous principle, and of their fineſt and moſt volatile parts. When they are deprived of their remaining part of volatile oil, their *reſidua* exactly reſemble thoſe which remain after the rectification of eſſential oils. Theſe *reſidua* are true reſins, from the analyſis of which the ſame principles are obtained as from natural reſins, which are themſelves nothing elſe but balſams exhauſted by time, or, by the action of the air and of the ſun, of all their odoriferous and volatile parts.

Balſamic medicines are warm and ſtimulating. Under this denomination come what we commonly call nervous and antiparalytic medicines, as alſo many cordial tinctures and other compounds of ſimilar properties. The principal medicines belonging to the balſamic claſs, which are retained in our modern pharmacopœias, are amber, benzoin, ſtorax, the balſams of Peru and Tolu, &c. &c. But though many writers have conſidered that claſs of remedies which we call balſams as of great ſervice in medicine, yet there are others who entertain

great doubts of their efficacy. And indeed it muſt be admitted, that where they are deſigned to act locally, as on the lungs for inſtance, balſamics labour under a moſt important defect; for they muſt take a moſt extraordinary circuit in moſt inſtances, before they can arrive at the intended ſcene of action; by which means they not only come ſlowly, and in ſmall quantities, but much weakened by the action of the ſtomach and blood veſſels, and by the intermixture of other fluids. In the intentions where balſams are chiefly given, the ſeat of the diſorder is generally in the *viſcera*; where a medicine can only arrive by the common conveyance of the blood; and how long, from its being taken into the ſtomach, muſt ſuch a medicine be, and how many alterations muſt it undergo in the divers parts of the body it paſſes through, before it comes to the part affected! Though the lungs are, by their ſituation, ſo near the ſtomach, a medicine cannot arrive there till it has taken its courſe through the lacteals, paſſed all the meanders of the meſentery, gone up with the chyle into the ſubclavian vein, and there entered the blood: and, after all, it has only the chance of coming to the part in ſuch a quantity, as with regard to the whole medicine which entered the blood, bears the ſame proportion, as the blood in the pulmonary artery bears to all the blood in the other arteries. Theſe conſiderations led the biſhop of Cloyne to prefer tar-water to all other balſamics; but, notwithſtanding this reaſoning on the ſubject, we know from experience, that, let their *modus operandi* be what it may, the ſtimulating gums, or the balſams prepared from them, are capable of doing conſiderable ſervice in the treatment of diſeaſes, thoſe ariſing from debility more eſpecially.

Balsam, or *Balm of Gilead*, as a popular medicine has been held in the greateſt eſteem, though there are ſome who hold that of Peru to be equal to it in virtue. It is drawn by inciſion from a tree of the ſame name growing in Egypt and Judea, but chiefly in Arabia Felix, and which is held ſo precious, that it makes part of the ſpecial revenue of the grand ſignior, without whoſe permiſſion, Dr. Lewis aſſerts, none are allowed to be planted or cultivated. Its ſmell is agreeable, and very briſk; its taſte bitter, ſharp, and aſtringent; it eaſily diſſolves in the mouth, and leaves no ſtain on woollen cloth.

At preſent there are three ways of obtaining it, and according to theſe there are three kinds of the balſam. The firſt kind is that obtained from the natural cracks or wounds made in the bark, as by the ancients, which is the beſt and moſt genuine kind. But there is ſo little procured in this way, that it ſcarcely ſupplies the ſeraglio, and the great officers; and hardly a drop of it is ever ſent out of the country. The ſecond kind is called by ſome the Conſtantinople balſam; this alſo rarely comes to us, unleſs in ſmall quantities preſented by the great men of the Porte, and is prepared by boiling. They fill large veſſels with the young twigs and leaves of the balſam ſhrub; and adding a large quantity of water, they boil them gently. During the boiling, there ariſes to the ſurface of the liquor an oily and balſamic matter, which they ſkim off and preſerve for uſe. After all this fine matter is raiſed, they increaſe the fire, and a large quantity of ſomewhat thicker balſam riſes more like turpentine; this they alſo ſeparate, and preſerve by itſelf; and this is principally what is imported into Europe.

It is unqueſtionably a very valuable medicine. It is of the ſame uſe with capivi in gonorrhœas, and is excellent in ſome complaints of the kidneys, and is by ſome perſons thought of ſo much efficacy in diſeaſes of the lungs, as to be eſteemed a cure for conſumptions. But though it does not abſolutely deſerve that title, yet with proper management it may do great ſervice in them. Externally it has alſo been of conſiderable uſe to ſurgeons in the cure of ulcers, &c.

For internal uſe it ſhould be given in boluſes, or elſe diſſolved by triture with the yolk of an egg, in the form of a mixture.

There is likewiſe a balſam of Mecca, which is a dry, white gum, eſpecially when kept till it is very old. It is brought from Mecca, by the return of the caravans of pilgrims and Mahometan merchants, who travel thither out of devotion to the birth-place of their prophet. It has all the virtues of the balm of Gilead, or Judea; and is probably the ſame, only hardened, and its colour ſomewhat altered.

Balsam, *Luccatellus's*, an old and not ineffectual though nauſeous remedy for coughs of long ſtanding. The College have lately rejected it from their pharmacopœia. It is compoſed of oil, two parts, and turpentine and wax, each one part; with ſome red ſanders to colour and improve its ſmell.

Balsam *of Peru*, is of three kinds; or rather, it is one and the ſame balſam, having three ſeveral names: 1. Balſam of inciſion, which is a white glutinous reſin, oozing at an inciſion in the tree, and afterwards thickened and hardened. This is excellent for ill conditioned ulcers, and much reſembles the opobalſamum, except in ſmell, which diſtinguiſhes it.—2. Dry balſam, which is diſtilled from the tips of branches cut off, to which are faſtened little veſſels to receive the liquor, which at firſt is like milk, but reddens by being expoſed to the ſun.—3. The balſam by lotion, which is blackiſh, and is drawn from the bark, roots, and leaves of the tree, bruiſed and boiled together. This is alſo uſed for the cure of wounds like the white balſam; and, on account of its excellent ſmell, by the perfumers.

The virtues of this balſam as a cordial, pectoral, and diuretic, are very great. It is given with ſucceſs from five to ten drops for a doſe, in conſumptions, aſthmas, nephritic complaints, obſtructions of the *viſcera*, and ſuppreſſions of the *menſes*. It is beſt taken dropped on ſugar; the yolk of an egg will indeed diſſolve it, and it may that way be made into an emulſion, but it is more acrid in that form than when taken ſingly. It is often made an ingredient in boluſes and electuaries; and enters into ſome of the officinal compoſitions.

Balsam of Capahu, or Copaiba, vulgarly Capivi, comes from Braſil in earthen bottles. There are two ſorts, the one bright and thin, the other thick; the firſt white, of a reſinous ſmell; the other a little more on the yellow. Both are uſeful for wounds: the Jews uſe this balſam after circumciſion to ſtop the blood. Many of the Americans call all odoriferous reſins, and ſweet-ſcented gums, copal; and the word iba, or iva, is the name for a tree; by which the etymology of copaiva eaſily appears. Having the property common to all terebinthinates of getting into the urine in an unaltered ſtate, and poſſeſſed of all its aſtringent and ſtimulating properties, it is found of uſe in the cure of gleets, *fluor albus*, &c. It alſo poſſeſſes the uſual properties of the balſams, and is therefore very advantageouſly adminiſtered in coughs and other pulmonary affections. Its heat and acrimony, however, render it hurtful in all inflammatory caſes, and it is ſometimes liable to produce very alarming effects when given too largely in urinary complaints. The balſam of Copaiba is frequently adulterated with olive oil, and oil of turpentine: indeed the near reſemblance it bears to this laſt, has occaſioned them to be ſometimes confounded; though they may be eaſily diſtinguiſhed both by their conſiſtence and colour; turpentine being thicker, and of a vitreous caſt, and the balſam more inclining to yellow. It is alſo more odorous, as well as ſharper and more bitter to the taſte.

This balſam yields a very large proportion of eſſential oil, by diſtillation with water, even to the quantity of five or ſix ounces from a pound; and the chemiſts who know this, adulterate their oils, either by mixing them with the oil of Copaiba, or more artfully, by putting a proper quantity of this

balſam with the ingredients into the ſtill, and ſo drawing off the oil of both mixed intimately together: and there ſeems no eaſy way of detecting this fraud. See COPAIFERA.

BALSAM *of Tolu*, is at firſt a liquid reſin, which, as it grows old, becomes of the colour and conſiſtence of Flanders glue. It is obtained by inciſion from ſome trees growing in New Spain; where the inhabitants receive it in little veſſels of black wax. In taſte and ſmell it reſembles balm of Gilead; and as it grows old, it takes the conſiſtence of a dry balſam. It is an excellent balſamic remedy, eſpecially for diſeaſes of the lungs. It cures catarrhs, and coughs, and protects the throat from tickling defluxions, &c. There is a ſyrup of it in the ſhops; but the beſt form of adminiſtering it is in ſubſtance mixed with an equal proportion of honey; or elſe diſſolved in ſome ſpirituous menſtruum, in which ſtate it is ſimilar to Sir John Hill's Balſam of Honey. It takes its denomination from a place called Tolu, ſituated between Carthagena and Nombre de Dios.

Hungarian BALSAM, is a ſpecies of oil, or liquid reſin, oozing from a coniferous tree growing on the Carpathian mountains, to which the Hungarians attribute many virtues. (Vide Ephem. Acad. N. C. Cent. 7. Obſ. 2. p. 4.) The virtues of this balſam, internally taken, or externally applied, are ſaid to be very great, and not inferior to thoſe of the oriental balſam. But whether either deſerve the commendation beſtowed on them, and how far they excel the common turpentine, is a queſtion that muſt be left to impartial practitioners to decide.

BALSAM *of Liquid Amber*, is a clear liquid reſin, produced by a tree in New Spain, called by the natives *oſoſol*; in ſome degree reſembling ambergriſe in ſmell, whence its name. This balſam is liquid; in which ſtate it is called oil of liquid amber, and when old, balſam of liquid amber; it comes from both the Spains, in barrels, but the genuine is very rare among us.

BALSAM, *new*, reſembles balſam of Tolu in ſmell and colour, and is procured in the manner of oil of bays, from a red fruit in the iſland of St. Domingo. It is found excellent for wounds and ulcers, and eſpecially for *fiſtulæ in ano*.

BALSAM is alſo a term applied to a mineral ſubſtance, of a fragrant quality, extracted from a kind of ſtones diſcovered in a mine near Bergamo in Italy. (Vide Phil. Tranſ. N° lxxix. p. 3059; or, Abridg. vol. ii. p. 460.) This is more particularly called, by way of diſtinction, the mineral balſam. The diſcoverer was Sig. Caſtagna. Its chief uſe is in diſorders of the uterus; on which account it is in great eſteem among the Genoeſe, to relieve women after labour. Some have alſo found it of great benefit in the phthiſis pulmonalis.

BALSAM is alſo a name given to certain factitious ſubſtances, made by chemiſts and apothecaries in imitation of the native balſams. Theſe are called, by way of diſtinction, factitious or artificial balſams. We have two different compoſitions of balſams, in imitation of the true, or Egyptian balſam; one by Mathiolus, the other by Eurieus Cordus. Pomet has alſo given a method of imitating one of the native balſams.

BALSAM *of Antimony*, a famous medicine deſcribed by Baſil Valentine in his *Currus antimonii triumphalis*. This author has related many incredible things in its praiſe: but Kerkring, in his commentaries on that work, declares, that all he has ſaid of it is ſhort of its real praiſe; and that, in particular, cancers were to be cured by it; himſelf having, as he informs us, performed a perfect cure on a breaſt condemned to be cut off, by anointing it with this balſam, and giving the common internal remedies. Both theſe gentlemen, however, are very cautious of giving the proceſſes for this and the like medicines, in intelligible terms; but they acknowledge, that it contains all the virtues of antimony.

BALSAM *of Sulphur*, is a ſolution of the flowers of ſulphur in ſome oil: it is made by boiling the two together over a ſlow fire the ſpace of an hour, or till the ſulphur be totally incorporated with the oil into a dark red balſam. The balſams of ſulphur are named from the particular oils which enter into their compoſition. Thus if it be made with the eſſential oil of turpentine, it is called *terebinthinated balſam of ſulphur*; if made with the eſſential oil of aniſeed, it is called *aniſated balſam of ſulphur*. Theſe are the two that have been moſt uſed. When made with the oil of nuts, it was called *Rulland's balſam of ſulphur*. The new name given to the common balſam of ſulphur by the college is *oleum ſulphuratum*; and that formerly called balſamum ſulphuris barbadenſe, they have named *petroleum ſulphuratum*. Theſe are of uſe both in external and internal caſes.

Helmont, the inventor of this remedy, extols it for all diſeaſes of the breaſt; and in many reſpects juſtly: yet Boerhaave rejects all internal uſe of it, as too hot and acrimonious. Bartholin alſo obſerves, that it ſometimes cauſes the heartburn.

BALSAM *of Saturn*, is prepared by diſſolving the ceruſſa acetata in oil of turpentine; digeſting the mixture till it acquires a red colour. This is found to be a good remedy for cleanſing foul ulcers.

BALSAM or BALM, among alchemiſts, ſometimes denotes the ſpirit of common ſalt extracted in a particular manner. The preparation is thus: they diſſolve the ſalt, and place the ſolution of it, well clarified, in horſe-dung, to putrefy, for the ſpace of two or three months, and then diſtil it ſtrongly with a ſand heat; upon which there ariſes a precious unctuoſity, wherein things the moſt corruptible being ſteeped, are ſaid to remain entire, eternally.

It is ſaid, that it was by this means ſome of the ancients preſerved dead bodies entire, without reducing them to mummy: and particularly that of the woman mentioned by Volaterranus to be found in a mauſoleum near Albano, in the time of Pope Alexander VI. which was by his order thrown ſecretly into the Tiber, to prevent idolatry; ſhe being found as freſh as when alive, though ſhe had been dead near 1300 years. —We read of a balſam of this kind, called *dead balſam*, which was a liquor prepared with myrrh and aloes, diſſolved in ſpirit of wine, chiefly uſed for drying and abſorbing the moiſture of dead bodies.

BALSAM *of the Philoſophers*, *balſamum philoſophorum*, is one of thoſe ænigmatical terms, whereby they expreſs *aurum potabile*.

BALSAM is alſo ſometimes uſed, in eccleſiaſtical writers, for the ſacred chryſm. This is otherwiſe denominated *balſameæum*.

BALSAMUM *traumaticum*, *vulnerary balſam*, a form of medicine preſcribed in the London Diſpenſatory, intended to ſupply the place of the tincture commonly called the Friar's *balſam*, ſo famous for curing old ulcers. The college have lately named it *tinctura benzoës compoſita*.

BALSAM *apple*, *male*, *momordica*, in botany, a genus of the monœcia ſyngeneſia claſs. Its characters are theſe: it hath male and female flowers upon the ſame plant; and the male flowers have an open concave empalement of one leaf. It has three ſhort awl-ſhaped ſtamina, which are compreſſed in a body, and have a reflected line containing the farina. The female flowers have the ſame empalement and petal as the male, but ſit upon the germen: theſe have three ſhort filaments, without ſummits. The germen ſupports one taper trifid ſtyle, crowned by three oblong, gibbous ſtigmas, and afterwards turns to an oblong fruit, opening with an elaſticity, having three membranaceous cells filled with compreſſed ſeeds. Linnæus enumerates eight, and Miller four ſpecies, one of which is known by the name of the wild, or ſpurting cucumber, from its caſting out its ſeeds, together with the viſcid juice in which they are lodged, with a violent force, if touched when ripe; and from hence it has ſometimes obtained the name of *noli me tangere*, or *touch me not*. This plant grows naturally in ſome of the warm

parts of Europe; but in England it is cultivated in gardens, for the fruit, which is uſed in medicine, or rather the *fæcula* of the juice of the fruit, which is the *elaterium* of the ſhops.

BALSAMATION, Balsamatio, is uſed by ſome writers for the art or act of embalming dead bodies. Dr. Hook ſpeaks of an univerſal balſamation, or method of preſerving all kinds of bodies from corruption, invented by Dr. Elſhot.

BALSAMELÆON, in the Materia Medica, a name given by ſome authors to the balm of Gilead, or true balſamum Judaicum.

BALSAMICS, *Balſamica*, is a Latin word which ſignifies *mitigating*. The term balſamic is a very lax one; it includes medicines of very different qualities, as emollients, detergents, reſtoratives, &c. but in medicines of all theſe kinds there ſeems to be this requiſite in them, *viz.* that they be ſoft, fragrant, and adheſive, alſo that by their ſtimulus they have a diſpoſition to invigorate. Medicines of this tribe are generally required for complaints whoſe ſeat is in the viſcera; and as they cannot be conveyed there but by the common road of the circulation, it follows, that no great effects can be expected from them but by their long continuation. Hoffman calls by the name of *balſamics*, thoſe medicines which are hot and acrid, and alſo the natural balſams, gums, &c. by which the vital heat is increaſed.

BALSAMINA *ſcandens*, a name given to the large-fruited white briony of Ceylon.

BALSAMINE, *female*, (*balſamina*). The plant thus named by Tournefort, is a ſpecies of the Impatiens of Linnæus; which is a genus of the monogamia order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 24th order, *Corydales*. The calyx is diphyllous; the corolla pentapetalous, and irregular, with an hooded nectarium; the capſule ſuperior and quinquevalved.

The *ſpecies* are, 1. The *noli-me-tangere*, or common yellow balſamine, a native of Britain, but cultivated in many gardens for curioſity. It has a fibrous root, an upright, jointed, ſucculent ſtalk, about 18 inches high, with alternate oval leaves; and, from the axillas of the ſtalks, long, ſlender, branching footſtalks, each ſuſtaining many yellow flowers; ſucceeded by taper capſules, that burſt open and dart forth their ſeeds with great velocity, whence its name. 2. The balſamina, or balſam, is a native of India. It hath a fibrous root, an upright, thick, ſucculent ſtalk, branching all around a foot and an half or two feet high; with long, ſpear-ſhaped, ſawed leaves, the upper ones alternate; and from the joints of the ſtalk and branches, cluſters of ſhort foot-ſtalks, each ſuſtaining one large irregular flower, of different colours in the varieties; flowering from June or July till September.

Culture. The firſt ſpecies is very hardy, and will grow freely from the ſeeds in any common border; but the ſecond requires artificial warmth. The ſeeds will indeed grow in the full ground, but rarely before the month of May; and more freely then, if covered with a hand-glaſs, &c. But the plants raiſed by artificial heat will flower five or ſix weeks ſooner than thoſe raiſed in the natural ground. The ſeeds ought therefore always to be ſowed on a hot-bed in March or April, and the plants continued therein till June; and if the frames be deep, they will then be drawn up to the length of two or three feet; after which they may be planted in pots, which muſt likewiſe be continued in the hot-bed till the plants have taken freſh root.

BALSORA. See Bassora.

BALTAGI, among the Turks, porters, and hewers of wood, in the court of the grand ſignior; who alſo mount on horſeback when the emperor rides out. Part of them alſo, who, for that purpoſe, muſt be caſtrated, keep watch at the gates of the firſt and ſecond courts of the ſeraglio. Theſe laſt are called *capigi*, and their commander *capigi paſcha*.

BALTIC sea, a great gulph ſurrounded by Sweden, Ruſſia, Courland, Pruſſia, Pomerania, and Denmark. The king of Denmark levies a tax at Elſineur on every ſhip that enters the Baltic ſea. It is remarkable that this ſea neither ebbs nor flows, and there is always a current ſets through the ſound into the ocean. It is generally frozen over three or four months in the year. Yellow amber is found in plenty on this coaſt.

BALTIMORA, in botany; a genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants. The receptaculum is chaffy; there is no pappus; the calyx is cylindrical and polyphyllous; and the ray of the corolla is quinqueflorous. There is but one ſpecies, the recta, a native of Maryland.

BALTIMORE, a town of Ireland in the county of Corke, and province of Munſter, with the title of a barony. It is ſeated on a headland which runs into the ſea, nine miles north-eaſt of Cape Clear. W. long. 9. 10. N. lat. 51. 15.

Baltimore, a county of Maryland in America. The town of Baltimore is reckoned the fourth in ſize, and the fifth in trade, in the United States. It is ſeated on the Patapſe, which runs into the bay of Cheſapeak. It is divided into "the Town and Fell's Point," by a creek, over which are two bridges. At Fell's Point, the water is deep enough for ſhips of burden; but ſmall veſſels only go up to the town. The houſes were numbered in 1787, and found to be 1955. There are nine churches, which reſpectively belong to German Calviniſts and Lutherans, Epiſcopalians, Preſbyterians, Papiſts, Baptiſts, Methodiſts, Quakers, and Nicolites or New Quakers. The number of inhabitants is upward of 10,000. Baltimore is 45 miles N. E. of Annapolis. Lon. 76. 25. W. Lat. 39. 45. N.

Baltimore *Bird*, in ornithology, a ſpecies of *Oriolus*, or *Oriole*, a genus belonging to the order of *picæ*. The bill in this genus is ſtrait, conic, very ſharp-pointed; edges cultrated, inclining inwards; mandibles of equal length. Noſtrils ſmall, placed at the baſe of the bill, and partly covered. Tongue divided at the end. Toes, three forward, one backward; the middle joined near the baſe to the outmoſt one. Theſe birds are inhabitants of America, except in a few inſtances; are a noiſy, gregarious, frugivorous, granivorous, and voracious race, very numerous, and often have penſile neſts. The ſeveral ſpecies, which are very numerous, ſince Mr. Latham deſcribes no leſs than 45, ſeem to be principally diſtinguiſhed by their colour. We have given engravings of two of them, the ſharp-tailed and Baltimore oriole, in Plate 47.

1. The firſt ſpecies, which we ſhall deſcribe, is called the *Baltimore* bird by Cateſby and Latham, *le Baltimore* by Buffon, the *oriolus Baltimore* by Linnæus, and the *Baltimore oriole* by Pennant, and is an inhabitant of North America; which country it quits before winter, and probably retires to Mexico, the *xochitotl* of Fernandez ſeeming to be of the ſame ſpecies. The head, throat, neck, and upper part of the back of the male, is deſcribed to be black; the leſſer coverts of the wings orange; the greater black, tipt with white; the breaſt, belly, lower part of the back, and coverts of the tail, of a bright orange; the primaries duſky, edged with white; the two middle feathers of the tail black; the lower part of the ſame colour, the remaining part orange; and the legs black. The head and back of the female are orange, edged with pale brown; the coverts of the wings of the ſame colour, marked with a ſingle bar of white; the under ſide of the body and coverts of the tail yellow; the tail duſky, edged with yellow. The length both of the male and female is ſeven inches. This bird ſuſpends its neſt to the horizontal forks of the tulip and poplar trees, formed of the filaments of ſome tough plants, curiouſly woven, mixed with wool, and lined with hairs. It is of a pear ſhape, open at top, with a hole on the ſide through which

the young diſcharge their excrements, and are fed. In ſome parts of North America, this ſpecies, from its brilliant colour, is called the *fiery hang-neſt*. It is named the *Baltimore bird* from its colours, reſembling thoſe in the arms of the late Lord Baltimore, whoſe family were proprietors of Maryland.

2. The ſharp-tailed oriole is about the ſize of a lark: the bill is duſky; the crown is brown and cinereous; the cheeks are brown, bounded above and below with deep dull yellow. The throat is white; the breaſt, ſides, thighs, and vent, are a dull pale yellow, ſpotted with brown; the belly is white; the back is varied with aſh-colour, black and white; the wing-coverts are duſky, with ferruginous edges. The quills are alſo duſky; the tail conſiſts of narrow ſharp-pointed feathers, of a duſky colour tinged with olive, and obſcurely barred; and the legs are a pale brown.

There are ſeveral other ſpecies of the oriole, all inhabitants of North America. Theſe, according to Mr. Pennant's enumeration, are the white-backed, the baſtard, the black, the brown-headed, the ruſty, the white-headed, the Hudſonian white-headed, the olive, the yellow-throated, the unalaſchka, the ſharp-tailed, and the red-wing. This laſt ſpecies is known in America by the name of the *red-winged ſtarling* and the *ſwamp black-bird*. Although they appear at New York only from April to October, they probably continue through the whole year in the ſouthern parts; at leaſt, Cateſby and Latham make no mention of their departure. They are ſeen at times in ſuch prodigious flocks, as even to obſcure the ſky. They were eſteemed the peſt of the colonies, making moſt dreadful havock among the maize and other grain, both when new ſown and when ripe. They are very bold, and not to be terrified by a gun; for, notwithſtanding the ſportſman makes ſlaughter in a flock, the remainder will take a ſhort flight, and ſettle again in the ſame field. The farmers ſometimes attempt their deſtruction, by ſteeping the maize before they ſow it in a decoction of white hellebore. The birds that eat this prepared corn, are ſeized with a vertigo, and fall down; which ſometimes drives the reſt away. This potion is particularly aimed at the purple grackles or purple jackdaw, which conſorts in myriads with this ſpecies, as if in conſpiracy againſt the labours of the huſbandman. The fowler feldom fires among the flocks without killing ſome of each. They appear in greateſt numbers in autumn, when they receive additions from the retired parts of the country, in order to prey on the ripened maize. Some of the colonies eſtabliſhed a reward of three-pence a dozen for the extirpation of the jackdaws; and, in New England, the intent was almoſt effected at the coſt of the inhabitants; who diſcovered, at length, that Providence had not formed theſe ſeemingly deſtructive birds in vain. Notwithſtanding they cauſed ſuch havock among the grain, they made ample recompenſe, by clearing the ground of the noxious worms, the Caterpillar of the *Bruchus Piſi*, or Peaſe-Beetle, in particular, with which it abounds. As ſoon as the birds were deſtroyed, the reptiles had full leave to multiply; and the conſequence was the total loſs of the graſs in 1749, when the New Englanders, repenting too late, were obliged to get their hay from Pennſylvania, and even from Great Britain.

There is beſides another oriole of this ſpecies, called the *baſtard Baltimore*: its ſize is that of the true Baltimore, but it meaſures ſomewhat leſs in length: the bill is lead-coloured; the forehead and cheeks black mixed with yellow; the hind head and nape are olive grey, marked with a few ſpots of black; the upper part of the back is the ſame, but ſomewhat duller; the lower part of the back, the rump, fore-part of the neck, breaſt, belly, ſides, thighs, upper and lower tail-coverts, and under the wings, are orange-yellow, but brighteſt on the breaſt and tail-coverts; the leſſer wing-coverts are deep brown; the greater are the ſame, tipped with dirty yellowiſh white: the quills are brown, bordered on both edges with white; the two middle tail-feathers are olive, then blackiſh, marked at the end with a longitudinal yellowiſh ſpot; the next on each ſide are olive and black, confuſedly mixed; and the four outer ones are of a yellowiſh olive: the legs and claws are blueiſh. They inhabit North America.

There ſeems to be great confuſion and uncertainty in the true and baſtard Baltimores and their females; moſt likely at laſt they may, the whole of them, turn out mere varieties of one ſingle ſpecies, all of them perhaps referable to one or other ſex of the true Baltimore, in the different ſtages of life. Since, however, it would be next to impoſſible, without enlarging this article beyond all bounds, to deſcribe each particular variety; we ſhall refer thoſe of our readers who wiſh for a more copious account, to Mr. Latham's *Synopſis of Birds*, where the whole genus is more minutely and more accurately deſcribed than in any other work.

BALUCCLAVO, or Jambol, a ſea-port town of Crimea on the Black Sea, where they build ſhips for the Grand Signior. E. long. 35. 15. N. lat. 44. 50.

BALYUR, or Baliur, a ſea port of Africa in the kingdom of Dancali, about 14 hours journey weſt from Babel-Mandel. It is remarkable only for being the landing place of the Abyſſinian patriarch Alphonſus Mendez, with his Jeſuits and Portugueſe, on April 3d, 1724. The king, who had received orders from the Abyſſinian emperor to give them a proper reception, diſpatched his ſon to meet them and conduct them to him. The royal palace they found to conſiſt of about half a dozen of tents, and a ſcore of huts, fenced about with a thorn hedge, and ſhaded by ſome wild kinds of trees. Near the palace was a river, which was then quite dried up, and no water to be found but what was digged for in the channel. The hall of audience was only a large tent about a muſket ſhot from the reſt. At the upper end was a kind of throne made of ſtones and clay, covered with a carpet, and two velvet cuſhions. At the other end was his majeſty's horſe, with the ſaddle and other accoutrements hanging on one ſide; it being the cuſtom of this country for the maſter and horſe to lie together, whether king or ſubject. Around the hall were about 50 young men ſitting croſs-legged; and when the Portugueſe ambaſſadors were admitted, they were made to ſit down in the ſame poſture. Soon after came the king's retinue conſiſting of his domeſtics, one having an earthen pitcher full of hydromel, another a cup made of porcelaine, a third carrying a cocoa ſhell full of tobacco, and a fourth bringing a ſilver tobacco-pipe with ſome fire. Next to them was the king, dreſſed in a light ſilk ſtuff, having on his head a turban, from the rims of which hung a parcel of rings nicely wrought, which dangled before his face. He had in his hand a ſhort kind of javelin, and was followed by all the chief officers of his court and houſehold. The reſpect paid him at his coming in was by ſtanding upright, and ſquatting down again twice, after which each went forward to kiſs his hand.

BAMBA, a province of the kingdom of Congo in Africa, ſituated between the rivers of Ambriſi and Loſe; the laſt of which parts it from Pemba on the eaſt, as the Ambriſi does from the province of Sogno on the north. Along the ſea-coaſts it extends itſelf northward to the river Lelunda; and on the ſouth to that of Danda, which parts it from the kingdom of Angola. The governors of this province bear the title of *dukes*, and are always ſome of the princes of the royal family. They are as deſpotic and arbitrary as if they were really kings, notwithſtanding the care and pains their monarchs have taken to keep them within due bounds. The ſoil of this province is very fertile; and would produce all the neceſſaries of life in great plenty, were the inhabitants but induſtrious in its cultivation. The ſea-coaſts produce a vaſt quantity of ſalt, which

could be purified with little trouble, and would yield an extraordinary revenue if the duties were duly paid; but these the governors find means to sink mostly into their own coffers. Here is also the fishery of the zimbis, or little sea snail, whose shell is the current coin not only in this and the neighbouring kingdom, but also in the most distant parts of Africa. Here are also said to be mines of gold, silver, quicksilver, copper, tin, and iron; but none except the iron mines are allowed to be worked.

BAMBERG, a large handsome town of Franconia in Germany, and capital of a bishopric of the same name. It was formerly imperial, but is now subject to the bishop. The country about it produces plenty of corn, fruits, and liquorice. It has an university, founded in 1585; and is situated at the confluence of the rivers Main and Reidnitz. E. long. 10. 15. N. lat. 50. 10.

Bamberg, a town of Bohemia, situated at the foot of a mountain. E. long. 16. 50. N. lat. 49. 53.

BAMBOCCIO, a celebrated painter of conversations, landscapes, cattle, &c. was born at Laeren, near Narden, in 1613. His name was Peter Van Laer; but in Italy they gave him the name of Bamboccio, on account of the uncommon shape of his body, the lower part being one third part longer than the upper, and his neck so short that it was buried between his shoulders. Nature, however, made ample amends for the unseemliness of his limbs, in the superior beauties of his mind; since he was endowed with an extensive genius; and, indeed, had an universal taste for every kind of painting. He studied nature incessantly; observing with a curious exactness every effect of light on different objects, at different hours of the day; and whatsoever incident afforded pleasure to his imagination, his memory for ever perfectly retained. His style of painting is sweet and true; and his touch delicate, with great transpareney of colouring. His figures are always of a small size, well proportioned, and correctly designed; and although his subjects are taken but from the lower walks of nature, such as plunderings, playing at bowls, inns, farrier's shops, cattle, or conversations; yet whatever he painted was so excellently designed, so happily executed, and so highly finished, that his manner was adopted by many of the Italian painters of his time. His works are still universally admired, and he is justly ranked among the first class of the eminent masters. In the latter part of his life, he was severely tormented with an asthmatic complaint, which he endured with much impatience; and it is reported, that as the disorder seemed to him insupportable, he threw himself into a canal to shorten his misery, and was drowned. His death happened in 1673.

BAMBOE, in botany, the trivial name of a species of arundo. See Arundo.

Bamboe-*Habit*; a Chinese contrivance by which a person who does not know how to swim may easily keep himself above water. The following account of it is from a letter to the author of the *Seaman's Preservative*. "In the year 1730, I was passenger in a ship from Batavia to China, burden about 400 tons, called the *Pridae*, Francisco Xavier commander, freighted by English, Chinese, and Portuguese. Near the coast of China we met one of those storms called a *Tuftoon (Tau fong)*, or a great wind, which carried away all our masts, bowsprit, and rudder; and in our hold we had six feet of water, expecting every moment the ship would founder —We consequently were consulting our preservation: the English and Portuguese stood in their shirts only, ready to be thrown off: but the Chinese merchants came upon deck, not in a cork-jacket, but I will call it a *bamboe-habit*, which had lain ready in their chests against such dangers; and it was thus constructed; four bamboes, two before and two behind their bodies, were placed horizontally, and projected about 28 inches. These were crossed on each side by two others, and the whole properly secured, leaving a space for their body; so that they had only to put it over their heads, and tie the same securely, which was done in two minutes, and we were satisfied they could not possibly sink." The shape is here subjoined.



BAMBOROUGH, a town of England on the coast of Northumberland. The particulars of the history of this place deserve to be mentioned at some length. The town, though now an inconsiderable village, was once a royal borough, and sent two members to parliament. It even gave name to a large tract extending southward, which was called *Bamboroughshire*. It had also three religious foundations; a house of friars preachers founded by Henry III. a cell of canons regular of St. Austin, and an hospital. Its very ancient castle stands on an almost perpendicular rock close to the sea, and accessible only on the south-east side, on a spot where, according to the monkish historians, there stood the castle or palace of the kings of Northumberland; built, as it is said, by king Ida, who began his reign about the year 559. Part of the present ruins are by some supposed to be the remains of king Ida's work. The ancient name of this place was, it is said, *Bebbanborough*; whose name Camden, from the authority of Bede, imagines borrowed from Bebba, Ida's queen: but the author of the additions to that writer is of a contrary opinion, as in the Saxon copy it is called *Cynelicanberg*, or the "royal mansion." According to Florilegus, king Ida at first fenced it only with a wooden inclosure, but afterwards surrounded it with a wall. It is thus described by Roger Hoveden, who wrote in the year 1192: "Bebba is a very strong city, but not exceeding large; containing not more than two or three acres of ground. It has but one hollow entrance into it, which is admirably raised by steps. On the top of the hill stands a fair church; and in the western point is a well curiously adorned, and of sweet clean water." This castle was besieged anno 642 by Penda, the Pagan king of the Mercians, who, as the story goes, attempted to burn it: for which purpose he laid vast quantities of wood under the walls, and set fire to it as soon as the wind was favourable; but no sooner was it kindled, than by the prayers of St. Adian, the wind changed and carried the flames into his camp, so that he was obliged to raise the siege. In 710, king Osred, on the death of Alfred his father, took shelter in this castle with Brithric his tutor or guardian; one Edulph having seized the crown, by whom, with his partisans, they were unsuccessfully besieged. Brithrie made so gallant a defence, that the siege was turned into a blockade, which gave the loyal subjects time to arm in defence of their young king. On their marching hither to his relief, Edulph fled, but was followed, taken, and put to death by Brithrie, who thereby securely seated Osred on the throne, when this castle became his palace. In the reign of Egbert, Kenulph bishop of Lindisfarn was confined here 30 years from 750 to 780. In 933, it was plundered and totally ruined by the Danes; but being of great importance in defending the northern parts against the continual incursions of the Scots, it was soon after repaired, and made a place of considerable strength.

It is ſaid to have been in good repair at the time of the Conqueſt, when it was probably put into the cuſtody of ſome truſty Norman, and had in all likelihood ſome additions made to its works; and this is the more probable, as the preſent area, contained within its walls, meaſures upwards of 80 acres, inſtead of three, as when deſcribed by Hoveden. About the year 1095 it was in the poſſeſſion of Robert de Mowbray earl of Northumberland, who engaging in ſome treaſonable practices againſt William Rufus, that king laid ſiege to it, and obliged it to ſurrender. In the next reign it was entruſted by Henry I. to Euſtace Fitz John, who was diſpoſſeſſed of it and his other employments by king Stephen, that king being jealous of his attachment to Maud, daughter of Henry I. Irritated at this, Fitz John delivered the caſtle of Alnwick to David king of Scotland, and brought to his aid all the forces he could raiſe; he was, however, afterwards reconciled to king Stephen, and held the manors of Burg and Knareſborough in Yorkſhire, but never recovered the government of this caſtle.

In the 16th of Henry II. ſome great repairs ſeem to have been made here, as in Madox's Hiſtory of the Exchequer, under the article of Amercements, it appears one William, ſon of Waldef, was fined five marks for refuſing his aſſiſtance in the King's works at Baenburg Caſtle. Its keep is ſuppoſed to have been the work of this reign.

Edward I. ſummoned Baliol to meet him here in 1296; and on his refuſal invaded Scotland, and took him priſoner. Edward II. ſheltered Gaveſton here in 1310. It was taken by the Yorkiſts after the battle of Hexham. In the reign of Elizabeth, Sir John Forſter, warden of the marches, was governor of it, and made a knight banneret after the battle of Maſſelburgh; and his grandſon John obtained a grant of both caſtle and manor from James I. His deſcendant Thomas forfeited it in 1715; but his maternal uncle, Nathaniel Crew, biſhop of Durham, purchaſed and bequeathed them to unconfined charitable uſes. The ruins are ſtill conſiderable; but many of them are now filled with ſand, caught up by the winds which rage here with great violence, and carried to very diſtant places. The remains of a great hall are very ſingular; it had been warmed by two fire-places of a vaſt ſize, and from the top of every window ran a flue like that of a chimney, which reached the ſummits of the battlements. Theſe flues ſeem deſigned as ſo many ſupernumerary chimnies to give vent to the ſmoke that the immenſe fires of thoſe hoſpitable times filled the rooms with; for halls ſmoky, but filled with good cheer, were in thoſe days thought no inconvenience. In the year 1757, the truſtees for lord Crew's charity began the repairs of the keep or great tower; the direction and management being committed to Dr. Sharp archdeacon of Durham, one of their number; who has made a moſt judicious and humane application of his lordſhip's generous bequeſt. The walls are from 9 to 12 feet thick. The upper parts of the building have been formed into granaries; whence, in times of ſcarcity, corn is ſold to the indigent without any diſtinction at four ſhillings per buſhel. A hall and ſome ſmall apartments are reſerved by the doctor, who frequently reſides here to ſee that his noble plan is properly executed. Among the variety of diſtreſſed who find relief from the judicious diſpoſition of this charity, are the mariners navigating this dangerous coaſt, for whoſe benefit a conſtant watch is kept on the top of the tower; from whence ſignals are given to the fiſhermen of Holy Iſland when any ſhip is diſcovered in diſtreſs, theſe fiſhermen by their ſituation being able to put off their boats when none from the land can get over the breakers. The ſignals are ſo regulated as to point out the particular place where the diſtreſſed veſſel lies. Beſides which, in every great ſtorm, two men on horſeback patrole the adjacent coaſt from ſun-ſet to ſun-riſe, who, in caſe of any ſhipwreck, are to give immediate notice at the caſtle. Premiums are likewiſe paid for the earlieſt information of any ſuch misfortune. By theſe means the lives of many ſeamen have been, and will be, preſerved, who would otherwiſe have periſhed for want of timely aſſiſtance. Nor does this benevolent arrangement ſtop here. The ſhipwrecked mariner finds an hoſpitable reception in this caſtle; and is here maintained for a week or longer, as circumſtances may require. Here, likewiſe, are ſtore-houſes for depoſiting the goods which may be ſaved; inſtruments and tackle for weighing and raiſing the ſunken and ſtranded veſſels; and, to complete the whole, at the expence of this fund, the laſt offices are decently performed to the bodies of ſuch drowned ſailors as are caſt on ſhore.

BAMBUCK, a country of Africa, of which the following account is given by the Abbé Raynal, on the credit of a modern traveller whom he does not name. "In the interior part of Africa, under the 12th or 13th degree of north latitude, there is (ſays a modern traveller) a pretty large country, known by the name of *Bambuck*. It is not ſubject to a particular king; but governed by village lords, called *farims*. Theſe hereditary and independent chiefs are all obliged to unite for the defence of the ſtate, when it is either attacked as a community, or only in one of its branches.

"The territory of this ariſtocratical ſtate is dry and barren. It produces neither maize, rice, nor pulſe. The inſupportable heat it is ſubject to, proceeds in part from its being ſurrounded by high mountains, which prevent the wind from refreſhing the air. The climate is as unwholeſome as it is diſagreeable: vapours, which continually iſſue from the bowels of a ſoil replete with minerals, render this country unfit to live in, eſpecially to ſtrangers.

"It is gold that has made this miſerable country an object worthy of notice; gold, which in the eyes of the covetous man ſeems to compenſate for all the evils of nature, though in reality it increaſes them all. This metal is ſo common in this country, that it is found almoſt indiſcriminately every where. To obtain it, ſometimes it is ſufficient to ſcrape the ſurface of the earth, which is clayiſh, light, and mixed with ſand. When the mine is very rich, it is digged only to the depth of a few feet, and never deeper; though it has been obſerved, that the lower it was digged, the more gold the ſoil afforded. The miners are too indolent to purſue a toil which conſtantly becomes more tedious, and too ignorant to perceive the conveniences it would be attended with. Their negligence and their folly are in this inſtance ſo extraordinary, that in waſhing the gold, in order to ſeparate it from the earth, they only preſerve the larger pieces: the light parts paſs away with the water, which flows down an inclined plane.

"The inhabitants of Bambuck do not work theſe mines at all times, nor are they at liberty to do it when they pleaſe. They are obliged to wait till private or public wants determine the farims to grant this permiſſion. When it is proclaimed, all who are able to avail themſelves of this advantage meet at the appointed place. When their work is finiſhed, a diviſion is made. Half of the gold goes to the lord, and the remainder is equally diſtributed among the labourers. Thoſe who want gold at any other time than that of the general digging, ſearch for it in the beds of the rivers, where it is very common.

"The French and Engliſh have ſucceſſively been deſirous of appropriating to themſelves theſe real or imaginary riches. Some thought they could reach this country by the Niger, others by the Salum. Far from having ſucceeded in their attempts of becoming maſters of this country, they have not yet aſcertained its exiſtence. The unſucceſsfulneſs of paſt efforts has redoubled the activity of ſanguine minds; though ſome merchants have choſen rather to limit themſelves to a commerce much more reprehenſible, viz. that of ſlaves."

BAMFF, a ſhire of Scotland, compreſſending part of

Buchan, with the counties of Strathdovern, Boyn, Enzie, Strathaven, and Balvenie, extends 32 miles from eaſt to weſt, and 13 in breadth from north to ſouth. On the ſouth, it is ſeparated from part of Buchan by the river Ugie; on the eaſt it is watered by the Dovern and the German Ocean; on the weſt it is bounded by the Spey and the county of Murray; on the ſouth-weſt, it borders on Badenoch and the Braes of Mar; and on the north, it is confined by the Murray Frith.

BAMFF, the capital of the ſhire, is pleaſantly ſituated on the ſide of a hill, at the mouth of the river Dovern. It was erected into a borough by virtue of a charter from Robert II. dated October 7, 1372, endowing it with the ſame privileges, and putting it on the ſame footing, with the burgh of Aberdeen; but tradition ſays it was founded in the reign of Malcolm Canmore. W. long. 2. 5. N. lat. 57. 40.

BAMIER, the name of a plant common in Egypt. It produces a pyramidal huſk, with ſeveral compartments, of the colour of a lemon, and filled with muſky ſeeds. This huſk dreſſed with meat is a wholeſome food, and has a very agreeable flavour. The Egyptians make great uſe of it in their ragouts.

BAMIYAN, a city of Aſia, ſituated in the province of Zableſtan, 10 days journey from Balkh, and eight from Gazna. It is remarkable only for its dreadful cataſtrophe when taken by Jenghiz Khan in 1221. At that time the city belonged to Sultan Jalallodin, the laſt of the famous Mahmud Gazni's race. Jenghiz Khan was at that time about to attack Gazna, that prince's capital; but was ſtopped by the garriſon of Gazna, which he had hoped would give him no trouble. In this, however, he was diſappointed. The people had for a long time expected an attack; and had therefore ruined the country for five or ſix leagues round, while the peaſants had carried away the ſtones, and every thing that could be of uſe to the beſiegers. Accordingly, Jenghiz Khan having erected wooden towers, and planted his engines upon them, was in a ſhort time obliged to give over his attacks till millſtones and other materials could be brought from a great diſtance. The walls of the city were very ſtrong, ſo that the engines of the Moguls made but little impreſſion; and the garriſon making frequent and furious ſallies cut off whole ſquadrons of their enemies, and frequently overthrew their towers and engines. This exceedingly chagrined Jenghiz Khan; who one day returning from a fruitleſs attack, and hearing of the defeat of one of his generals by Jalallodin, ſwore to be revenged on Bamiyan. This fury coſt the life of one of his grandchildren; who, expoſing himſelf too much, to pleaſe his grandfather, was ſlain with an arrow. At laſt, however, by the numberleſs multitude of the Moguls, who continued the attacks without intermiſſion, the city was taken, after its walls had been ruined in many places, and the braveſt ſoldiers and officers of the garriſon ſlain in its defence. The mother of the young prince who had been killed entering with the troops, and more deſerving the name of a fiend than a woman, cauſed the throats of all the inhabitants to be cut, without excepting one. She even gave orders to rip up the bellies of all the women with child, that not an infant might be left alive. In ſhort, to gratify the rage of this inhuman monſter, the buildings were all levelled with the ground; the cattle, and every living creature, deſtroyed; inſomuch that the hardened Moguls themſelves gave this place the name of *Maulalig*, which in their language ſignifies *the unfortunate city*. A ſtrong caſtle has ſince been built out of its ruins.

BAMPTON, a town of Devonſhire, ſituated in a bottom ſurrounded with high hills. W. long. 4. 25. N. lat. 51. 5.

BAN, or BANS. See BANN.

BAN, in commerce, a ſort of ſmooth fine muſlin, which the Engliſh import from the Eaſt Indies. The piece is almoſt a yard broad, and runs about 20 yards and a half in length.

BANANA TREE, a ſpecies of the *muſa* or plantain. The plantain-tree is a genus of the moncecia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the eighth order, *Scitamineæ*. The calyx of the male hermaphrodite is a ſpatha or ſheath; the corolla is dipetalous; the one petal erect and quinquedentate; the other nectariferous, coneave, and ſhorter; there are ſix filaments, five of which are perfect; one ſtyle; the germen inferior and abortive. The female hermaphrodite has the calyx, corolla, filaments, and piſtil of the male hermaphrodite, with only one filament perfect; the berry is oblong, and three-angled below. The moſt remarkable ſpecies are, 1. The *paradiſaica*, or plantain; 2. The *muſa ſapientum*, or banana tree. See Plate 48.

The firſt ſort is cultivated in all the iſlands of the Weſt Indies, where the fruit ſerves the Indians for bread; and ſome of the white people alſo prefer it to moſt other things, eſpecially to the yams and caſſada bread. The plant riſes with a ſoft ſtalk 15 or 20 feet high; the lower part of the ſtalk is often as large as a man's thigh, diminiſhing gradually to the top, where the leaves come out on every ſide; theſe are often eight feet long, and from two to three feet broad, with a ſtrong fleſhy midrib, and a great number of tranſverſe veins running from the midrib to the borders. The leaves are thin and tender, ſo that where they are expoſed to the open air, they are generally torn by the wind; for, as they are large, the wind has great power over them. Theſe leaves come out from the centre of the ſtalk, and are rolled up at their firſt appearance; but when they are advanced above the ſtalk, they expand and turn backward. As theſe leaves come up rolled in the manner before-mentioned, their advance upward is ſo quick, that their growth may almoſt be diſcerned by the naked eye; and if a fine line is drawn acroſs level with the top of the leaf, in an hour's time the leaf will be near an inch above it. When the plant is grown to its full height, the ſpike of flowers will appear in the centre, which is often near four feet in length, and nods on one ſide. The flowers come out in bunches; thoſe in the lower part of the ſpike being the largeſt; the others diminiſh in their ſize upward. Each of theſe bunches is covered with a ſpatha or ſheath of a fine purple colour, which drops off when the flowers open. The upper part of the ſpike is made up of male or barren flowers, which are not ſucceeded by fruit, but fall off with their covers. The fruit or plantains are about a foot long, and an inch and a half or two inches diameter: it is at firſt green, but when ripe of a pale yellow colour. The ſkin is tough; and within is a ſoft pulp of a luſcious ſweet flavour. The ſpikes of fruit are often ſo large as to weigh upwards of 40lb. The fruit of this ſort is generally cut before it is ripe. The green ſkin is pulled off, and the heart is roaſted in a clear fire for a few minutes, and frequently turned: it is then ſcraped, and ſerved up as bread. Boiled plantains are not ſo palatable. This tree is cultivated on a very extenſive ſcale in Jamaica; without the fruit of which, Dr. Wright ſays, the iſland would ſcarcely be habitable, as no ſpecies of proviſion could ſupply their place. Even flour or bread itſelf would be leſs agreeable, and leſs able to ſupport the laborious negro, ſo as to enable him to do his buſineſs or to keep in health. Plantains alſo fatten horſes, cattle, ſwine, dogs, fowls, and other domeſtic animals. The leaves being ſmooth and ſoft are employed as dreſſings after bliſters. The water from the ſoft trunk is aſtringent, and employed by ſome to check diarrhœas. Every other part of the tree is uſeful in different parts of rural economy. The leaves are uſed for napkins and table-cloths, and are food for hogs.

The ſecond ſort differs from the firſt, in having its ſtalks marked with dark purple ſtripes and ſpots. The fruit is ſhorter, ſtraighter, and rounder: the pulp is ſofter, and of a more luſcious taſte. It is never eaten green; but when ripe,

it is very agreeable, either eaten raw or fried in ſlices as fritters; and is reliſhed by all ranks of people in the Weſt Indies.

Both the above plants were carried to the Weſt Indies from the Canary Iſlands; whither, it is believed, they had been brought from Guinea, where they grow naturally. They are alſo cultivated in Egypt, and in moſt other hot countries, where they grow to perfection in about 10 months from their firſt planting to the ripening of their fruit. When their ſtalks are cut down, there will ſeveral ſuckers come up from the root, which in ſix or eight months will produce fruit; ſo that, by cutting down the ſtalks at different times, there is a conſtant ſucceſſion of fruit all the year.

In Europe there are ſome of theſe plants preſerved in the gardens of curious perſons, who have hot-houſes capacious enough for their reception, in many of which they have ripened their fruit very well; but as they grow very tall, and their leaves are large, they require more room in the ſtove than moſt people care to allow them. They are propagated by ſuckers, which come from the roots of thoſe plants which have fruited; and many times the younger plants, when they are ſtinted in growth, will alſo put out ſuckers.

The fruit of the banana-tree is four or five inches long, of the ſize and ſhape of a middling cucumber, and of a high, grateful flavour: the leaves are two yards long, and a foot broad in the middle; they join to the top of the body of the tree, and frequently contain in their cavities a great quantity of water, which runs out, upon a ſmall inciſion being made into the tree, at the junction of the leaves. Bananas grow in great bunches, that weigh a dozen pounds and upwards. The body of the tree is ſo porous as not to merit the name of wood; the tree is only perennial by its roots, and dies down to the ground every autumn.

When the natives of the Weſt Indies (ſays Labat) undertake a voyage, they provide themſelves a paſte of banana; which, in caſe of need, ſerves them for nouriſhment and drink: for this purpoſe they take ripe bananas; and having ſqueezed them through a fine ſieve, form the ſolid fruit into ſmall loaves, which are dried in the ſun or in hot aſhes, after being previouſly wrapped up in the leaves of Indian flowering-reed. When they would make uſe of this paſte they diſſolve it in water, which is very eaſily done; and the liquor, thereby rendered thick, has an agreeable acid taſte imparted to it, which makes it both refreſhing and nouriſhing. The banana is greatly eſteemed, and even venerated, by the natives of Madeira, who term it the *forbidden fruit*, and reckon it a crime almoſt inexpiable to cut it with a knife; becauſe, after diſſection, it exhibits, as they pretend, a ſimilitude of our Saviour's crucifixion; and to cut the fruit open with a knife, is, in their apprehenſion, to wound his ſacred image.

Some authors have imagined, that the banana tree was that of the leaves of which our firſt parents made themſelves aprons in Paradiſe. The ſacred text, indeed, calls the leaves employed for that purpoſe *fig-leaves*; and Milton, in a moſt beautiful but erroneous deſcription, affirms the bearded or Bengal fig to have been the tree alluded to. But beſides that the fruit of the banana is often by the moſt ancient authors called a *fig*, its leaves, by reaſon of their great ſize and ſolidity, were much more proper for a veil or covering than thoſe of the Bengal fig, which are ſeldom above ſix or eight inches long and three broad. On the other hand, the banana leaves being three, four, and five feet long, and proportionably broad, could not fail to be pitched upon in preference to all others; eſpecially as they might be eaſily joined, or ſewed together, with the numerous thread-like filaments that may, with the utmoſt facility, be peeled from the body of this tree.

Some have ſuppoſed the Abyſſinian plant *enſete* to be a ſpecies of muſa. It is ſaid to be a native of the province of Narea, where it grows in the great marſhes and ſwamps for which that province is remarkable, owing to the many rivers which originate in that country, and have but a ſmall declivity to the ocean. This plant, as well as the coffee-tree, is ſaid to have been unknown in Abyſſinia before the arrival of the Galla, who imported them both along with them. It comes to great perfection about Gondar; but the principal plantations of it are in that part of Maitſha and South, to the weſt of the Nile, where it is almoſt the ſole food of the Galla who inhabit that country. Maitſha is almoſt entirely on a dead level; ſo that the rains ſtagnate, and prevent the ſowing of grain. Were it not for the enſete, therefore, the Galla would have ſcarce any vegetable food. Mr. Bruce (ſee his Travels, vol. v. p. 36) thinks that the enſete may have been cultivated in ſome of the gardens of Egypt about Roſetto, but that it was not a native of the country. He ſtrongly controverts the opinion that this plant is a ſpecies of muſa. "It is true (ſays he), the leaf of the banana reſembles that of the enſete: it bears figs, and has an excreſcence from its trunk, which is terminated by a conical figure, chiefly differing from the enſete in ſize and quantity of parts; but the figs of the banana are of the ſize and figure of a cucumber, and this is the part which is eaten. This fig is ſweet, though mealy, and of a taſte highly agreeable. It is ſuppoſed to have no ſeeds, though in fact there are four ſmall black ſeeds belonging to every fig. But the figs of the enſete are not eatable; they are of a ſoft tender ſubſtance; watery, taſteleſs, and in colour and conſiſtence reſembling a rotten apricot: they are of a conical form, crooked a little at the lower end; about an inch and an half in length, and an inch in breadth where thickeſt. In the inſide of theſe is a large ſtone half an inch long, of the ſhape of a bean or caſhew-nut, of a dark-brown colour; and this contains a ſmall ſeed, which is ſeldom hardened into fruit, but conſiſts only of ſkin. The long ſtalk that bears the figs of the enſete ſprings from the centre of the plant, or rather is the body or ſolid part of the plant itſelf. Upon this, where it begins to bend, are a parcel of looſe leaves; then grows the fig upon the body of the plant without any ſtalk; after which the top of the ſtalk is thick ſet with ſmall leaves, in the midſt of which it terminates the flower in the form of an artichoke; whereas in the banana, the flower in form of the artichoke grows at the end of that ſhoot or ſtalk which proceeds from the middle of the plant, the upper part of which bears the row of figs. The leaves of the enſete are formed of longitudinal fibres cloſely ſet together: the leaves grow from the bottom without ſtalks: whereas the banana is in form like a tree, and has been miſtaken for ſuch. One half of it is divided into a ſtem, the other is a head formed with leaves; and in place of the ſtem that grows out of the enſete, a number of leaves, rolled round together like a truncheon, ſhoots out of the heart of the banana, and renews the upper as the under leaves fall off: but all the leaves of the banana have a long ſtalk; this fixes them to the trunk, which they do not embrace by a broad baſe or involucrum as the enſete does.

"But the greateſt differences are ſtill remaining. The banana has by ſome been miſtaken for a tree of the palmaceous kind, for no other reaſon but a kind of ſimilarity in producing the fruit on an excreſcence or ſtalk growing from the heart of the ſtem: but ſtill the muſa is neither woody nor perennial; it bears the fruit but once; and in all theſe reſpects it differs from trees of the palmaceous kind, and indeed from all ſort of trees whatever. The enſete, on the contrary, has no naked ſtem; no part of it is woody: the body of it, for ſeveral feet high, is eſculent; but no part of the banana plant can be eaten. As ſoon as the ſtalk of the enſete appears perfect and full of leaves, the body of the plant turns hard and fibrous, and is no longer fit to be eaten: before, it is the beſt of all

vegetables. When boiled, it has the taſte of the beſt new wheat-bread not perfectly baked. When you make uſe of the enſete for eating, you cut it immediately above the ſmall detached roots, and perhaps a foot or two higher, as the plant is of age. The green muſt be ſtripped from the upper part till it becomes white; when ſoft, like a turnip well boiled, if eat with milk or butter, it is the beſt of all food, wholeſome, nouriſhing, and eaſily digeſted."

Mr. Bruce next proceeds to conſider an hieroglyphic ſometimes met with in Egypt, viz. "the figure of Iſis ſitting between ſome branches of the banana tree, as is ſuppoſed, and ſome handfuls of ears of wheat. There is likewiſe the hippopotamus ravaging a quantity of the banana tree. Yet the banana is merely adventitious in Egypt: it is a native of Syria: it does not even exiſt in the low hot country of Arabia Felix; but chooſes ſome elevation in the mountains where the air is temperate; and is not found in Syria farther to the ſouthward than lat. 34°.

For theſe reaſons our author thinks, that the banana, not being a plant of the country, "could never have entered into the liſt of their hieroglyphics; conſequently, it could not figure any thing regular or permanent in the hiſtory of Egypt or its climate. I therefore imagine (adds he), that this hieroglyphic was wholly Ethiopian; and that the ſuppoſed banana, which, as an adventitious plant, ſignified nothing in Egypt, was only a repreſentation of the enſete; and that the record in the hieroglyphic of Iſis and the enſete-tree was ſomething that happened between harveſt, which was about Auguſt, and the time that the enſete-tree came in uſe, which was in October. The hippopotamus is generally thought to repreſent a Nile that has been ſo abundant as to be deſtructive. When, therefore, we ſee upon the obeliſks the hippopotamus deſtroying the banana, we may ſuppoſe it meant, that the extraordinary inundation had gone ſo far as not only to deſtroy the wheat, but alſo to retard or hurt the growth of the enſete, which was to ſupply its place."

BANARES, or BENARES, a handſome town of Aſia, in the dominions of the Great Mogul, greatly celebrated for its ſanctity, and being the univerſity of the Indian Bramins. It is ſeated on the north ſide of the river Ganges, in E. long. 82. 30. N. lat. 26. 20. The obſervatory at this place is particularly worthy of notice, for which reaſon we extract the following from Sir Robert Barker's deſcription given in vol. lxvii. of the Philoſophical Tranſactions. "Having (ſays he) frequently heard that the ancient Bramins had a knowledge of aſtronomy, and being confirmed in this by their information of an approaching eclipſe both of the ſun and moon, I made enquiry, when at that place in the year 1772, among the principal Bramins, to endeavour to get ſome information relative to the manner in which they were acquainted of an approaching eclipſe. The moſt intelligent that I could meet with, however, gave me but little ſatisfaction. I was told, that theſe matters were confined to a few, who were in poſſeſſion of certain books and records; ſome containing the myſteries of their religion; and others the tables of aſtronomical obſervations, written in the Shanſcrit language, which few underſtood but themſelves: that they would take me to a place which had been conſtructed for the purpoſe of making ſuch obſervations as I was enquiring after, and from whence they ſuppoſed the learned Bramins made theirs. I was then conducted to an ancient building of ſtone, the lower part of which, in its preſent ſituation, was converted into a ſtable for horſes, and a receptacle for lumber; but, by the number of court-yards and apartments, it appeared that it muſt once have been an edifice for the uſe of ſome public body of people. We entered this building, and went up a ſtaircaſe to the top of a part of it, near to the river Ganges, that led to a large terrace, where, to my ſurpriſe and ſatisfaction, I ſaw a number of inſtruments yet remaining, in the greateſt preſervation, ſtupendouſly large, immoveable from the ſpot, and built of ſtone, ſome of them being upwards of 20 feet in height; and although they are ſaid to have been erected 200 years ago, the graduations and diviſions on the ſeveral arcs appeared as well cut, and as accurately divided, as if they had been the performance of a modern artiſt. The execution in the conſtruction of theſe inſtruments exhibited a mathematical exactneſs in the fixing, bearing, fitting of the ſeveral parts, in the neceſſary and ſufficient ſupports to the very large ſtones that compoſed them, and in the joining and faſtening each into the other by means of lead and iron.

"The ſituation of the two large quadrants of the inſtrument marked 1 in plate 50, whoſe radius is nine feet two inches, by their being at right angles with a gnomon at twenty-five degrees elevation, are thrown into ſuch an oblique ſituation as to render them the moſt difficult, not only to conſtruct of ſuch a magnitude, but to ſecure in their poſition for ſo long a period, and affords a ſtriking inſtance of the ability of the architect in their conſtruction: for, by the ſhadow of the gnomon thrown on the quadrants, they do not appear to have altered in the leaſt from their original poſition; and ſo true is the line of the gnomon, that, by applying the eye to a ſmall iron ring of an inch diameter at one end, the ſight is carried through three others of the ſame dimenſion, to the extremity at the other end, diſtant 38 feet 8 inches, without obſtruction: ſuch is the firmneſs and art with which this inſtrument has been executed. This performance is the more wonderful and extraordinary when compared with the works of the artificers of Hindoſtan at this day, who are not under the immediate direction of an European mechanic; but arts appear to have declined equally with ſcience in the eaſt.

"Lieutenant colonel Archibald Campbell, at that time chief engineer in the Eaſt India Company's ſervice at Bengal, made a perſpective drawing of the whole of the apparatus that could be brought within his eye at one view; but I lament he could not repreſent ſome very large quadrants, whoſe radii were about twenty feet, they being on the ſide from whence he took his drawing. Their deſcription however is, that they are exact quarters of circles of different radii, the largeſt of which I judged to be 20 feet, conſtructed very exactly on the ſides of ſtone-walls, built perpendicular, and ſituated, I ſuppoſe, in the meridian of the place: a braſs pin is fixed at the centre or angle of the quadrant, from whence, the Bramin informed me, they ſtretched a wire to the circumference when an obſervation was to be made; from which it occurred to me, the obſerver muſt have moved his eye up or down the circumference, by means of a ladder or ſome ſuch contrivance, to raiſe and lower himſelf, until he had diſcovered the altitude of any of the heavenly bodies in their paſſage over the meridian, ſo expreſſed on the arcs of theſe quadrants: theſe arcs were very exactly divided into nine large ſections; each of which again into ten, making ninety leſſer diviſions or degrees; and thoſe alſo into twenty, expreſſing three minutes each, of about two-tenths of an inch aſunder; ſo that it is probable they had ſome method of dividing even theſe into more minute diviſions at the time of obſervation.

"My time would only permit me to take down the particular dimenſions of the moſt capital inſtrument, or the greater equinoctial ſun-dial, repreſented at figure 1, which appears to be an inſtrument to expreſs ſolar time by the ſhadow of a gnomon upon two quadrants, one ſituated to the eaſt, and the other to the weſt of it; and indeed the chief part of their inſtruments at this place appear to be conſtructed for the ſame purpoſe, except the quadrants, and a braſs inſtrument that will be deſcribed hereafter.

" Figure 2 is another inſtrument for the purpoſe of determining the exact hour of the day by the ſhadow of a gnomon, which ſtands perpendicular to, and in the centre of, a flat circular ſtone, ſupported in an oblique ſituation by means of four upright ſtones and a croſs-piece; ſo that the ſhadow of the gnomon, which is a perpendicular iron-rod, is thrown upon the diviſion of the circle deſcribed on the face of the flat circular ſtone.

" Figure 3 is a braſs circle, about two feet diameter, moving vertically upon two pivots between two ſtone pillars, having an index or hand turning round horizontally on the centre of this circle, which is divided into 360 parts; but there are no counter diviſions on the index to ſubdivide thoſe on the circle. This inſtrument appears to be made for taking the angle of a ſtar at ſetting or riſing, or for taking the azimuth or amplitude of the ſun at riſing or ſetting.

" The uſe of the inſtrument, figure 4, I was at a loſs to account for. It conſiſts of two circular walls; the outer of which is about forty feet diameter, and eight feet high; the wall within about half that height, and appears intended for a place to ſtand on to obſerve the diviſions on the upper circle of the outer wall, rather than for any other purpoſe; and yet both circles are divided into 360 degrees, each degree being ſubdivided into twenty leſſer diviſions, the ſame as the quadrants. There is a door-way to paſs into the inner circle, and a pillar in the centre, of the ſame height with the lower circle, having a hole in it, being the centre of both circles, and ſeems to be a ſocket for an iron rod to be placed perpendicular into it. The diviſions on theſe, as well as all the other inſtruments, will bear a nice examination with a pair of compaſſes.

" Figure 5 is a ſmaller equinoctial ſun-dial, conſtructed upon the ſame principle as the large one at figure 1.

" I cannot quit this ſubject without obſerving, that the Bramins, without the aſſiſtance of optical glaſſes, had nevertheleſs an advantage unexperienced by the obſervers of the more northern climates. The ſerenity and clearneſs of the atmoſphere in the night-time in the Eaſt Indies, except at the ſeaſons of changing the monſoons or periodical winds, is difficult to expreſs to thoſe who have not ſeen it, becauſe we have nothing in compariſon to form our ideas upon: it is clear to perfection, a total quietude ſubſiſts, ſcarcely a cloud is to be ſeen; and the light of the heavens, by the numerous appearance of the ſtars, affords a proſpect both of wonder and contemplation.

" This obſervatory at Benares is ſaid to have been built by the order of the emperor Ackbar: for as this wiſe prince endeavoured to improve the arts, ſo he wiſhed alſo to recover the ſciences of Hindoſtan, and therefore directed that three ſuch places ſhould be erected; one at Delhi, another at Agra, and a third at Benares.

BANBURY, a town of Oxfordſhire in England, ſituated on the river Charwell, in W. long. 1. 20. N. lat. 52. 0. It ſends one member to parliament.

BANC, or Benca, in law, denotes a tribunal, or judgment-ſeat: hence *king's banc* is the ſame with the *court of king's bench*, and *common banc* with that of *common pleas*.

BANCI jus, or the privilege of having a bench, was anciently only allowed to the king's judges, *qui ſummam adminiſtrant juſtitiam*. Inferior courts, as courts baron, hundred courts, &c. were not allowed that prerogative; and even at this day the hundred court at Freibridge in Norfolk is held under an oak at Gey-wood; and that of Woolſry in Herefordſhire, under an oak near Aſhton in that county, called *Hundred-Oak*.

BANCA, an iſland of Aſia, in the Eaſt Indies, between Sumatra and Borneo; from the firſt of which it is ſeparated only by a narrow channel. E. long. 105. 10. N. lat. 13. 25.

BANCALIS, a ſea-port town on the eaſt coaſt of the iſland of Sumatra, where the Dutch have a ſettlement. E. long. 99. 7. N. lat. 1. 5.

BANCK (Peter Vander), an engraver of conſiderable repute, was born at Paris, and received his inſtructions in the art from the celebrated François de Poilly. He came over into England with Gaſcar the painter, about the year 1674. His chief employment was engraving of portraits; and, according to Vertue's account of this artiſt publiſhed by the Hon. Mr. Walpole, he was the firſt in England who engraved them on ſo large a ſcale. But, like many of Poilly's diſciples, his great merit conſiſts in the laboured neatneſs and management of the mechanical part of the art. Freedom, harmony, and chaſteneſs of outline, are by no means the characteriſtic of his prints. He died at Bradfield in Hertfordſhire in 1674.

BANCO, an Italian word which ſignifies *bank*. It is commonly uſed to denote the Bank of Venice.

BANCOCK, a town of the kingdom of Siam in Aſia, with a fort, which was once in the poſſeſſion of the French, but they were driven from it in 1688. E. long. 101. 5. N. lat. 13. 25.

BAND, in a general ſenſe, ſome ſmall narrow ligament wherewith any thing is bound, tied, or faſtened.

Band, in architecture, a general name for any flat low member, or moulding, that is broad but not very deep.

Band *of Soldiers*, in military affairs, thoſe who fight under the ſame flag or enſign.

Band *of Penſioners*, a company of 120 gentlemen, who receive a yearly allowance of 100l. for attending on his majeſty on ſolemn occaſions.

Band is alſo the denomination of a military order in Spain, inſtituted by Alphonſus XI. king of Caſtile, for the younger ſons of the nobility; who, before their admiſſion, muſt ſerve 10 years at leaſt, either in the army or at court; and are bound to take up arms for the catholic faith againſt the infidels.

Band, in ſurgery. See Bandage.

BANDA islands, the general name of five iſlands in the Eaſt Indies belonging to the Dutch. Two of them are uncultivated, and almoſt entirely uninhabited; the other three claim the diſtinction of being the only iſlands in the world that produce the nutmeg.

If we except this valuable ſpice, the iſlands of Banda, like all the Moluccas, are barren to a dreadful degree. What they produce in ſuperfluities they want in neceſſaries. The land will not bring forth any kind of corn; and the pith of the ſago ſerves the natives of the country inſtead of bread. As this food is not ſufficient for the Europeans who ſettle in the Moluccas, they are allowed to fetch proviſions from Java, Macaſſar, or the extremely fertile iſland of Bali. The company itſelf carries ſome merchandiſe to Banda.

This is the only ſettlement in the Eaſt Indies that can be conſidered as an European colony; becauſe it is the only one where the Europeans are proprietors of lands. The company finding that the inhabitants of Banda were ſavage, cruel, and treacherous, becauſe they were impatient under their yoke, reſolved to exterminate them. Their poſſeſſions were divided among the white people, who got ſlaves from ſome of the neighbouring iſlands to cultivate the lands. Theſe white people are for the moſt part Creoles, or malecontents who have quitted the ſervice of the country. In the ſmall iſland of Roſinging, there are likewiſe ſeveral banditti, whom the laws have branded with diſgrace; and young men of abandoned principles, whoſe families wanted to get rid of them: ſo that Banda is called the *iſland of correction*. The climate is ſo unhealthy, that theſe unhappy men live but a ſhort time. It is on account of the loſs of ſo great a number of lives, that

attempts have been made to transfer the culture of the nutmeg to Amboyna; and the company were likewiſe probably influenced by two other ſtrong motives of intereſt, as their trade would be carried on with leſs expence and greater ſafety. But the experiments that have been made have proved unſucceſsful, and matters remain in their former ſtate.

BANDAGE, in *Surgery*, the application of a band, ſwath, roller, or fillet, to a part of the body; or the act of rolling or tying a ſwath or band, round a part affected, and the parts adjacent, with compreſſes, plaſters, &c. Of bandages there are two ſorts; whereof one ſort are remedies of themſelves. The other, being intended only to keep the medicaments on the part, are called more particularly *retentive bandages*.

Bandages are a very neceſſary part of the apparatus of the ſurgeon. They are of moſt excellent uſe in reſtraining dangerous hemorrhages, and in aſſiſting the union of fractured or diſlocated bones. Almoſt all bandages have uſually been made of linen cloth, ſoftened by wearing, but ſtrong. This may do for the ſimple purpoſe of retaining the dreſſings applied to a wound; but where firm and uniform preſſure as a curative means are required, they ſhould be made of fine, thin, flannel, of a looſe texture, or of a coarſe, thin, looſe-woven cotton or callico. They are to be made of a proper length and breadth for the occaſion; and, that they may be ſtrong, we ſhould examine the threads, and tear the cloth lengthways. Darns, ſeams, and large hems in the cloth, are, as much as poſſible, to be avoided, that no inconvenience may be brought on by the roughneſs and irregularity of the roller.

Bandages may be diſtinguiſhed alſo into ſimple and compound; the ſimple are thoſe which are formed of one entire piece of linen; the compound, of ſeveral pieces ſewed together, in different manners. The moſt ſimple of all bandages is that uſed in phlebotomy. The next to this, is that called the ſingle-headed bandage, which is rolled up at one end only. Next to that, the double-headed bandage, or that rolled up at both ends. After theſe come thoſe bandages which are made out of one piece, but are divided at both ends, almoſt as far as the middle; theſe are uſually called, by ſurgeons, four-headed bandages. Another ſort is ſomewhat ſhorter, and narrower than the laſt deſcribed, and is divided at one end, and perforated at the other. This is uſually employed in dreſſing the penis, or the finger, &c. Another kind is, from its uſe, called the uniting bandage: it is a double-headed bandage, divided about the middle, and ſerves to unite the wounds that are made lengthways, without requiring the ſuture. There is alſo another bandage, provided with an opening in the middle, through which the head may eaſily paſs; the extreme parts of the bandage hanging, one over the breaſt, the other over the back. The chief uſe of this bandage conſiſts in this; that, in dreſſing wounds of the thorax or abdomen, it is capable of ſupporting another bandage, ſomething wider, made of a cloth four or ſix times doubled, and bound round the breaſt or belly.

There remains ſtill to be conſidered, a compound bandage made of two pieces of cloth, almoſt in form of the letter T. The upper part of this is to be brought round the belly, and faſtened by the knot; but the lower part paſſes under the body, between the thighs, and, being brought up again, is faſtened to the upper part upon the back. This bandage plainly appears to be deſigned for the ſecurity of ſuch dreſſings as ſhall be applied to the *anus*, or parts of generation. Some, from the inventor, call this Heliodorus's bandage; others, from its ſhape, denominate it the T bandage; and, from the diviſion that is frequently made at the lower part of it, it is ſometimes called the double T.

As to bandages for the head, notwithſtanding ſurgeons have formerly invented different kinds of them, for every wound that could be inflicted on that part, yet there is but one form that ſeems neceſſary; and this alone will anſwer all the ends that can be propoſed from this kind of application. It is requiſite only to employ a handkerchief, napkin, or any ſquare piece of linen doubled up in a triangular form; and applying it as we frequently do in hot weather, when we lay aſide the uſual coverings of the head. In our hoſpitals, an elaſtic woollen cap is moſt uſed, and in general anſwers every good purpoſe.

But there is another method of bandage in uſe, called creeping bandages, and in the French ſchools, *rampants*. Theſe creeping, or, as we ſometimes call them, ſerpentine bandages are uſed to ſecure cataplaſms, or compreſſes, upon a diſeaſed part. Some nicety is requiſite as to the place of beginning and ending theſe bandages. When the arm is to be dreſſed, the beginning is formed by two or three circular windings on the wriſt, aſcending by looſe ſpires, up to the cubit or ſhoulder, as the nature of the caſe ſhall require. But when the beginning is to be on the foot, it is to be formed by three or four circular windings of the bandage, round the tarſus and metatarſus; then proceeding, in a ſerpentine courſe, up to the knee; or, if the caſe requires it, up to the head of the thigh, and then, as it ſometimes happens, deſcending again.

We ſhould not omit to mention, that the beginning of the bandage is ſometimes applied to the diſeaſed part, as in ſeveral kinds of fractures; ſometimes near it, above it, or below it; and ſometimes at a great diſtance from it, according to the diſpoſition of the wound. On the contrary, the extremity of the bandage is ſcarcely ever faſtened on the diſeaſed part, but rather on a ſound one, to avoid giving pain. Beſides the double and four-headed bandages, ſurgeons ſometimes make uſe of the eighteen-headed bandage.

BANDAGE, *knotted*, a bandage deſcribed by Heiſter, for the head—called knotted, from its many croſſings on the temples; and ſtellar, or ſolar, from its directions in radii. It is a very uſeful bandage, when the temporal artery is divided, either in arteriotomy, or by an accidental wound, and hardly ever fails of ſucceſs in ſuppreſſing the hemorrhage.

BANDALEER, or BANDELEER, a large leathern belt, thrown over the right ſhoulder, and hanging down under the left arm; worn by the ancient muſqueteers both for the ſuſtaining of their fire-arms, and for the carriage of their muſquet-charges; which being put up in little wooden caſes, coated with leather, were hung, to the number of twelve, to each bandaleer.

The word is originally French, *bandouiller*, formed apparently from *bandoulier*, a kind of banditti particularly infeſting the Pyreneans, who were formerly diſtinguiſhed by this piece of furniture; and were themſelves ſo denominated, *quaſi ban de volieres*, a knot of robbers

The French ſoldiery ſtill retain the bandaleer; their horſe, their muſqueteers, and common guards, wearing it indifferently; excepting ſome little difference in its garniture.

BANDELET, or BANDLET, in architecture, any little band, or flat moulding, as that which crowns the Doric architrave.

BANDER CONGO, a ſmall ſea-port town in Aſia, ſeated on the Perſian Gulph. E. long. 54. 10. N. lat. 19. 0.

BANDERET, a general, or one of the commanders in chief of the forces.—This appellation is given to the principal commanders of the troops of the canton of Bern in Switzerland, where there are four banderets, who command all the forces of that canton.

BANDEROLL, a little flag, in form of a guidon, extended more in length than in breadth, uſed to be hung out on the maſts of veſſels, &c.

BANDITTI, from the Italian *bandito*; perſons proſcribed, or, as we call it, outlawed: ſometimes denominated *banniti* or

forris banniti. It is alſo a denomination given to highwaymen or robbers who infeſt the roads in troops, eſpecially in Italy, France, and Sicily. Mr. Brydone, in his Tour through Sicily, informs us, that in the eaſtern part, called *Val Demoni* from the devils that are ſuppoſed to inhabit Mount Ætna, it has ever been found altogether impracticable to extirpate the banditti; there being numberleſs caverns and ſubterraneous paſſages round that mountain, where no troops could poſſibly purſue them: beſides, they are known to be perfectly determined and reſolute, never failing to take a dreadful revenge on all who have offended them. Hence the prince of Villa Franca has conſidered it, not only as the ſafeſt, but likewiſe as the wiſeſt and moſt political ſcheme, to become their declared patron and protector: and ſuch of them as think proper to leave their mountains and foreſts, though perhaps only for a time, are ſure to meet with good encouragement and a certain protection in his ſervice, where they enjoy the moſt unbounded confidence, which, in no inſtance, they have ever yet been found to make an improper or a diſhoneſt uſe of. They are clothed in the prince's livery, yellow and green with ſilver lace; and wear likewiſe a badge of their honourable order, which intitles them to univerſal fear and reſpect from the people.

In ſome circumſtances, theſe banditti are the moſt reſpectable people of the iſland, and have by much the higheſt and moſt romantic notions of what they call their point of honour. However criminal they may be with regard to ſociety in general; yet, with reſpect to one another, and to every perſon to whom they have once profeſſed it, they have ever maintained the moſt unſhaken fidelity. The magiſtrates have often been obliged to protect them, and even pay them court, as they are known to be perfectly determined and deſperate, and ſo extremely vindictive, that they will certainly put any perſon to death that has ever given them juſt cauſe of provocation. On the other hand, it never was known that any perſon who had put himſelf under their protection, and ſhowed that he had confidence in them, had cauſe to repent of it, or was injured by any of them in the moſt minute trifle; but, on the contrary, they will protect him from impoſitions of every kind, and ſcorn to go halves with the landlord, like moſt other conductors and travelling ſervants, and will defend them with their lives if there is occaſion. Thoſe of their number who have thus enliſted themſelves in the ſervice of ſociety, are known and reſpected by the other banditti all over the iſland; and the perſons of thoſe they accompany are ever held ſacred. For theſe reaſons, moſt travellers chooſe to hire a couple of them from town to town; and may thus travel over the whole iſland in ſafety.

BANDORA, the capital of the iſland of Salſet, on the weſt coaſt of the peninſula on this ſide of the Ganges. It is ſeparated from the iſland of Bombay by a narrow channel, and ſubject to the Portugueſe. E. long. 72. 30. N. lat. 19. 0.

BANDORE, the name of a muſical inſtrument with ſtrings, reſembling a lute, and ſaid to be invented in the fourth year of Queen Elizabeth, by John Roſe, a citizen of London.

BANDY-LEGS, from the French *bander* to bend, a diſtortion of the legs, when they turn either inward or outward on either ſide; ariſing from ſome defect in the birth, or imprudence in the nurſe endeavouring to make a child ſtand or walk before his legs are ſtrong enough to ſuſtain the weight of his body.

BANE (from the Saxon *bana*, a murderer), ſignifies deſtruction or overthrow. Thus, "I will be the *bane* of ſuch a man," is a common ſaying. So, when a perſon receives a mortal injury by any thing, we ſay, "it was his *bane*:" and he who is the cauſe of another man's death is ſaid to be *le bane*, i. e. a malefactor.

BANFF. See BAMFF.

BANGHIR, a town of Ireland, in King's County in the province of Leinſter, ſeated on the river Shannon. W. long. 8. 5. N. lat. 53. 10.

BANGLE EARS, an imperfection in the poſition of a horſe's ears. To cure it, place his ears in ſuch a manner as you would have them ſtand; bind them with two little boards ſo faſt that they cannot ſtir, and then clip away all the looſe wrinkled ſkin cloſe by the head.

BANGOR, an epiſcopal city of Carnarvonſhire in North Wales. In ancient times it was ſo conſiderable, that it was called *Bangor the Great*, and defended by a ſtrong caſtle: but it is now a very mean place; the principal buildings being the cathedral, the biſhop's palace, and a free ſchool. The ſee is of very great antiquity, and its founder unknown. The church is dedicated to St. Daniel, who was biſhop here about the year 516; but for near 500 years afterwards there is no certainty of the names of his ſucceſſors. Owen Glendower greatly defaced the cathedral church; but Biſhop Dean repaired it again. This ſee met a ſtill more cruel ravager than Owen Glendower, in the perſon of Biſhop Bulkeley; who not only alienated many of the lands belonging to it, but even ſold the bells of the church. This dioceſe contains the whole of Carnarvonſhire except three pariſhes, the ſhire of Angleſey, and part of the ſhires of Denbigh, Merioneth, and Montgomery; in which are 107 pariſhes, whereof 36 are impropriated. It has three archdeaconries, viz. Bangor, Angleſey, and Merioneth; the two firſt of which are commonly annexed to the biſhopric for its better ſupport. This ſee is valued in the king's books at 131l. 16s. 4d. and is computed to be worth annually 1200l. The tenths of the clergy are 151l. 14s. 3¼d. To the cathedral there belong a biſhop, a dean, an archdeacon, a treaſurer, and two prebendaries, endowed; a precentor, a chancellor, and three canons, not endowed; three vicars choral, an organiſt, lay-clerks, choriſters, and two officers. W. long. 4. 10. N. lat. 53. 20.

BANGOR, a town of Ireland, in the county of Down and province of Ulſter. It is ſeated on the ſouth ſhore of the bay of Carriek Fergus, oppoſite to the town of that name; and ſends two members to parliament. W. long. 6. N. lat. 54. 42.

BANGUE, a ſpecies of opiate, in great uſe throughout the eaſt, for drowning cares and inſpiring joy. This by the Perſians is called *beng*; by the Arabs, *eſſrar*, corruptly *aſſeral*, and *aſſarth*: by the Turks, *bengitie*, and vulgarly called *maſtack*; by the European naturaliſts, *bangue* or *bange*. It is the leaf of a kind of wild hemp, growing in the countries of the Levant: it differs little, either as to leaf or ſeed, from our hemp, except in ſize. Some have ſuppoſed it a ſpecies of althæa, but this is not the fact. It is prepared in a variety of ways in different countries. Olearius deſcribes the method uſed in Perſia. Mr. Sale tells us, that, among the Arabs, the leaf is made into pills, or conſerves. But the moſt diſtinct account is that given by Alexander Maurocordato, counſellor and phyſician of the Ottoman Porte, in a letter to Wedelius. According to this author, bangue is made of the leaves of wild hemp, dried in the ſhade, then ground to powder; put into a pot wherein butter has been kept; ſet in an oven till it begin to torreſy: then taken out, and pulverized again; thus to be uſed occaſionally, as much at a time as will lie on the point of a knife. Such is the Turkiſh bangue. The effects of this drug are, to confound the underſtanding; ſet the imagination looſe; induce a kind of folly and forgetfulneſs, wherein all cares are left, and joy and gaiety rule in their ſtead. Bangue, in reality, is a ſuccedaneum to wine, and obtains in thoſe countries where Mahometaniſm is eſtabliſhed; which prohibiting the

uſe of that liquor abſolutely, the poor muſſulmans are forced to have recourſe to ſuccedanea to rouſe their ſpirits. The principal are *opium* and this bangue. As to the opinion among Europeans, that the Turks prepare themſelves for battle by a doſe of bangue, which rouſes their courage, and drives them, with eagerneſs, to certain death; Dr. Maurocordato aſſures us, that it is a popular error; the Turks think they are then going aſſuredly to receive the crown of martyrdom; and would not, for any conſideration, loſe the merit of it, which they would do by eating the bangue, as being held unlawful by their apoſtle, among other things which intoxicate.

BANIALUCH, or BAGNALUCH, a city of European Turkey, the capital of Boſnia, upon the frontiers of Dalmatia, near the river Setina. E. long. 18. 20. N. lat. 44. 20.

BANIAN-TREE, a ſpecies of the Ficus or Fig-tree. The Ficus is a genus of the triœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The receptacle is common, turbinated, carnous, and connivent; incloſing the florets either in the ſame or in a diſtinct one. The male calyx is tripartite; no corolla; three ſtamina: the female calyx is quinquepartite; no corolla; one piſtil; and one ſeed. There are ten ſpecies, of which the following are the moſt remarkable.

1. The *Religioſa*, or Banian-tree, is a native of ſeveral parts of the Eaſt Indies. It hath a woody ſtem, branching to a great height and vaſt extent, with heart-ſhaped entire leaves ending in acute points. This tree is beautifully deſcribed by Milton in Paradiſe Loſt, book ix. l. 1100.

Indeed the Banian-tree, or Indian fig, is perhaps the moſt beautiful of Nature's productions in that genial climate, where ſhe ſports with ſo much profuſion and variety. Some of theſe trees are of amazing ſize and great extent, as they are continually increaſing, and, contrary to moſt other things in animal and vegetable life, ſeem to be exempted from decay. Every branch from the main body throws out its own roots; at firſt, in ſmall tender fibres, ſeveral yards from the ground: theſe continually grow thicker until they reach the ſurface; and there ſtriking in, they increaſe to large trunks, and become parent-trees, ſhooting out new branches from the top: theſe in time ſuſpend their roots, which, ſwelling into trunks, produce other branches; thus continuing in a ſtate of progreſſion as long as the earth, the firſt parent of them all, contributes her ſuſtenance. The Hindoos are peculiarly fond of the Banian-tree; they look upon it as an emblem of the Deity, from its long duration, its out-ſtretching arms, and overſhadowing beneficence; they almoſt pay it divine honours, and

"Find a fane in every ſacred grove."

Near theſe trees the moſt eſteemed pagodas are generally erected; under their ſhade the Brahmins ſpend their lives in religious ſolitude; and the natives of all caſts and tribes are fond of recreating in the cool receſſes, beautiful walks, and lovely viſtas of this umbrageous canopy, impervious to the hotteſt beams of a tropical ſun.

A remarkable large tree of this kind grows on an iſland in the river Nerbedda, ten miles from the city of Baroche in the province of Guzerat, a flouriſhing ſettlement lately in poſſeſſion of the Eaſt India company, but ceded by the government of Bengal, at the treaty of peace concluded with the Mahrattas in 1783, to Mahdajee Scindia a Mahratta chief. It is diſtinguiſhed by the name of Cubbeer Burr, which was given it in honour of a famous ſaint. It was once much larger than at preſent; but high floods have carried away the banks of the iſland where it grows, and with them ſuch parts of the tree as had thus far extended their roots: yet what remains is about 2000 feet in circumference, meaſured round the principal ſtems; the over-hanging branches, not yet ſtruck down, cover a much larger ſpace. The chief trunks of this ſingle tree (which in ſize greatly exceed our Engliſh elms and oaks) amount to 350; the ſmaller ſtems, forming into ſtronger ſupporters, are more than 3000; and every one of theſe is caſting out new branches, and hanging roots, in time to form trunks, and become the parents of a future progeny. Cubbeer Burr is famed throughout Hindoſtan for its great extent and ſurpaſſing beauty: the Indian armies generally encamp around it; and, at ſtated ſeaſons, ſolemn jatarras, or Hindoo feſtivals, are held there, to which thouſands of votaries repair from various parts of the Mogul empire. It is ſaid that 7000 perſons find ample room to repoſe under its ſhade. The Engliſh gentlemen, on their hunting and ſhooting parties, uſed to form extenſive encampments, and ſpend weeks together under this delightful pavilion, which is generally filled with green wood-pigeons, doves, peacocks, and a variety of feathered ſongſters; crowded with families of monkeys performing their antic tricks, and ſhaded by bats of a large ſize, many of them meaſuring upwards of ſix feet from the extremity of one wing to the other. This tree not only affords ſhelter, but ſuſtenance, to all its inhabitants, being covered amid its bright foliage with ſmall figs of a rich ſcarlet, on which they all regale with as much delight, as the lords of creation on their more various and coſtly fare.

2. The *Sycamorus*, or Sycamore of ſcripture. According to Mr. Haſſelquiſt, this is a huge tree, the ſtem being often 50 feet round. The fruit is pierced in a remarkable manner by an inſect. There is an opening made in the calyx near the time the fruit ripens, which is occaſioned in two different ways. 1. When the ſquamæ, which cover the calyx, wither and are bent back; which, however, is more common to the carica than the ſycamore. 2. A little below the ſcales, on the ſide of the flower-cup, there appears a ſpot before the fruit is ripe: the fruit in this place is affected with a gangrene which extends on every ſide, and frequently occupies a finger's breadth. It withers; the place affected becomes black; the fleſhy ſubſtance in the middle of the calyx, for the breadth of a quill, is corroded; and the male bloſſoms, which are neareſt to the bare ſide, appear naked, opening a way for the inſect, which makes ſeveral furrows in the inſide of the fruit, but never touches the ſtigmata, though it frequently eats the germen. The wounded or gangrenous part is at firſt covered or ſhut up by the bloſſoms; but the hole is by degrees opened and enlarged of various ſizes in the different fruits; the margin and ſides being always gangrenous, black, hard, and turned inwardly. The ſame gangrenous appearance is alſo found near the ſquamæ, after the inſect has made a hole in that place. The tree is very common in the plains and fields of Lower Egypt. It buds in the latter end of March, and the fruit ripens in the beginning of June. It is wounded or cut by the inhabitants at the time it buds; for, without this precaution, they ſay it would not bear fruit.

3. The *Carica*, or common Fig, with an upright ſtem branching 15 or 20 feet high, and garniſhed with large palmated or hand-ſhaped leaves. Of this there are a number of varieties; as the common fig, a large, oblong, dark purpliſh blue fruit, which ripens in Auguſt either on ſtandards or walls, and the tree carries a great quantity of fruit. The brown or cheſnut fig; a large, globular, cheſnut-coloured fruit, having a purpliſh delicious pulp; ripening in July and Auguſt. The black Iſchia fig; a middle-ſized, ſhortiſh, flat-crowned, blackiſh fruit, having a bright pulp; ripening in the middle of Auguſt. The green Iſchia fig; a large, oblong, globular-headed, greeniſh fruit, ſlightly ſtained by the pulp to a reddiſh-brown colour; ripens in the end of Auguſt. The brown Iſchia fig; a ſmall, pyramidal, browniſh-yellow fruit, having a purpliſh very rich pulp; ripening in Auguſt and September. The

Malta fig; a ſmall flat-topped brown fruit, ripening in the middle of Auguſt or beginning of September.—The round brown Naples fig; a globular, middle-ſized, light-brown fruit, and browniſh pulp; ripe by the end of Auguſt.—The long brown Naples fig; a long dark-brown fruit, having a reddiſh pulp; ripe in September.—The great blue fig; a large blue fruit, having a fine red pulp.—The black Genoa fig; a large, pear-ſhaped, black-coloured fruit, with a bright red pulp; ripe in Auguſt.

Culture. The laſt ſpecies is that moſt frequently cultivated in this country, and the only one which does not require to be kept in a ſtove. It may be propagated either by ſuckers ariſing from the roots, by layers, or by cuttings. The ſuckers are to be taken off as low down as poſſible: trim off any ragged part at bottom, leaving the tops entire, eſpecially if for ſtandards; and plant them in nurſery lines at two or three feet diſtance from each other, or they may at once be planted where they are to remain; obſerving, that if they are deſigned for walls or eſpaliers, they may be headed to ſix or eight inches in March, the more effectually to force out lateral ſhoots near the bottom; but, if intended for ſtandards, they muſt not be topped, but trained with a ſtem, not leſs than 15 or 18 inches for dwarf-ſtandards, a yard for half-ſtandards, and four, five, or ſix feet for full ſtandards. Then they muſt be ſuffered to branch out to form a head; obſerving, that whether againſt walls, eſpaliers, or ſtandards, the branches or ſhoots muſt never be ſhortened unleſs to procure a neceſſary ſupply of wood: for the fruit is always produced on the upper parts of the young ſhoots; and if theſe are cut off, no fruit can be expected. The beſt ſeaſon for propagating theſe trees by layers is in autumn; but it may be alſo done any time from October to March or April. Chooſe the young pliable lower ſhoots from the fruitful branches: lay them in the uſual way, covering the body of the layers three or four inches deep in the ground, keeping the top entire, and as upright as poſſible; and they will be rooted and fit to ſeparate from the parent in autumn; when they may be planted either in the nurſery, or where they are to remain, managing them as above directed. The time for propagating by cuttings is either in autumn at the fall of the leaf, or any time in March: chooſe well-ripened ſhoots of the preceding ſummer; ſhort, and of robuſt growth, from about 12 to 15 inches long; having an inch or two of the two-years wood at their baſe, the tops left entire; and plant them ſix or eight inches deep, in a bed or border of good earth, in rows two feet aſunder: and, when planted in autumn, it will be eligible to protect their tops in time of hard froſt, the firſt winter, with any kind of long looſe litter.

That part of the hiſtory of the fig-tree, which for many ages was ſo enigmatical, namely, the *caprification*, as it is called, is particularly worthy of attention, not only as a ſingular phænomenon in itſelf, but as it has furniſhed one of the moſt convincing proofs of the reality of the ſexes in plants. In brief it is this: The flowers of the fig-tree are ſituated within a pulpy receptacle, which we call the fig or fruit: of theſe receptacles, in the wild fig-tree, ſome have male flowers only, and others have male and female, both diſtinct, though placed in the ſame receptacle. In the cultivated fig, theſe are found to contain only female flowers; which are fecundated by means of a kind of gnat bred in the fruit of the wild fig-trees, which pierces that of the cultivated, in order to depoſit its eggs within; at the ſame time diffuſing within the receptacle the farina of the male flowers. Without this operation the fruit may ripen, but no effective ſeeds are produced: hence the garden fig can only be propagated by layers and cuttings, in thoſe countries where the wild fig is not known. The proceſs of thus ripening the fruit, in the oriental countries, is not left to nature, but is managed with great art, and different degrees of dexterity, ſo as to reward the ſkilful huſbandman with a much larger increaſe of fruit than would otherwiſe be produced. A tree of the ſame ſize, which, in Provence, where caprification is not practiſed, may produce about 25 pounds of fruit, will, by that art, in the Grecian iſlands, bring ten times that quantity. See the article CAPRIFICATION.

Uſes. Figs are a conſiderable article in the materia medica, chiefly employed in emollient cataplaſms and pectoral decoctions. The beſt are thoſe which come from Turky. Many are alſo brought from the ſouth of France, where they prepare them in the following manner. The fruit is firſt dipped in ſcalding hot ley made of the aſhes of the fig-tree, and then dried in the ſun. Hence theſe figs ſtick to the hands, and ſcour them like lixivial ſalts; and for the ſame reaſon they purge gently, without griping. They are moderately nutrimental, grateful to the ſtomach, and eaſier to digeſt than any other of the ſweet fruits. They have been ſaid to produce lice when eaten as a common food; but this ſeems to be entirely without foundation. The reaſon of this ſuppoſition ſeems to be, that, in the countries where they grow naturally, they make the principal food of the poor people, who are generally troubled with theſe vermin. The wood of the ſycamore is not ſubject to rot; and has therefore been uſed for making of coffins in which embalmed bodies were put. Mr. Haſſelquiſt affirms, that he ſaw in Egypt coffins made of this kind of wood, which had been preſerved found for 2000 years.

BANIANS, a religious ſect in the empire of the Mogul, who believe a metempſychoſis; and will therefore eat no living creature, nor kill even noxious animals, but endeavour to releaſe them when in the hands of others. The name of *Banian* is uſed with ſome diverſity, which has occaſioned much confuſion, and many miſtakes. Sometimes it is taken in a leſs proper ſenſe, and extended to all the idolaters of India, as contradiſtinguiſhed from the Mahometans: in which ſenſe, Banians include the Bramin and other caſts. *Banians*, in a more proper ſenſe, are reſtrained to a peculiar caſt, or tribe, of Indians, whoſe office or profeſſion is trade and merchandize; in which ſenſe, *Banians* ſtand contradiſtinguiſhed from *Bramins*, *Cuttery*, and *Wyſe*, the three other caſts into which the Indians are divided. The four caſts are abſolutely ſeparate as to occupation, relation, marriage, &c. though all of the ſame religion; which is more properly denominated the religion of the Bramins, who make the eccleſiaſtical tribe, than of the *Banians*, who make the mercantile. The proper *Banians* are called, in the *Shaſter*, or book of their law, by the name of *Shuddery*; under which are comprehended all who live after the manner of merchants, or that deal and tranſact for others, as brokers; excluſive of the mechanics, or artificers, who make another caſt, called *Wyſe*. Theſe Banians have no peculiar ſect or religion, unleſs it be, that two of the eight general precepts given by their legiſlator Bremaw to the Indian nation, are, on account of the profeſſion of the Banians, ſuppoſed more immediately to relate to them, viz. thoſe which enjoin veracity in their words and dealings, and avoiding all practices of circumvention in buying and ſelling. Some of the Banians, quitting their profeſſion, and retiring from the world, commence religious, aſſume a peculiar habit, and devote themſelves more immediately to God, under the denomination of *Vertea*. Theſe, though they do not hereby change their caſt, are commonly reckoned as Bramins of a more devout kind; much as monks in the Romiſh church, though frequently not in orders, are reputed as a more ſacred order than the regular clergy. The name *Banian* imports as much, in the Bramin language (wherein their law is written), as a people innocent and harmleſs; void of all guile; ſo gentle, that they cannot endure to ſee either a fly or a worm injured; and who, when

ſtruck, will patiently bear it, without reſiſting or returning the blow. Their mien and appearance is deſcribed by Lord, in terms a little preciſe, but very ſignificant: "A people preſented themſelves to my eyes clothed in linen garments, ſomewhat low deſcending, of a geſture and garb, as I may ſay, maidenly, and well nigh effeminate, of a countenance ſhy and ſomewhat eſtranged." Gemelli Careri divides the Banians into 22 tribes, all diſtinct, and not allowed to marry with each other. Lord aſſures us they are divided into 82 caſts or tribes, correſponding to the caſts or diviſions of the Bramins or prieſts, under whoſe diſcipline they are, as to religious matters; though the generality of the Banians chooſe to be under the direction of the two Bramin tribes, the Viſalnagranaugers and Vulnagranaugers.

The Banians are the great factors, by whom moſt of the trade of India is managed; being in this reſpect equal to the Jews and Armenians, and not inferior to either in ſkill and experience, in whatever relates to commerce. Nothing is bought but by their mediation. They ſeem to claim a kind of *jus divinum* to the adminiſtration of the traffic of the nation, grounded on their ſacred books, as the Bramins do to that of religion. They are diſperſed, for this purpoſe, through all parts of Aſia, and abound in Perſia, particularly at Iſpahan and Gombroon, where many of them are extremely rich, yet not above acting as brokers, where a penny is to be got. The chief agents of the Engliſh, Dutch, and French Eaſt India companies are of this nation: they are faithful, and are generally truſted with the caſh of thoſe companies in their keeping. They act alſo as bankers, and can give bills of exchange for moſt cities in the Eaſt Indies. Their form of contract in buying and ſelling is remarkable; being done without words, in the profoundeſt ſilence, only by touching each other's fingers: the buyer, looſening his pamerin, or girdle, ſpreads it on his knee, and both he and the ſeller having their hands underneath, by the intercourſe of the fingers, mark the price of pounds, ſhillings, &c. demanded, offered, and at length agreed on. When the ſeller takes the buyer's whole hand, it denotes a thouſand; and, as many times as he ſqueezes it, as many thouſand pagods, or roupees, according to the ſpecies in queſtion, are demanded: when he only takes the five fingers, it denotes five hundred; and when only one, one hundred: taking only half a finger, to the ſecond joint, denotes fifty; the ſmall end of the finger, to the firſt joint, ſtands for ten.

BANIAN-DAYS, in marine language, a cant term among ſailors, to ſignify thoſe days in which they have no fleſh meat. It ſeems to be derived from the practice of the people mentioned in the preceding article.

BANILLIA, in the materia medica, a name uſed by ſome for the *vanillia*, or vanilloes, uſed in making the ſcented chocolate.

BANISHMENT, EXILE, among us, is of two kinds: the one voluntary, and upon oath; the other by compulſion, for ſome offence or crime.

The former, properly called *abjuration*, is now ceaſed; the latter is chiefly enjoined by judgment of parliament. Yet outlawing and tranſportation may alſo be conſidered as a ſpecies of exile.

By Magna Charta, none ſhall be outlawed or baniſhed his country, but by lawful judgment of his peers, or according to the law of the land. 9 Hen. III. cap. 29. And by the common law no perſon ſhall be baniſhed but by authority of parliament; or in caſe of ABJURATION for felony, &c. But this is taken away by ſtatute, 3 Inſt. 115. Stat. 21 Jac. I. cap. 28.

BANISTERIA, in botany: a genus of the trigynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 23d order, *Tribilatæ*. The calyx is quinquepartite, with nectarious pores on the outſide of the baſe; the petals are roundiſh and ungulated; the ſeeds are three, with membranaceous wings. There are ſeven ſpecies, all natives of warm countries, but poſſeſſing no remarkable properties.

BANK, in commerce, is a denomination given to certain ſocieties, or communities, who take on them the charge of the money of private perſons, to keep it ſecure, and pay whenſoever demanded. The word *bank*, in this ſenſe, comes from the Italian *banca*, formed of the word *banco*, a bench, whereon the ancient money-changers ſat in the public markets; or, as others think, a table whereon they told their money; for the term *banco* ſignifies a table, as well as a bench; as among the Greeks the word τραπεζα ſignified a *bench*, as well as a *table*; whence the word τραπεζιτης for a *bencher*.

It cannot be doubted but that the beginning of traffic was by exchanging one commodity for another, as men could beſt ſuit each others occaſions. But the neceſſities of men being ſo various and different, in reſpect to the quantity and quality of requiſites, money was inſtituted as the moſt convenient medium for commerce; whereby people might procure whatſoever they ſtood in need of, in quantities according to their exigencies. Yet this way of payment is attended with many inconveniences, as the trouble in counting the money, hazard in ſecuring it from the attempts of robbers, and loſs from truſting it with unfaithful ſervants: for the prevention of all which, cities of large commerce have very naturally introduced the uſe of *banks*. A bank then may be properly defined a common repoſitory, where many perſons agree to keep their caſh, to be always ready at their call, or direction. The firſt inſtitution of banks was in Italy, where the Lombard Jews kept benches in the market-places for the exchange of money and bills; and *banco* being the Italian name for *bench*, banks took their title from this word.

Banks are of two principal kinds. One ſort is either *public*, conſiſting of a company of monied men, who being duly eſtabliſhed, and incorporated by the laws of their country, agree to depoſit a conſiderable fund, or joint ſtock, to be employed for the uſe of the ſociety, as lending money upon good ſecurity, buying and ſelling bullion, diſcounting bills of exchange, &c.: or *private*, i. e. ſet up by private perſons, or partnerſhips, who deal in the ſame way as the former upon their own ſingle ſtock and credit.

1. *Incorporated Banks.* The greateſt bank of circulation in Europe is the *Bank of England*, which was originally projected by a merchant of the name of Patterſon, and eſtabliſhed in the year 1694, though not without many obſtacles being thrown in the way. The company was incorporated by parliament in the fifth and ſixth years of king William and queen Mary, by the name of *The Governors and Company of the Bank of England*: in conſideration of the loan of 1,200,000l. granted to the government; for which the ſubſcribers received almoſt 8 *per cent.* By this charter, the company are not to borrow under their common ſeal, unleſs by act of parliament; they are not to trade, or ſuffer any perſon in truſt for them to trade, in any goods or merchandize; but they may deal in bills of exchange, in buying or ſelling bullion, and foreign gold and ſilver coin, &c.

By an act of parliament paſſed in the 8th and 9th year of William III. they were impowered to enlarge their capital ſtock to 2,201,171l. 10s. It was then alſo enacted, that bank ſtock ſhould be a perſonal, and not a real eſtate; that no contract either in word or writing, for buying or ſelling bank ſtock, ſhould be good in law, unleſs regiſtered in the books of the bank within 7 days, and the ſtock transferred in 14 days; and that it ſhall be felony, without benefit of clergy, to counterfeit the common ſeal of the bank, or any ſealed bank-

bill, or any bank-note, or to alter or erafe fuch bills or notes. By another act paffed in the 7th of queen Anne, the company were empowered to augment their capital to 4,402,343l. and they then advanced 400,000l. more to the government; and in 1714, they advanced another loan of 1,500,000l.

In the third year of the reign of king George I. the intereft in their capital ftock was reduced to 5 *per cent.* when the bank agreed to deliver up as many exchequer bills as amounted to 2,000,000l. and to accept an annuity of 100,000l. and it was declared lawful for the bank to call from their members, in proportion to their intereffs in the capital ftock, fuch fums of money as in a general court fhould be found neceffary. If any member fhould neglect to pay his fhare of the moneys fo called for, at the time appointed by notice in the London Gazette, and fixed upon the Royal Exchange, it fhould be lawful for the bank, not only to ftop the dividend of fuch member, and to apply it towards payment of the money in queftion, but alfo to ftop the transfers of the fhare of fuch defaulter, and to charge him with an intereft of 5 *per cent. per annum*, for the money fo omitted to be paid: and if the principal and intereft fhould be three months unpaid, the bank fhould then have power to fell fo much of the ftock belonging to the defaulter as would fatisfy the fame. After this, the bank reduced the intereft of the 2,000,000l. lent to the government, from 5 to 4 *per cent.* and purchafed feveral other annuities, which were afterwards redeemed by the government, and the national debt due to the bank reduced to 1,600,000l. But in 1742, the company engaged to fupply the government with 1,600,000l. at 3 *per cent.* which is now called the 3 *per cent. annuities*; fo that government was now indebted to the company 3,200,000l. the one half bearing 4, and the other 3 *per cent.*

In the year 1746, the company agreed that the fum of 986,800l. due to them in the exchequer bills unfatisfied, on the duties for licences to fell fpirituous liquors by retail, fhould be cancelled, and in lieu thereof to accept of an annuity of 39,442l. the intereft of that fum at 4 *per cent.* The company alfo agreed to advance the further fum of 1,000,000l. into the exchequer, upon the credit of the duties arifing by the malt and land tax, at 4 *per cent.* for exchequer bills to be iffued for that purpofe; in confideration of which, the company were enabled to augment their capital with 986,800l.; the intereft of which, as well as that of the other annuities, was reduced to 3½ *per cent.* till the 25th of December 1757, and from that time to bear only 3 *per cent.*

And in order to enable them to circulate the faid exchequer bills, they eftabliffed what is now called *bank circulation*; the nature of which may be underftood from what follows.—The company of the bank are obliged to keep cafh fufficient not only to anfwer the common, but alfo any extraordinary demand that may be made upon them; and whatever money they have by them, over and above the fum fuppofed neceffary for thefe purpofes, they employ in what may be called the *trade of the company*; that is to fay, in difcounting bills of exchange, in buying of gold and filver, and in government fecurities, &c. But when the bank entered into the abovementioned contract, as they did not keep unemployed a larger fum of money than what they deemed neceffary to anfwer their ordinary and extraordinary demands, they could not conveniently take out of their current cafh fo large a fum as a million, with which they were obliged to furnifh government, without either leffening that fum they employed in difcounting, buying gold and filver, &c. (which would have been very difadvantageous to them), or inventing fome method that fhould anfwer all the purpofes of keeping the million in cafh. The method which they chofe, and which fully anfwers their end, was as follows:

They opened a fubfcription, which they renew annually, for a million of money; wherein the fubfcribers advance 10 *per cent.* and enter into a contract to pay the remainder, or any part thereof, whenever the bank fhall call upon them, under penalty of forfeiting the 10 *per cent.* fo advanced; in confideration of which, the bank pays the fubfcribers 4 *per cent.* intereft for the money paid in, and ¼ *per cent.* for the whole fum they agree to furnifh; and in cafe a call fhall be made upon them for the whole, or any part thereof, the bank further agrees to pay them at the rate of 5 *per cent. per annum* for fuch fum till they repay it, which they are under an obligation to do at the end of the year. By this means the bank obtains all the purpofes of keeping a million of money by them: and though the fubfcribers, if no call is made upon them (which is in general the cafe), receive 6½ *per cent.* for the money they advance, yet the company gains the fum of 23,500l. *per annum* by the contract; as will appear by the following ftatement:

	£.
The bank receives from government for the advance of a million - - - - -	30,000
The bank pays the fubfcribers who advance 100,000l., and engage to pay (when called for) 900,000l. more. - - - - -	6,500
The clear gain to the bank therefore is -	23,500

This is the ftate of the cafe, provided the company fhould make no call on the fubfcribers; which they will be very unwilling to do, becaufe it would not only leffen their profit, but affect the public credit in general.

Bank-ftock may not improperly be called a *trading ftock*, fince with this they deal very largely in foreign gold and filver, in difcounting bills of exchange, &c. Befides which, they are allowed by the government very confiderable fums annually for the management of the annuities paid at their office. All which advantages render a fhare in their ftock very valuable; though it is not equal in value to the Eaft India ftock. The company make dividends of the profits half yearly, of which notice is publicly given; when thofe who have occafion for their money may readily receive it; but private perfons, if they judge convenient, are permitted to continue their funds, and to have their intereft added to the principal.

This company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the fame manner as in the Eaft India company. Thirteen, or more, compofe a court of directors for managing the affairs of the company. The officers of this company are very numerous.

The ftability of the bank of England is equal to that of the Britifh government. All that it has advanced to the public muft be loft before its creditors can fuftain any lofs. No other banking company in England can be eftabliffed by act of parliament, or can conffft of more than fix members. It acts, not only as an ordinary bank, but (as we have already feen) as a great engine of ftate; receiving and paying the greater part of the annuities which are due to the creditors of the public; circulating exchequer bills; and advancing to government the annual amount of the land and malt taxes, which are frequently not paid up till fome years afterwards. It likewife has, upon feveral different occafions, fupported the credit of the principal houfes, not only in England, but of Hamburgh and Holland. Upon one occafion it is faid to have advanced for this purpofe, in one week, about 1,600,000l., a great part of it in bullion.

In Scotland there are two public banks, both at Edinburgh. The one, called *The Bank of Scotland*, was eftabliffed by act of parliament in 1695; the other, called *The Royal Bank*, by royal charter in 1727. Within thefe 30 years there have alfo

been erected private banking companies in almoſt every conſiderable town, and even in ſome villages. Hence the buſineſs of the country is almoſt entirely carried on by paper currency, *i. e* by the notes of thoſe different banking companies; with which purchaſes and payments of all kinds are commonly made. But though the conduct of all thoſe different companies has not been unexceptionable, and has accordingly required an act of parliament to regulate it; the country, notwithſtanding, has evidently derived great benefit from their trade. It has been aſſerted, that the trade of the city of Glaſgow doubled, in about 15 years after the firſt erection of the banks there; and that the trade of Scotland has more than quadrupled ſince the firſt erection of the two public banks at Edinburgh. Whether the trade, either of Scotland in general, or of the city of Glaſgow in particular, has really increaſed in ſo great a proportion, during ſo ſhort a period, we do not pretend to know. If either of them has increaſed in this proportion, it ſeems to be an effect too great to be accounted for by the ſole operation of this cauſe. That the trade and induſtry of Scotland, however, have increaſed very conſiderably during this period, and that the banks have contributed a good deal to this increaſe, cannot be diſputed.

It is chiefly by diſcounting bills of exchange, that is, by advancing money upon them before they are due, that the greater part of banks and bankers iſſue their promiſſory notes. They deduct always, upon whatever ſum they advance, the legal intereſt till the bill ſhall become due. The payment of the bill, when it becomes due, replaces to the bank the value of what had been advanced, together with a clear profit of the intereſt. The banker, who advances to the merchant whoſe bill he diſcounts, not gold and ſilver, but his own promiſſory notes, has the advantage of being able to diſcount to a greater amount, by the whole value of his promiſſory notes, which he finds by experience are commonly in circulation. He is thereby enabled to make his clear gain of intereſt on ſo much a larger ſum. The commerce of Scotland, which at preſent is not very great, was ſtill more inconſiderable when the two firſt banking companies were eſtabliſhed; and thoſe companies would have had but little trade, had they confined their buſineſs to the diſcounting of bills of exchange. They invented, therefore, another method of iſſuing their promiſſory notes, by granting what they called *caſh-accounts*; that is, by giving credit to the extent of a certain ſum (2000l. or 3000l. for example), to any individual who could procure two perſons of undoubted credit and good landed eſtate to become ſurety for him, that whatever money ſhould be advanced to him within the ſum for which the credit had been given ſhould be repaid upon demand, together with the legal intereſt. Credits of this kind are commonly granted by banks and bankers in all different parts of the world. But the eaſy terms on which the Scots banking companies accept of repayment are peculiar to them, and have perhaps been the principal cauſe, both of the great trade of thoſe companies and of the benefit which the country has received from it.

Whoever has a credit of this kind with one of thoſe companies, and borrows 1000l. upon it, for example, may repay this ſum piece-meal, by 20l. and 30l. at a time, the company diſcounting a proportionable part of the intereſt of the great ſum from the day on which each of thoſe ſmall ſums is paid in, till the whole be in this manner repaid. All merchants therefore, and almoſt all men of buſineſs, find it convenient to keep ſuch caſh-accounts with them; and are thereby intereſted to promote the trade of thoſe companies, by readily receiving their notes in all payments, and by encouraging all thoſe with whom they have any influence to do the ſame. The banks, when their cuſtomers apply to them for money, generally advance it to them in their own promiſſory notes. Theſe the merchants pay away to the manufacturers for goods, the manufacturers to the farmers for materials and proviſions, the farmers to their landlords for rent, the landlords repay them to the merchants for the conveniences and luxuries with which they ſupply them, and the merchants again return them to the banks in order to balance their caſh accounts, or to replace what they may have borrowed of them; and thus almoſt the whole money-buſineſs of the country is tranſacted by means of them.

By means of thoſe caſh accounts, every merchant can, without imprudence, carry on a greater trade than he otherwiſe could do. If there are two merchants, one in London and the other in Edinburgh, who employ equal ſtocks in the ſame branch of trade, the Edinburgh merchant can, without imprudence, carry on a greater trade, and give employment to a greater number of people, than the London merchant. The London merchant muſt always keep by him a conſiderable ſum of money, either in his own coffers, or in thoſe of his banker (who gives him no intereſt for it), in order to anſwer the demands continually coming upon him for payment of the goods which he purchaſes upon credit. Let the ordinary amount of this ſum be ſuppoſed 500l. The value of the goods in his warehouſe muſt always be leſs by 500l. than it would have been, had he not been obliged to keep ſuch a ſum unemployed. Let us ſuppoſe that he generally diſpoſes of his whole ſtock upon hand, or of goods to the value of his whole ſtock upon hand, once in the year. By being obliged to keep ſuch a great ſum unemployed, he muſt ſell in a year 500l. worth leſs goods than he might otherwiſe have done. His annual profits muſt be leſs by all that he could have made by the ſale of 500l. worth more goods; and the number of people employed in preparing his goods for the market muſt be leſs by all thoſe that 500l. more ſtock could have employed. The merchant in Edinburgh, on the other hand, keeps no money unemployed for anſwering ſuch occaſional demands. When they actually come upon him, he ſatisfies them from his caſh-account with the bank, and gradually replaces the ſum borrowed with the money or paper which comes in from the occaſional ſales of his goods. With the ſame ſtock, therefore, he can, without imprudence, have at all times in his warehouſe a larger quantity of goods than the London merchant; and can thereby both make a greater profit himſelf, and give conſtant employment to a greater number of induſtrious people who prepare thoſe goods for the market. Hence the great benefit which the country has derived from a trade carried on by the means we have deſcribed.

The late multiplication of banking companies in both parts of the united kingdom, an event by which many people have been much alarmed, inſtead of diminiſhing, increaſes the ſecurity of the public. It obliges all of them to be more circumſpect in their conduct, and, by not extending their currency beyond its due proportion to their caſh, to guard themſelves againſt thoſe malicious runs which the rivalſhip of ſo many competitors is always ready to bring upon them. It reſtrains the circulation of each particular company within a narrower circle, and reduces their circulating notes to a ſmaller number. By dividing the whole circulation into a greater number of parts, the failure of any one company, an accident which, in the courſe of things, muſt ſometimes happen, becomes of leſs conſequence to the public. This free competition too obliges all bankers to be more liberal in their dealings with their cuſtomers, leſt their rivals ſhould carry them away. In general, if any branch of trade, or any diviſion of labour, be advantageous to the public, the freer and more general the competition that prevails, the better.

2. *Banks of depoſit.* The other kind of banks conſiſt of ſuch as are inſtituted wholly on the public account, and are called

Banks of depoſit; the nature of which not being generally underſtood, the following particular explanation may not be unacceptable. The currency of a great ſtate, ſuch as Britain, generally conſiſts almoſt entirely of its own coin. Should this currency, therefore, be at any time worn, clipt, or otherwiſe degraded below its ſtandard value, the ſtate by a reformation of its coin can effectually re-eſtabliſh its currency. But the currency of a ſmall ſtate, ſuch as Genoa or Hamburgh, can ſeldom conſiſt altogether in its own coin, but muſt be made up, in a great meaſure, of the coins of all the neighbouring ſtates with which its inhabitants have a continual intercourſe. Such a ſtate, therefore, by reforming its coin, will not always be able to reform its currency. If foreign bills of exchange are paid in this currency, the uncertain value of any ſum, of what is in its own nature ſo uncertain, muſt render the exchange always very much againſt ſuch a ſtate, its currency being, in all foreign ſtates, neceſſarily valued even below what it is worth. In order to remedy the inconvenience to which this diſadvantageous exchange muſt have ſubjected their merchants, ſuch ſmall ſtates, when they began to attend to the intereſt of trade, have frequently enacted, that foreign bills of exchange of a certain value ſhould be paid, not in common currency, but by an order upon, or by a transfer in the books of, a certain bank, eſtabliſhed upon the credit and under the protection of the ſtate; this bank being always obliged to pay, in good and true money, exactly according to the ſtandard of the ſtate. The banks of Venice, Genoa, Amſterdam, Hamburgh, and Nuremberg, ſeem to have been all originally eſtabliſhed with this view, though ſome of them may have afterwards been made ſubſervient to other purpoſes. The money of ſuch banks, being better than the common currency of the country, neceſſarily bore an agio, which was greater or ſmaller, according as the currency was ſuppoſed to be more or leſs degraded below the ſtandard of the ſtate. The agio of the bank of Hamburgh, for example, which is ſaid to be commonly about 14 *per cent.* is the ſuppoſed difference between the good ſtandard money of the ſtate, and the clipt, worn, and diminiſhed currency poured into it from all the neighbouring countries.

Before 1609, the great quantity of clipt and worn foreign coin, which the extenſive trade of Amſterdam brought from all parts of Europe, reduced the value of its currency about 9 *per cent.* below that of good money freſh from the mint. Such money no ſooner appeared, than it was melted down or carried away, as it always is in ſuch circumſtances. The merchants, with plenty of currency, could not always find a ſufficient quantity of good money to pay their bills of exchange; and the value of thoſe bills, in ſpite of ſeveral regulations which were made to prevent it, became in a great meaſure uncertain. In order to remedy theſe inconveniences, a bank was eſtabliſhed in 1609 under the guarantee of the city. The bank received both foreign coin, and the light and worn coin of the country, at its real and intrinſic value in the good ſtandard money of the country, deducting only ſo much as was neceſſary for defraying the expence of coinage, and the other neceſſary expence of management. For the value which remained after this ſmall deduction was made, it gave a credit in its books. This credit was called *bank-money*; which, as it repreſented money exactly according to the ſtandard of the mint, was always of the ſame real value, and intrinſically worth more than current money. It was at the ſame time enacted, that all bills drawn upon or negotiated at Amſterdam of the value of 600 gilders and upwards ſhould be paid in bank-money, which at once took away all uncertainty in the value of thoſe bills. Every merchant, in conſequence of this regulation, was obliged to keep an account with the bank in order to pay his foreign bills of exchange, which neceſſarily occaſioned a certain demand for bank-money.

Bank-money, over and above both its intrinſic ſuperiority to currency, and the additional value which this demand neceſſarily gives it, has likewiſe ſome other advantages. It is ſecure from fire, robbery, and other accidents; the city of Amſterdam is bound for it; it can be paid away by a ſimple transfer, without the trouble of counting, or the riſk of tranſporting it from one place to another. In conſequence of thoſe different advantages, it ſeems from the beginning to have borne an agio; and it is generally believed that all the money originally depoſited in the bank was allowed to remain there, nobody caring to demand payment of a debt which he could ſell for a premium in the market. Beſides, this money could not be brought from thoſe coffers, as it will appear by and by, without previouſly paying for the keeping.

Thoſe depoſits of coin, or which the bank was bound to reſtore in coin, conſtituted the original capital of the bank, or the whole value of what was repreſented by what is called *bank-money*. At preſent they are ſuppoſed to conſtitute but a very ſmall part of it. In order to facilitate the trade in bullion, the bank has been for theſe many years in the practice of giving credit in its books upon depoſits of gold and ſilver bullion. This credit is generally about 5 *per cent.* below the mint price of ſuch bullion. The bank grants at the ſame time what is called a *recipe* or receipt, intitling the perſon who makes the depoſit, or the bearer, to take out the bullion again at any time within ſix months, upon re-transferring to the bank a quantity of bank-money equal to that for which credit had been given in its books when the depoſit was made, and upon paying $\frac{1}{4}$ *per cent.* for the keeping if the depoſit was in ſilver, and $\frac{1}{2}$ *per cent.* if it was in gold; but at the ſame time declaring, that in default of ſuch payment, and upon the expiration of this term, the depoſit ſhould belong to the bank at the price at which it had been received, or for which credit had been given in the transfer books. What is thus paid for the keeping of the depoſit may be conſidered as a ſort of warehouſe rent; and why this warehouſe rent ſhould be ſo much dearer for gold than for ſilver, ſeveral different reaſons have been aſſigned. The fineneſs of gold, it has been ſaid, is more difficult to be aſcertained than that of ſilver. Frauds are more eaſily practiſed, and occaſion a greater loſs in the more precious metal. Silver, beſides, being the ſtandard metal, the ſtate, it has been ſaid, wiſhes to encourage more the making of depoſits of ſilver than of thoſe of gold.

Depoſits of bullion are moſt commonly made when the price is ſomewhat lower than ordinary; and they are taken out again when it happens to riſe. In Holland the market price of bullion is generally above the mint-price, for the ſame reaſon that it was ſo in England before the late reformation of the gold coin. The difference is ſaid to be commonly from about ſix to ſixteen ſtivers upon the mark, or eight ounces of ſilver of eleven parts fine and one part alloy. The bank-price, or the credit which the bank gives for depoſits of ſuch ſilver (when made in foreign coin of which the fineneſs is well known and aſcertained, ſuch as Mexico dollars), is 22 gilders the mark; the mint-price is about 23 gilders; and the market-price is from 23 gilders ſix to 23 gilders ſixteen ſtivers, or from 2 to 3 *per cent.* above the mint price. The proportions between the bank-price, the mint-price, and the market-price, of gold bullion are nearly the ſame. A perſon can generally ſell his receipt for the difference between the mint-price of bullion and the market-price. A receipt for bullion is almoſt always worth ſomething; and it very ſeldom happens, therefore, that any body ſuffers his receipt to expire, or allows his bullion to fall to the bank at the price at which it

had been received, either by not taking it out before the end of the ſix months, or by neglecting to pay the 1 or ½ *per cent.* in order to obtain a new receipt for another ſix months. This, however, though it ſeldom happens, is ſaid to happen ſometimes, and more frequently with regard to gold than with regard to ſilver, on account of the higher warehouſe-rent which is paid for the keeping of the former.

The perſon who by making a depoſit of bullion obtains both a bank-credit and a receipt, pays his bills of exchange as they become due with his bank-credit; and either ſells or keeps his receipt, according as he judges that the price of bullion is likely to riſe or to fall. The receipt and the bank-credit ſeldom keep long together, and there is no occaſion that they ſhould. The perſon who has a receipt, and who wants to take out bullion, finds always plenty of bank-credits, or bank-money, to buy at the ordinary price; and the perſon who has bank-money, and wants to take out bullion, finds receipts always in equal abundance.

The owners of bank-credits and the holders of receipts conſtitute two different ſorts of creditors againſt the bank. The holder of a receipt cannot draw out the bullion for which it is granted, without re-aſſigning to the bank a ſum of bank-money equal to the price at which the bullion had been received. If he has no bank-money of his own, he muſt purchaſe it of thoſe who have it. The owner of bank-money cannot draw out bullion without producing to the bank receipts for the quantity which he wants. If he has none of his own, he muſt buy them of thoſe who have them. The holder of a receipt, when he purchaſes bank money, purchaſes the power of taking out a quantity of bullion, of which the mint price is 5 *per cent.* above the bank-price. The agio of 5 *per cent.* therefore, which he commonly pays for it, is paid, not for an imaginary, but for a real value. The owner of bank-money, when he purchaſes a receipt, purchaſes the power of taking out a quantity of bullion, of which the market-price is commonly from 2 to 3 *per cent.* above the mint-price. The price which he pays for it, therefore, is paid likewiſe for a real value. The price of the receipt, and the price of the bank-money, compound or make up between them the full value or price of the bullion.

Upon depoſits of the coin current in the country, the bank grants receipts likewiſe as well as bank-credits; but thoſe receipts are frequently of no value, and will bring no price in the market. Upon ducatoons, for example, which in the currency paſs for three gilders three ſtivers each, the bank gives a credit of three gilders only, or 5 *per cent.* below their current value. It grants a receipt likewiſe intitling the bearer to take out the number of ducatoons depoſited at any time within ſix months, upon paying ¼ *per cent.* for the keeping. This receipt will frequently bring no price in the market. Three gilders bank-money generally ſell in the market for three gilders three ſtivers, the full value of the ducatoons if they were taken out of the bank; and before they can be taken out, ¼ *per cent.* muſt be paid for the keeping, which would be mere loſs to the holder of the receipt. If the agio of the bank, however, ſhould at any time fall to 3 *per cent.* ſuch receipts might bring ſome price in the market, and might ſell for 1¾ *per cent.* But the agio of the bank being now generally about 5 *per cent.* ſuch receipts are frequently allowed to expire, or, as they expreſs it, to fall to the bank. The 5 *per cent.* which the bank gains, when depoſits either of coin or bullion are allowed to fall to it, may be conſidered as the warehouſe rent for the perpetual keeping of ſuch depoſits.

The ſum of bank-money for which the receipts are expired muſt be very conſiderable. It muſt comprehend the whole original capital of the bank, which, it is generally ſuppoſed, has been allowed to remain there from the time it was firſt depoſited, nobody caring either to renew his receipt or to take out his depoſit, as, for the reaſons already aſſigned, neither the one nor the other could be done without loſs. But whatever may be the amount of this ſum, the proportion which it bears to the whole maſs of bank-money is ſuppoſed to be very ſmall. The bank of Amſterdam has for theſe many years paſt been the great warehouſe of Europe for bullion, for which the receipts are very ſeldom allowed to expire, or, as they expreſs it, to fall to the bank. The far greater part of the bank-money, or of the credits upon the books of the bank, is ſuppoſed to have been created, for theſe many years paſt, by ſuch depoſits as the dealers in bullion are continually both making and withdrawing.

No demand can be made upon the bank but by means of a recipe or receipt. The ſmaller maſs of bank-money, for which the receipts are expired, is mixed and confounded with the much greater maſs for which they are ſtill in force; ſo that, though there may be a conſiderable ſum of bank-money for which there are no receipts, there is no ſpecific ſum or portion of it which may not at any time be demanded by one. The bank cannot be debtor to two perſons for the ſame thing; and the owner of bank-money who has no receipt cannot demand payment of the bank till he buys one. In ordinary and quiet times, he can find no difficulty in getting one to buy at the market price, which generally correſponds with the price he can get for the coin or bullion it entitles him to take out of the bank.

It might be otherwiſe during a public calamity; an invaſion, for example, ſuch as that of the French in 1672. The owners of bank-money being then all eager to draw it out of the bank, in order to have it in their own keeping, the demand for receipts might raiſe their price to an exorbitant height. The holders of them might form extravagant expectations, and, inſtead of 2 or 5 *per cent.* demand half the bank-money for which credit had been given upon the depoſits that the receipts had reſpectively been granted for. The enemy, informed of the conſtitution of the bank, might even buy them up in order to prevent the carrying away of the treaſure. In ſuch emergencies, the bank, it is ſuppoſed, would break through its ordinary rule of making payment only to the holders of receipts. The holders of receipts, who had no bank-money, muſt have received within 2 or 3 *per cent.* of the value of the depoſit for which their reſpective receipts had been granted. The bank, therefore, it is ſaid, would in this caſe make no ſcruple of paying, either with money or bullion, the full value of what the owners of bank-money who could get no receipts were credited for in its books; paying at the ſame time 2 or 3 *per cent.* to ſuch holders of receipts as had no bank-money, that being the whole value which in this ſtate of things could juſtly be ſuppoſed due to them.

Even in ordinary and quiet times it is the intereſt of the holders of receipts to depreſs the agio, in order either to buy bank-money (and conſequently the bullion which their receipts would then enable them to take out of the bank) ſo much cheaper, or to ſell their receipts to thoſe who have bank-money, and who want to take out bullion, ſo much dearer; the price of a receipt being generally equal to the difference between the market-price of bank-money and that of the coin or bullion for which the receipt had been granted. It is the intereſt of the owners of bank-money, on the contrary, to raiſe the agio, in order either to ſell their bank-money ſo much dearer, or to buy a receipt ſo much cheaper. To prevent the ſtock-jobbing tricks which thoſe oppoſite intereſts might ſometimes occaſion, the bank has of late years come to a reſolution to ſell at all times bank-money for currency, at 5 *per cent.* agio, and to buy it again at 4 *per cent.* agio. In conſequence of this

reſolution, the agio can never either riſe above 5 or ſink below 4 *per cent.* and the proportion between the market-price of the bank and that of the current money is kept at all times very near to the proportion between their intrinſic values. Before this reſolution was taken, the market-price of money uſed ſometimes to riſe ſo high as 9 *per cent.* agio, and ſometimes to ſink ſo low as par, according as oppoſite intereſts happened to influence the market.

The bank of Amſterdam profeſſes to lend out no part of what is depoſited with it, but, for every gilder for which it gives credit in its books, to keep in its repoſitories the value of a gilder either in money or bullion. That it keeps in its repoſitories all the money or bullion for which there are receipts in force, for which it is at all times liable to be called upon, and which, in reality, is continually going from it and returning to it again, cannot well be doubted. But whether it does ſo likewiſe with regard to that part of its capital for which the receipts are long ago expired, for which in ordinary and quiet times it cannot be called upon, and which in reality is very likely to remain with it for ever, or as long as the States of the United Provinces ſubſiſt, may perhaps appear more uncertain. At Amſterdam, however, no part of faith is better eſtabliſhed, than that for every gilder circulated as bank-money there is a correſpondent gilder in gold and ſilver to be found in the treaſure of the bank. The city is guarantee that it ſhall be ſo. The bank is under the direction of the four reigning burgomaſters, who are changed every year. Each new ſet of burgomaſters viſits the treaſure, compares it with the books, receives it upon oath, and delivers it over, with the ſame awful ſolemnity, to the ſet which ſucceeds it; and in that ſober and religious country oaths are not yet diſregarded. A rotation of this kind ſeems alone a ſufficient ſecurity againſt any practices which cannot be avowed. Amidſt all the revolutions which faction has ever occaſioned in the government of Amſterdam, the prevailing party has at no time accuſed their predeceſſors of infidelity in the adminiſtration of the bank. No accuſation could have affected more deeply the reputation and fortune of the diſgraced party; and if ſuch an accuſation could have been ſupported, we may be aſſured that it would have been brought. In 1672, when the French king was at Utrecht, the bank of Amſterdam paid ſo readily as left no doubt of the fidelity with which it had obſerved its engagements. Some of the pieces which were then brought from its repoſitories appeared to have been ſcorched with the fire which happened in the town houſe ſoon after the bank was eſtabliſhed. Thoſe pieces, therefore, muſt have lain there from that period.

What may be the amount of the treaſure in the bank is a queſtion which has long employed the ſpeculations of the curious. Nothing but conjecture can be offered concerning it. It is generally reckoned, that there are about 2000 people who keep accounts with the bank; and allowing them to have, one with another, the value of 1500l. lying upon their reſpective accounts (a very large allowance), the whole quantity of bank money, and conſequently of treaſure in the bank, will amount to 3,000,000l. or, at 11 gilders the pound ſterling, 33,000,000 of gilders; a great ſum, and ſufficient to carry on a very extenſive circulation, but vaſtly below the extravagant ideas which ſome people have formed of this treaſure.

The city of Amſterdam derives a conſiderable revenue from the bank. Beſides what may be called the *warehouſe-rent* above mentioned, each perſon, upon firſt opening an account with the bank, pays a fee of 10 gilders; and for every new account, 3 gilders, 3 ſtivers; for every transfer, 2 ſtivers; and if the transfer is for leſs than 300 gilders, 6 ſtivers, in order to diſcourage the multiplicity of ſmall tranſactions. The perſon who neglects to balance his accounts twice in the year forfeits 25 gilders. The perſon who orders a transfer for more than is upon his account, is obliged to pay 3 *per cent.* for the ſum overdrawn, and his order is ſet aſide into the bargain. The bank is ſuppoſed too to make a conſiderable profit by the ſale of the foreign coin or bullion which ſometimes falls to it by the expiring of receipts, and which is always kept till it can be ſold with advantage. It makes a profit likewiſe by ſelling bank-money at 5 *per cent.* agio, and buying it in at 4. Theſe different emoluments amount to a good deal more than what is neceſſary for paying the ſalaries of officers, and defraying the expence of management. What is paid for the keeping of bullion upon receipts, is alone ſuppoſed to amount to a nett annual revenue of between 150,000 and 200,000 gilders. Public utility, however, and not revenue, was the original object of this inſtitution. Its object was to relieve the merchants from the inconvenience of a diſadvantageous exchange. The revenue which has ariſen from it was unforeſeen, and may be conſidered as an accidental benefit.

BANK, or BANCO, *of Venice*, commonly called *banco del guira*, was eſtabliſhed in the middle of the twelfth century, and is properly a board of public credit and intereſt; or a general and perpetual purſe for all merchants and traders; eſtabliſhed by a ſolemn edict of the commonwealth, which enacts, that all payments of wholeſale merchandize, and letters of exchange, ſhall be in *banco*, or *bank* notes; and that all debtors and creditors ſhall be obliged, the one to carry their money to the *bank*, the other to receive their payments at *banco*; ſo that payments are performed by a ſimple transfer from the one to the other: he who was before creditor on the *bank* books, becoming debtor as ſoon as he has reſigned his right to another, who is entered down as creditor in his place; ſo that the parties only change names, without any effective payment being made. Indeed there are ſometimes actual payments made, eſpecially in matters of retail, and when foreigners are diſpoſed to have ready money to carry off in ſpecie; or when particular traders chooſe to have a ſtock by them to negotiate in bills of exchange, &c. The neceſſity of theſe effective payments has given occaſion to the opening a fund of ready money; which is found ſo far from diminiſhing the ſtock, that this liberty of withdrawing money at pleaſure rather augments it. By means of this *bank*, the republic, without encroaching on the freedom of commerce, or without paying any intereſt, became miſtreſs of 5,000,000 ducats, to which the capital of the *bank* is limited, to be in readineſs on any preſſing occaſion; the republic being ſecurity for the capital ſum.

BANK, *million*, derives its name from king William's *million* lottery in the year 1695. The proprietors agreed in partnerſhip to purchaſe tickets in this lottery. They afterwards purchaſed many reverſions of the 14 *per cent.* annuities, and admitted many proprietors of annuities to purchaſe their joint ſtock, which amounted and ſtill amounts to 500,000l. They are a partnerſhip by deed enrolled in chancery, in the year 1721. They divided 5 *per cent.* till Lady-day, 1728, when they reduced their annual dividend to 4 *per cent.* and it was again raiſed to 5 *per cent.* which is ſtill continued.

BANK, in *Natural Hiſtory*, denotes an elevation of the ground, or bottom of the ſea, ſo as ſometimes to ſurmount the ſurface of the water, or, at leaſt, to leave the water ſo ſhallow, as uſually not to allow a veſſel to remain afloat over it. In this ſenſe, *bank* amounts to much the ſame with flat, ſhoal, &c. There are *banks* of ſand, and others of ſtone, called alſo ſhelves or rocks. In the north ſea, they alſo ſpeak of *banks* of ice, which are large pieces of that ſubſtance floating about. Vapours at ſea occaſion ſometimes ſuch a *deceptio viſûs*, that mariners imagine they ſee land with trees, &c. They call theſe deceptions fog-*banks*. A remarkable appearance of this kind is

deſcribed in Dr. Hawkſworth's Account of the Voyages to the Southern Hemiſphere, vol. i. p. 10. A long narrow *bank* is ſometimes called a *rib*.

The *bank* abſolutely ſo called, or the *main bank*, or *great bank*, denotes that of Newfoundland, the ſcene of the cod fiſhery. It is called the *great bank*, not only by reaſon of its vaſt extent, being, according to the Engliſh computation, two hundred miles long, and, according to the French, one hundred leagues, or three hundred miles; but alſo on account of ſeveral leſſer *banks* near it, where cod are alſo caught. Theſe laſt the French call *banquereaux*. This is one of thoſe *banks* which have water enough to float a ſhip, and which, on this account, are not dangerous.

Banks are uſually diſtinguiſhed by a buoy, poſt, or the like. On charts, ſand *banks* are uſually marked by little dots, and *banks* of ſtone by croſſes. The colours of the buoys are alſo varied accordingly; ſand-*banks* being denoted by light coloured buoys, and rocks by black ones. In large rivers, as the Elbe, &c. ſand-*banks*, by high tides and inundations, are liable to change places; care is therefore taken to ſhift the buoys from time to time, to ſhew the true channel of the river. An exact knowledge of the *banks*, their extent, and the depth of water on them, forms the moſt eſſential part of the ſcience of a pilot, and a maſter of a ſhip. If the veſſel be large, and draw much water, great attention will be neceſſary to keep clear of the *banks*: on the contrary, if it be ſmall, the ſame *banks* afford a ſure *aſylum*, where it may brave the largeſt and ſtouteſt veſſels, which dare not follow it. By means of this barrier, many a ſmall veſſel has eſcaped a purſuing enemy.

Bank, in veſſels which go with oars, is uſed for the bench where the rowers are ſeated; popularly called by our ſeamen the *thought*. In this ſenſe we read of *banks* of gallies, of galeaſſes, of galliots, of brigantines, and the like. The Venetian gondolas have no *banks*; for the watermen row ſtanding. The common gallies have twenty-five *banks*, that is, twenty-five on each ſide, in all fifty *banks*, with one oar to each *bank*, and four or five men to each oar. The galeaſſes have thirty-two *banks* on a ſide, and ſix or ſeven rowers are commonly appointed to a *bank*.

BANKER, *in Commerce*. The hiſtory of private *banks* is as follows. The royal mint in the Tower of London had for ſome years, before the year 1640, been made uſe of as a kind of *bank*, or depoſit, for merchants to lodge their caſh in. But king Charles the Firſt having in that year made free with their money, the mint loſt its credit. After this, the merchants and traders of London generally truſted their caſh with their ſervants, until the breaking out of the civil war, when it was very cuſtomary for their apprentices and clerks to leave their maſters and go into the army. Whereupon, in ſuch unſettled times, merchants, not daring longer to confide in their apprentices, began firſt, about the year 1645, to lodge their neceſſary caſh in goldſmiths' hands, both to receive and pay for them; until which time the whole and proper buſineſs of London goldſmiths was to buy and ſell plate, and foreign coins of gold and ſilver, to melt and cull them, to coin ſome at the mint, and with the reſt to ſupply the refiners, plate-makers, and merchants, as they found the price to vary. This account of the matter is given in a ſcarce and moſt curious pamphlet, publiſhed in 1676, entitled "The Myſtery of the new-faſhioned Goldſmiths, or Bankers, diſcovered," conſiſting of only eight quarto pages.

Bankers on their firſt eſtabliſhment allowed to thoſe who entruſted their money in their hands a moderate intereſt for the ſame, and hereby their buſineſs was very conſiderably increaſed, and roſe to great reputation in the year 1667, when the Dutch burnt our ſhips at Chatham; but this event cauſed a *run* on the *bankers*, which hurt their credit; and in the year 1672 king Charles II. ſhut up the exchequer, and ſeized the money which the *bankers* had lent him at 8 *per cent.* intereſt, the whole ſum amounting to 1,328,526l. The king was afterwards neceſſitated to pay 6 *per cent.* intereſt for this debt out of his hereditary exciſe, but the principal was never paid. However, the parliament of 12 William, cap. 12. provided for a large arrear of intereſt, and ſettled an intereſt of 3 *per cent.* for the future. The debt was hereby made redeemable, on paying one moiety of the principal ſum, viz. 664,263l. farther confirmed by an act of 2 and 3 Anne, cap. 15. which moiety now became the proper debt of the public; and being reduced from 6 to 5 *per cent.* in 1717, was finally ſubſcribed into the South-ſea capital ſtock in the year 1720.

Bankers now allow no intereſt for money, and by inveſting a portion of it in the funds, or laying it out on other ſufficient ſecurities, and trafficking with it occaſionally in diſcounts, &c. reap very conſiderable advantage from it; and by negotiating bills, &c. on the part of their creditors, greatly contribute to the convenience and diſpatch of buſineſs.

The ancient *bankers* were called *argentarii*, and *nummularii*. Their chief buſineſs was to put out the money of private perſons to intereſt; and they had boards and benches for this purpoſe in all the markets and public places, where they took in the money from ſome to lend it to others. The Romans had two kinds of *bankers*, though their office was much more extenſive than that of the *bankers* among us, theirs being that of public officers, in whom were united the functions of a broker, agent, *banker*, and notary; managing the exchange, taking in money, aſſiſting in buying and ſelling, and drawing the writings neceſſary on all theſe occaſions.

Bankers *in the court of Rome*, are perſons authorized, excluſive of all others, to ſolicit and procure by their correſpondents at Rome, all bulls, diſpenſations, and other acts diſpatched at the papal datary, or in the legateſhip of Avignon. They were common in all the cities of France that had a parliament, or a preſidial; and were erected into a regular and hereditary office, by an edict in 1673.

They owe their origin to the Guelphs, who took ſhelter at Avignon, and in other cities within the juriſdiction of the pope, in the time of the civil wars in Italy. The favour they were in with the pontiffs, for having eſpouſed the papal cauſe, occaſioned their being employed in procuring expeditions of the court of Rome. But the heavy extortions they practiſed towards their clients, ſoon rendered them odious, and occaſioned ſeveral denominations of reproach, as *coarcini*, *caturcini*, *caurſini*, *corſini*, &c. from the city Cahors, the native place of pope John XXII. in whoſe pontificate they were in their higheſt power.

Banker, in *Bricklaying*, a piece of timber whereon they cut the bricks. The *banker* is ſix feet long or more, according to the number of men to work at it, and nine or ten inches ſquare; it is to be laid on two piers of timber, three feet high from the floor they ſtand on.

BANKING, the making of banks to oppoſe the force of the ſea, rivers, or the like, and ſecure the land from being overflowed or waſted. With reſpect to the water which is to be kept out, this is called *banking*; with reſpect to the land, which is hereby to be defended, *embanking*.

Banking is alſo applied to the keeping a bank, or the employment of a banker. Banking, in this ſenſe, ſignifies the trading in money, or remitting it from place to place, by means of bills of exchange. This anſwers to what the French call *faire la banque*. In France, before the revolution, every body was allowed to bank, whether merchant or not; even foreigners were indulged in this kind of traffic. In Italy,

banking does not derogate from nobility, eſpecially in the republican ſtates; whence it is, that moſt of the younger ſons of great families engage in it. In reality, it was the nobility of Venice and Genoa, that, for a long time, were the chief bankers in the other countries of Europe.

BANKISH, a province of the Mogul's dominions, in the north part of the Hither India, lying ſouth-weſt of the province of Caſſimere.

BANKRUPT (*bancus ruptus*), is ſo called, becauſe, when the bank or ſtock is broken or exhauſted, the owner is ſaid to be a *bankrupt*. And this word *bankrupt* is derived from the French *banqueroute*, which ſignifies a breaking or failing in the world. *Banque* in French is as much as *menſa* in Latin, and *route* is the ſame as *veſtigium*; and this term is ſaid to be taken originally from the Roman *menſarii*, which were ſet in public places; and when a tradeſman ſlipped away, with an intention to deceive his creditors, he left only ſome *veſtigia* or ſigns of his table or ſhop behind him. But a bankrupt with us, from the ſeveral deſcriptions given of him in our ſtatute-law, may be defined "a trader, who ſecretes himſelf, or does certain other acts tending to defraud his creditors." For the better underſtanding of this article, it will be proper to conſider, 1. *Who* may become a bankrupt: 2. What *acts* make a bankrupt: 3. The *proceedings* on a commiſſion of bankruptcy: and, 4. In what manner an eſtate in goods and chattels may be *tranſferred* by bankruptcy. But of theſe, the two laſt being treated under the article COMMISSION *of Bankruptcy*, the two firſt only belong to this place.

1. A bankrupt was formerly conſidered merely in the light of a criminal or offender; and in this ſpirit we are told by Sir Edward Coke, that we have fetched as well the name, as the wickedneſs, of bankrupts from foreign nations. But at preſent the laws of bankruptcy are conſidered as laws calculated for the benefit of trade, and founded on the principles of humanity as well as juſtice; and to that end they confer ſome privileges, not only on the creditors, but alſo on the bankrupt or debtor himſelf. On the creditors; by compelling the bankrupt to give up all his effects to their uſe, without any fraudulent concealment: on the debtor, by exempting him from the rigour of the general law, whereby his perſon might be confined at the diſcretion of his creditor, though in reality he has nothing to ſatisfy the debt; whereas the law of bankrupts, taking into conſideration the ſudden and unavoidable accidents to which men in trade are liable, has given them the liberty of their perſons, and ſome pecuniary emoluments, upon condition they ſurrender up their whole eſtate to be divided among their creditors.

In this reſpect our legiſlature ſeems to have attended to the example of the Roman law. We mean not the terrible law of the twelve tables; whereby the creditors might cut the debtor's body into pieces, and each of them take his proportional ſhare: if indeed that law, *de debitore in partes ſecando*, is to be underſtood in ſo very butcherly a light; which many learned men have with reaſon doubted. Nor do we mean thoſe leſs inhuman laws (if they may be called ſo, as *their* meaning is indiſputably certain), of impriſoning the debtor's perſon in chains; ſubjecting him to ſtripes and hard labour, at the mercy of his rigid creditor; and ſometimes ſelling him, his wife, and children, to perpetual foreign ſlavery *trans Tiberim* *: an oppreſſion which produced ſo many popular inſurrections, and ſeceſſions to the *mons ſacer*. But we mean the law of ceſſion, introduced by the Chriſtian emperors; whereby, if a debtor *ceded* or yielded up all his fortune to his creditors, he was ſecured from being dragged to a gaol, "*omni quoque corporali cruciatu ſemoto.*" For, as the emperor juſtly obſerves, "*inhumanum erat ſpoliatam fortunis ſuis in ſolidum damnari.*" Thus far was juſt and reaſonable: but as the departing from one extreme is apt to produce its oppoſite, we find it afterwards enacted, that if the debtor by any unforeſeen accident was reduced to low circumſtances, and would ſwear that he had not ſufficient left to pay his debts, he ſhould not be compelled to cede or give up even that which he had in his poſſeſſion; a law which, under a falſe notion of humanity, ſeems to be fertile of perjury, injuſtice, and abſurdity.

The laws of England, more wiſely, have ſteered in the middle between both extremes: providing at once againſt the inhumanity of the creditor, who is not ſuffered to confine an honeſt bankrupt after his effects are delivered up; and at the ſame time taking care that all his juſt debts ſhall be paid, ſo far as the effects will extend. But ſtill they are cautious of encouraging prodigality and extravagance by this indulgence to debtors: and therefore they allow the benefit of the laws of bankruptcy to none but actual traders; ſince that ſet of men are, generally ſpeaking, the only perſons liable to accidental loſſes, and to an inability of paying their debts, without any fault of their own. If perſons in other ſituations of life run in debt without the power of payment, they muſt take the conſequences of their own indiſcretion, even though they meet with ſudden accidents that may reduce their fortunes: for the law holds it to be an unjuſtifiable practice, for any perſon but a trader to encumber himſelf with debts of any conſiderable value. If a gentleman, or one in a liberal profeſſion, at the time of contracting his debts, has a ſufficient fund to pay them, the delay of payment is a ſpecies of diſhoneſty, and a temporary injuſtice to his creditor: and if, at ſuch time, he has not ſufficient fund, the diſhoneſty and injuſtice are the greater. He cannot therefore murmur, if he ſuffer the puniſhment which he has voluntarily drawn upon himſelf. But in mercantile tranſactions the caſe is far otherwiſe. Trade cannot be carried on without mutual credit on both ſides: the contracting of debts is therefore here not only juſtifiable but neceſſary. And if, by accidental calamities, as by the loſs of a ſhip in a tempeſt, the failure of brother-traders, or by the non-payment of perſons out of trade, a merchant or trader becomes incapable of diſcharging his own debts, it is his misfortune and not his fault. To the misfortunes therefore of debtors the law has given a compaſſionate remedy, but denied it to their faults: ſince, at the ſame time that it provides for the ſecurity of commerce, by enacting that every conſiderable trader may be declared a bankrupt, for the benefit of his creditors as well as himſelf, it has alſo, to diſcourage extravagance, declared, that no one ſhall be capable of being made a bankrupt, but only a trader; nor capable of receiving the full benefit of the ſtatutes, but only an induſtrious trader.

In the interpretation of the ſeveral ſtatutes made concerning Engliſh bankrupts, it has been held, that buying only, or ſelling only, will not qualify a man to be a bankrupt; but it muſt be both buying and ſelling, and alſo getting a livelihood by it: as, by exerciſing the calling of a merchant, a grocer, a mercer, or, in one general word, a *chapman*, who is one that buys and ſells any thing. But no handicraft occupation (where nothing is bought or ſold, and therefore an extenſive credit, for the ſtock in trade, is not neceſſary to be had) will make a man a regular bankrupt; as that of a huſbandman, a gar-

* In Pegu, and the adjacent countries in Eaſt India, the creditor is intitled to diſpoſe of the debtor himſelf, and likewiſe of his wife and children: inſomuch, that he may even violate, with impunity, the chaſtity of the debtor's wife; but then, by ſo doing, the debt is underſtood to be diſcharged.

dener, and the like, who are paid for their work and labour. Alſo an inn-keeper cannot, as ſuch, be a bankrupt: for his gain or livelihood does not ariſe from buying and ſelling in the way of merchandize, but greatly from the uſe of his rooms and furniture, his attendance, and the like: and though he may buy corn and victuals, to ſell again at a profit, yet that no more makes him a trader, than a ſchool-maſter or other perſon is, that keeps a boarding-houſe, and makes conſiderable gains by buying and ſelling what he ſpends in the houſe, and ſuch a one is clearly not within the ſtatutes. But where perſons buy goods, and make them up into ſaleable commodities, as ſhoemakers, ſmiths, and the like: here, though part of the gain is by bodily labour, and not by buying and ſelling, yet they are within the ſtatutes of bankrupts; for the labour is only in melioration of the commodity, and rendering it more fit for ſale.

2. To learn what the *acts* of bankruptcy are which render a man a bankrupt, we muſt conſult the ſeveral ſtatutes, and the reſolutions formed by the courts thereon. Among theſe may however be reckoned. 1. Departing from the realm, whereby a man withdraws himſelf from the juriſdiction and coercion of the law, with an intent to defraud his creditors. 2. Departing from his own houſe, with intent to ſecrete himſelf and avoid his creditors. 3. Keeping in his own houſe, privately (except for juſt and neceſſary cauſe), ſo as not to be ſeen or ſpoken with by his creditors; which is likewiſe conſtrued to be an intention to defraud his creditors, by avoiding the proceſs of the law. 4. Procuring or ſuffering himſelf willingly to be arreſted, or outlawed, or impriſoned, without juſt and lawful cauſe; which is likewiſe deemed an attempt to defraud his creditors. 5. Procuring his money, goods, chattels, and effects, to be attached or ſequeſtrated by any legal proceſs; which is another plain and direct endeavour to diſappoint his creditors of their ſecurity. 6. Making any fraudulent conveyance to a friend, or ſecret truſtee, of his lands, tenements, goods, or chattels; which is an act of the ſame ſuſpicious nature with the laſt. 7. Procuring any protection, not being himſelf privileged by parliament, in order to ſcreen his perſon from arreſts; which alſo is an endeavour to elude the juſtice of the law. 8. Endeavouring, or deſiring, by any petition to the king, or bill exhibited in any of the king's courts againſt any creditors, to compel them to take leſs than their juſt debts; or to procraſtinate the time of payment originally contracted for; which are an acknowledgment of either his poverty or his knavery. 9. Lying in priſon for two months, or more, upon arreſt or other detention for debt, without finding bail, in order to obtain his liberty. For the inability to procure bail argues a ſtrong deficiency in his credit, owing either to his ſuſpected poverty, or ill character; and his neglect to do it, if able, can ariſe only from a fraudulent intention: in either of which caſes, it is high time for his creditors to look to themſelves, and compel a diſtribution of his effects. 10. Eſcaping from priſon after an arreſt for a juſt debt of 100l. or upwards. For no man would break priſon, that was able and deſirous to procure bail; which brings it within the reaſon of the laſt caſe. 11. Neglecting to make ſatisfaction for any juſt debt to the amount of 100l within two months after ſervice of legal proceſs, for ſuch debt, upon any trader having privilege of parliament.

Theſe are the ſeveral acts of bankruptcy expreſsly defined by the ſtatutes relating to this article; which being ſo numerous, and the whole law of bankrupts being an innovation on the common law, our courts of juſtice have been tender of extending or multiplying acts of bankruptcy by any conſtruction or implication. And therefore Sir John Holt held, that a man's removing his goods privately to prevent their being ſeized in execution, was no act of bankruptcy. For the ſtatutes mention only fraudulent gifts to third perſons, and procuring them to be ſeized by ſham proceſs, in order to defraud creditors: but this, though a palpable fraud, yet, falling within neither of thoſe caſes, cannot be adjudged an act of bankruptcy. So alſo it has been determined expreſsly, that a banker's ſtopping or refuſing payment is no act of bankruptcy: for it is not within the deſcription of any of the ſtatutes; and there may be good reaſons for his ſo doing, as ſuſpicion of forgery, and the like: and if, in conſequence of ſuch refuſal, he is arreſted, and puts in bail, ſtill it is no act of bankruptcy; but if he goes to priſon, and lies there two months, then, and not before, is he become a bankrupt. As to the conſequences reſulting from the unhappy ſituation of a bankrupt, ſee the article COMMISSION *of Bankruptcy*.

BANKS (John), a dramatic writer, was bred to the law, and belonged to the ſociety of Gray's Inn; but this profeſſion not ſuiting his natural diſpoſition, he quitted it for the ſervice of the muſes. Here, however, he found his rewards by no means adequate to his deſerts. His turn was entirely to tragedy; his merit in which is of a peculiar kind: for at the ſame time that his language muſt be allowed extremely unpoetical, and his numbers uncouth and unharmonious; nay, even his characters very far from being ſtrongly marked or diſtinguiſhed, and his epiſodes extremely irregular: yet it is impoſſible to avoid being deeply affected at the repreſentation, and even at the reading, of his tragic pieces. This is owing in general to an happy choice of his ſubjects; which are all borrowed from hiſtory, either real or romantic; and indeed the moſt of them from circumſtances in the annals of our own country, which, not only from their being familiar to our continual recollection, but even from their having ſome degree of relation to ourſelves, we are apt to receive with a kind of partial prepoſſeſſion, and a pre-determination to be pleaſed. His verſe is not poetry, but proſe run mad. Yet will the falſe gem ſometimes approach ſo near in glitter to the true one, at leaſt in the eyes of all but the real connoiſſeur, that bombaſt will frequently paſs for the true ſublime; and where it is rendered the vehicle of incidents in themſelves affecting, and in which the heart is apt to intereſt itſelf, it will perhaps be found to have a ſtronger power on the human paſſions than even that property to which it is in reality no more than a bare ſuccedaneum. His tragedies are, 1. *Albion Queens*. 2. *Cyrus the Great*. 3. *Deſtruction of Troy*. 4. *Innocent Uſurper*. 5. *Iſland Queens* (only the Albion Queens altered). 6 *Rival Kings*. 7. *Virtue betrayed*. 8. *Unhappy Favourite*. The Unhappy Favourite continued till very lately a ſtock tragedy at the theatres. Neither the time of the birth, nor that of the death, of this author, are aſcertained. His remains, however, lie interred in the church of St. James's, Weſtminſter.

BANKS's ISLAND, a ſmall iſland in the South Sea, diſcovered by Captain Cook in 1770, in S. lat. 53. 32. W. long. 186. 30. It is of a circular figure, and about 24 leagues in compaſs: it is ſufficiently high to be ſeen at the diſtance of 12 or 15 leagues; and the land has a broken irregular ſurface, with the appearance of barrenneſs rather than fertility. It is, however, inhabited; as ſome ſtraggling ſavages were obſerved upon it by our navigators.

BANKSIA, in botany; a genus of the monogynia order, belonging to the tetrandria claſs of plants. The amentum is ſcaly, the corolla conſiſts of four petals; the antheræ are in the cavity of the folds, and foſſile; the capſule is bivalvular; and the ſeed is ſolitary, and bipartite. There are four ſpecies, the ſerrata, integrifolia, eridæfolia, and dentata, all natives of New Holland.

BANN, or BAN (from the Brit. *ban*, i. e. clamour), is a proclamation or public notice; any public ſummons or edict, whereby a thing is commanded or forbidden. There is both *banus* and *banum*, which ſignify two different things. The

word *banns* is particularly uſed in England in publiſhing matrimonial contracts; which is done in the church before marriage, to the end that if any perſons can ſpeak againſt the intention of the parties, either in reſpect of kindred, precontract, or for other juſt cauſe, they may take their exception in time, before the marriage is conſummated; and in the canon law, Bannæ *ſunt proclamationes ſponſi et ſponſæ in eccleſiis fieri ſolitæ*. But there may be a faculty or licence for the marriage, and then this ceremony is omitted: and miniſters are not to celebrate matrimony between any perſons without a licence, except the banns have been firſt publiſhed three ſeveral times, upon pain of ſuſpenſion, &c. Can. 62.

The uſe of matrimonial banns is ſaid to have been firſt introduced into the Gallican church, though ſomething like it obtained even in the primitive times; and it is this that Tertullian is ſuppoſed to mean by *trinundina promulgatio*. The council of Lateran firſt extended, and made the uſage general. By the ordinance of Blois, no perſon could validly contract marriage, without a preceding proclamation of three banns; nor could this in any caſe be diſpenſed with, except for the two laſt. But the French, even before their revolution, abated of this ſeverity; and minors only were under an abſolute neceſſity of ſubmitting to the formality of banns. For majors, or thoſe of age, after publication of the firſt banns, the two latter were eaſily bought off.

Bann is alſo uſed to denote proſcription or baniſhment for a crime proved; becauſe anciently publiſhed by ſound of trumpet; or, as Voſſius thinks, becauſe thoſe who did not appear at the abovementioned ſummons, were puniſhed by proſcription. Hence, *to put a prince under the bann of the empire*, is to declare him diveſted of all his dignities. The ſentence only denotes an interdict of all intercourſe, and offices of humanity, with the offender; the form of which ſeems taken from that of the Romans, who baniſhed perſons by forbidding them the uſe of fire and water. Sometimes alſo cities are put under the imperial bann; that is, ſtripped of their rights and privileges.

Bann alſo denotes a pecuniary mulct, or penalty, laid on a delinquent for offending againſt a bann.

Bann, or Bannus, a title anciently given to the governor or viceroy of Croatia, Dalmatia, and Sclavonia.

Epiſcopal Bann, *Bannus Epiſcopalis*, a mulct paid to the biſhop by thoſe guilty of ſacrilege and other crimes againſt religion and morality.

Bann is alſo uſed for a ſolemn anathema, or excommunication, attended with curſes, &c. In this ſenſe we read of *papal banns*, &c.

Bann, in military affairs, a proclamation made in the army by beat of drum, ſound of trumpet, &c. requiring the ſtrict obſervance of diſcipline, either for the declaring a new officer, or puniſhing an offender.

BANNER denotes either a ſquare flag, or the principal ſtandard belonging to a prince. We find a multiplicity of opinions concerning the etymology of the word *banner*; ſome deriving it from the Latin *bandum*, a band or flag; others from the word *bann*, to ſummons the vaſſals to appear in arms; others again from the German *ban*, a field or tenement, becauſe landed men alone were allowed a banner: and, finally, there are ſome who think it is a corruption of *panniere*, from *pannus*, cloth, becauſe banners were originally made of cloth.

The Banner *of France*, was the largeſt and richeſt of all the flags borne by the ancient kings in their great military expeditions. St. Martin's cap was in uſe 600 years as the banner of France; it was made of taffety, painted with the image of that ſaint, and laid one or two days on his tomb to prepare it for uſe. About the year 1100 came in a more pompous apparatus. The banner royal was faſtened to the top of a maſt, or ſome tall tree, planted on a ſcaffold, borne on a carriage drawn by oxen covered with velvet houſings decorated with devices or cyphers of the reigning prince. At the foot of the tree was a prieſt, who ſaid maſs early every morning. Ten knights mounted guard on the ſcaffold night and day, and as many trumpets at the foot of the tree never ceaſed flouriſhing, to animate the troops. This cumberſome machine, the mode of which was brought from Italy, continued in uſe about 130 years. Its poſt was in the centre of the army; and here it was that the chief feats were performed, to carry off and defend the royal banner; for there was no victory without it, nor was any army reputed vanquiſhed till it had loſt this banner.

BANNERETS, an ancient order of knights, or feudal lords; who, poſſeſſing ſeveral large fees, led their vaſſals to battle under their own flag or banner, when ſummoned thereto by the king. The word ſeems formed from *banner*, a ſquare flag; or from *band*, which anciently denoted a flag. Bannerets are alſo called in ancient writers *milites vexilliferi*, and *vexillarii*, *bannerarii*, *bannarii*, *banderiſii*, &c.

Anciently there were two kinds of knights, *great* and *little*: the firſt of theſe were called *bannerets*, the ſecond *bachelors*; the firſt compoſed the upper, the ſecond the middle, nobility. The banneret was a dignity, which allowed the poſſeſſor to march under his own flag, whereas the *bachelarius eques* followed that of another. To be qualified for a banneret, the party was required to be a gentleman of family, and poſſeſſed of power to raiſe a certain number of armed men, with eſtate enough to ſubſiſt at leaſt 28 or 30 ſoldiers. This muſt have been very conſiderable in thoſe days; becauſe each man, beſides his ſervant, had two horſemen to wait on him, armed, the one with a croſs-bow, the other with a bow and hatchet. As he was not allowed to be a baron who had not above 13 knights fees, ſo he was not admitted to be a banneret who had leſs than ten.

Banneret, according to Spelman, was a middle order between a baron and a ſimple knight; called ſometimes alſo *vexillarius minor*, to diſtinguiſh him from the greater, that is, from the baron, to whom alone properly belonged the *jus vexilli*, or privilege of the ſquare flag. Hence the banneret was alſo called *bannerettus*, *quaſi baro minor*; a word frequently uſed by Engliſh writers in the ſame ſenſe as banneret was by the French, though neither of them occur before the time of Edward II.

Some, however, will have bannerets to have originally been perſons who had ſome portion of a barony aſſigned them; and enjoyed it under the title of *baro proximus*, and that with the ſame prerogatives as the baron himſelf. Some, again, find the origin of bannerets in France, others in Brittany, others in England. Theſe laſt attribute the inſtitution of bannerets to Conan, lieutenant of Maximus, who commanded the Roman legions in England under the empire of Gratian in 383. This general, ſay they, revolting, divided England into 40 cantons, and in theſe cantons diſtributed 40 knights; to whom he gave a power of aſſembling, on occaſion, under their ſeveral banners, as many of the effective men as were found in their reſpective diſtricts: whence they are called *bannerets*. However this be, it appears from Froiſſart, &c. that anciently ſuch of the military men as were rich enough to raiſe and ſubſiſt a company of armed men, and had a right to do ſo, were called *bannerets*. Not, however, that theſe qualifications rendered them knights, but only bannerets; the appellation of *knight* being only added thereto, becauſe they were ſimple knights before.

Bannerets were ſecond to none but knights of the garter They were reputed the next degree below the nobility; and were allowed to bear arms with ſupporters, which none elſe may under the degree of a baron. In France, it is ſaid, the dignity was hereditary; but in England it died with the perſon that gained it. The order dwindled on the inſtitution of

baronets by king James I. and at length became extinct. The laſt perſon created banneret was Sir John Smith, made ſo after Edghill-fight, for reſcuing the ſtandard of king Charles I.

The form of the banneret's creation was this. On a day of battle, the candidate preſented his flag to the king or general; who, cutting off the train or ſkirt thereof, and making it a ſquare, returned it again, the proper banner of bannerets; who are hence ſometimes called *knights of the ſquare flag*. There ſeem to have been bannerets created either in a different manner, or by others than the ſovereign; ſince king James, in the patent of baronets, gives them precedence to all knights bannerets, except ſuch as are created by the king himſelf in the field; which implies, either that there are ſome of this order created out of the field, or by inferior perſons.

BANNERET is alſo the name of an officer or magiſtrate of Rome towards the cloſe of the 14th century. The people of that city, and throughout the territory of the church, during the diſputes of the anti-popes, had formed a kind of republican government; where the whole power was lodged in the hands of a magiſtrate called *ſenator*, and twelve heads of quarters called *bannerets*, by reaſon of the banners which each raiſed in his diſtrict.

BANNOCK, a kind of oat-cake, baked in the embers, or on a ſtone placed before the fire. It is common in the northern parts of this kingdom, eſpecially among the peaſantry.

BANNUM, in law, ſignifies the utmoſt bounds of a manor or town.

BANOY, the name given, by the people of the Philippine iſlands, to a kind of hawk, ſomewhat larger than our ſparrow-hawk, and of a yellowiſh colour on the back and wings, and white under the belly. It is the moſt common of all the kinds of hawk in that part of the world, and is a very voracious bird.

BANQUET, a feaſt or entertainment where people regale themſelves with pleaſant foods or fruits.

BANQUET, in the manege, that ſmall part of the branch of a bridle that is under the eye; which being rounded like a ſmall rod, gathers and joins the extremities of the bit to the branch, in ſuch a manner that the banquet is not ſeen, but covered by the cope, or that part of the bit that is next the branch.

BANQUET-*Line*, is an imaginary line drawn by the bit-makers along the *banquet*, in forging a bit; and prolonged upwards and downwards, to adjuſt the deſigned force or weakneſs of the branch, in order to make it ſtiff, or eaſy. For the branch will be hard and ſtrong, if the ſevil-hole be on the outſide of the *banquet*, with reſpect to the neck; and it will be weak, and eaſy, if the ſevil-hole be on the inſide of the line, taking the centre from the neck.

BANQUET, or *Banquette*, in fortification, a little foot-bank, or elevation of earth, forming a path which runs along the inſide of a parapet, upon which the beſieged get up, in order to diſcover the counterſcarp, or to fire on the enemy, in the moat or in the covert-way.

BANQUETING ROOM or HOUSE. (See SALOON.) The ancient Romans ſupped in the atrium, or veſtibule, of their houſes; but, in after times, magnificent ſaloons, or banqueting rooms, were built, for the more commodious and ſplendid entertainment of their gueſts. Lucullus had ſeveral of theſe, each diſtinguiſhed by the name of ſome god; and there was a particular rate of expence appropriated to each. Plutarch relates with what magnificence he entertained Cicero and Pompey, who went with a deſign to ſurpriſe him, by telling only a ſlave who waited, that the cloth ſhould be laid in the Apollo. The emperor Claudius, among others, had a ſplendid banqueting-room, named *Mercury*. But every thing of this kind was outdone by the luſtre of that celebrated banqueting-houſe of Nero, called *domus aurea*; which, by the circular motion of it partitions and ceilings, imitated the revolution of the heavens and repreſented the different ſeaſons of the year, which changed at every ſervice, and ſhowered down flowers, eſſences, and perfumes, on the gueſts.

BANSTICKLE, in ichthyology, a ſpecies of GASTEROSTEUS, or *Stickle-back*, which is a genus of fiſhes belonging to the order of thoracici. There are three rays in the membrane of the gills; the body is carinated; and there are ſome diſtinct prickles before the back-fin. There are 11 ſpecies, diſtinguiſhed by the number of prickles on the back. One of theſe ſpecies, the aculeatus, ſtickleback, *banſticle*, or ſharpling, is common in many of the Britiſh rivers. In the fens of Lincolnſhire, and ſome rivers that proceed from them, they are found in prodigious quantities. At Spalding there are once in ſeven or eight years amazing ſhoals that appear in the Welland, and come up the river in form of a vaſt column. They are ſuppoſed to be the multitudes that have been waſhed out of the fens by the floods of ſeveral years, and collected in ſome deep hole, till overcharged with numbers, they are periodically obliged to attempt a change of place. The quantity is ſo great, that they are uſed to manure the land, and trials have been made to get oil from them. A notion may be had of this vaſt ſhoal, on being informed, that a man employed by the farmer to take them, has got for a conſiderable time four ſhillings a-day, ſelling them for a halfpenny per buſhel. This ſpecies ſeldom reaches the length of two inches; it hath three ſharp ſpines on the back, that can be raiſed or depreſſed at pleaſure. The colour of the back and ſides is an olive-green; the belly white; but in ſome the lower jaws and belly are of a bright crimſon.

BANTAM, a large town of the iſland of Java, in the Eaſt Indies, ſituated in E. long. 105. 16. S lat. 6. 20. It is the capital of a kingdom of the ſame name, with a good harbour and fortified caſtle. It is divided into two towns ſeparated by a river, and one of them inhabited by the Chineſe: theſe however are poor to what they formerly were.

BANTAM-WORK, a kind of painted or carved work, reſembling that of Japan, only more gaudy.

There are two ſorts of Bantam, as well as of Japan work. As, in the latter, ſome are flat, lying even with the black, and others high and emboſſed; ſo, in Bantam-work, ſome are flat, and others in-cut, or carved into the wood, as we find in many large ſcreens: with this difference, that the Japan artiſts work chiefly in gold and other metals; and thoſe of Bantam generally in colours, with a ſmall ſprinkling of gold here and there: for the flat Bantam-work is done in colours, mixed with gum-water, proper for the thing deſigned to be imitated. For the carved, or in-cut kind, the method of performing it is thus deſcribed by an ingenious artiſt: 1. The wood is to be primed with whiting and ſize, ſo often, till the primer lie near a quarter of an inch thick; then it is to be water-plained, *i. e.* rubbed with a fine wet cloth, and, ſome time after, rubbed very ſmooth, the blacks laid on, varniſhed up with a good body, and poliſhed well, though with a gentle hand. This done, the deſign is to be traced out with vermilion and gum-water, exactly in the manner wherein it is intended to be cut; the figures, trees, buildings, &c. in their due proportion. Then the graver is applied, with other tools, of proper ſhapes, differing according to the workman's fancy: with theſe he cuts deep or ſhallow, as is found convenient, but never deeper than the whiting lies, the wood being never to feel the edge of the inſtrument. Lines, or parts of the black, are ſtill to be left for the draperies, and other outlines, and for the diſtinction of one thing from another, the rule being to cut where the white is, and leave the black untouched. The carving being finiſhed, then is uſed the pencil, with which the colours are

laid into the cut-work. After this, the gold is to be laid in thoſe places which the deſign requires; for which purpoſe, a ſtrong thick gum-arabic water is taken and laid with a pencil on the work; and, while this remains wet, leaf-gold is cut with a ſharp ſmooth-edged knife, in little pieces, ſhaped to the bigneſs and figure of the places where they are to be laid. Theſe being taken up with a little cotton, are preſſed with the ſame cloſe to the gum-water, which affords a rich luſtre. The work thus finiſhed, they clear up the black with oil, taking care not to touch the colours. The European workmen frequently uſe braſs-duſt, which is leſs bright and beautiful, and is alſo liable to tarniſh.

BANTRY, a town of Ireland, in the county of Cork, and province of Munſter. It is ſeated on a bay of the ſame name, in W. long. 9. 15. N. lat. 51. 30.

BAOBAB, the name given by Proſper Alpinus to the African calabaſh-tree, which has been ſince called ADANSONIA. It is of the ſize of a lemon, but it reſembles a gourd, and contains ſeveral black ſeeds, whoſe extremities are a little crooked. Its ſubſtance alſo much reſembles that of the gourd; and, when firſt pulled off, is moiſt, red, and of a grateful acid taſte. The people of Æthiopia, where it is plentiful, are very fond of it, in the ſcorching heats of ſummer; and the richer ſort add ſugar to it, to correct its acidity. It is cool to the palate, quenches thirſt, and has alſo ſome medicinal qualities as a remedy in contagious fevers. The people of Cairo, where the freſh fruit is not to be had, uſe its pulp dried and powdered; and it is ſo uſed at Senegal in putrid fevers, and as a cure for the dyſentery. The doſe is a dram, taken either in common water, or in an infuſion of plantain.

The *baobab* tree has been lately very minutely and accurately deſcribed by Mr. Adanſon, in the Memoirs of the Academy of Sciences at Paris. It is found at Senegal in Africa; and its bulk is ſo enormous, that it has more the appearance of a foreſt than of a ſingle tree. Its trunk, which ſeldom exceeds twelve feet in height, meaſures between ſeventy and eighty feet in circumference, and is crowned with a number of branches, remarkable for their thickneſs and their length, which is from fifty to ſixty feet. They moſtly ſhoot out in an horizontal direction, and give to the trunk the appearance of an hemiſphere from ſixty to ſeventy feet high, and about a hundred and forty feet in diameter. The bark is an inch thick, of an aſh-coloured grey, greaſy to the touch, bright and very ſmooth; the outſide is covered with a varniſh, and the inſide is green, ſpeckled with red. The wood is white and ſoft; the leaves are oval, pointed at the end, and about five inches long, and two and a half broad: ſeven of theſe are generally attached to one pedicle. The tree produces flowers much larger than any hitherto known; the calyx of the flower conſiſts only of one piece, the lower part of which forms a ſhort tube, which ſpreads into the ſhape of a faucer, having its edge divided into five equal parts of a triangular figure. The petals are five in number, of the ſame length with the calyx. From the ſame centre, and within the petal, riſes a cone, which ſpreads into about ſeven hundred filaments, each having at the end of it, a ſmall ſubſtance in form of a kidney, the convex part of which opens into two cells, that ſhed a duſt, conſiſting of ſmall white tranſparent particles. The piſtil riſes from the centre of the calyx, and conſiſts of an ovary, a ſtylus, and ſeveral ſtigmata, in number from ten to fourteen. The ovary becomes a very conſiderable fruit. The tree flowers in July, and the fruit ripens in October and November. The bark and leaves are dried and powdered by the negroes of Senegal, and uſed like pepper and ſalt. Mr. Adanſon uſed it as a preſervative from the epidemic fever of the country, and found it of great benefit in promoting perſpiration, and attempering the exceſſive heat of the blood. The woody bark of the fruit, and the fruit itſelf, ſupply the negroes with an excellent ſoap, which they prepare by drawing a ley from the aſhes, and boiling it with palm-oil that begins to be rancid. The decaying trunks are hollowed out into burying-places for perſons moſt eſteemed by the negroes; ſuch as poets, muſicians, and buffoons; and their bodies ſhut up in theſe trunks become perfectly dry, without rotting, and form a kind of mummies, without the help of embalming. The African *baobab* has been ſometimes confounded with the American CALABASH. See ADANSONIA.

BAPHE, in the writings of the ancients, a word uſed to expreſs that fine red colour, with which they uſed to illuminate the capital letters in manuſcripts, at the beginning of chapters. It is alſo called, by ſome, *encauſtum ſacrum*, and by others *coccus* and *cinnabaris*. It was a very elegant colour, and is ſaid to have been prepared of the purple colour taken from the *murex*, and ſome other ingredients. It was called *encauſtum* from its reſembling very much the fine bright red uſed in enamels.

BAPTÆ, in antiquity, an effeminate voluptuous kind of prieſts at Athens, belonging to the goddeſs Cotyttus; thus called from their ſtated dippings and waſhings, by way of purification. It ſeems, they were to be made very clean and pure, that they might wallow, and defile themſelves, with the leſs reſerve; for their rites were performed in the night, and conſiſted chiefly of laſcivious dances.

Eupolis having compoſed a comedy to expoſe them, entitled Βαπται, they threw him into the ſea, to be revenged; and the ſame fate is alſo ſaid to have befallen Cratinus, another Athenian poet, who had written a comedy againſt the *baptæ*, under the ſame title. Others deduce the denomination *baptæ*, from the practice of dyeing and painting their bodies, eſpecially their eye-brows, and officiating at the ſervice of their deity with the parade and demureneſs of women. Juvenal deſcribes them in this light. Sat. ii. ver. 91.

BAPTES, in natural hiſtory, a name given by the ancients to a foſſile ſubſtance uſed in medicine; but they have left us but very ſhort deſcriptions of it. Pliny only tells us, that it was ſoft, and of an agreeable ſmell. Hence Agricola judges, that it was probably one of the bitumens.

BAPTISECULA, in botany, a name given by ſome authors to the blue corn-flower, called the CYANUS, or blue-bottle.

BAPTISM, in matters of religion, the ceremony of waſhing; or a ſacrament, by which a perſon is initiated into the Chriſtian church. The word is formed from the Greek βαπτιζω, of βαπτω to *dip*, or *waſh*; but baptiſm is known, in eccleſiaſtical writers, by various other names and titles. Many learned authors have ſuppoſed that baptiſm had its origin from the Jewiſh church, in which, as they maintain, it was the practice long before Chriſt's time, to baptize proſelytes or converts to their faith, as part of the ceremony of their admiſſion; a practice which, according to ſome, obtains among them to this day; a perſon turning Jew is firſt circumciſed, and, when healed, is bathed, or baptiſed in water, in preſence of their rabins; after which he is reputed a good Jew. Others, however, inſiſt that the Jewiſh proſelyte baptiſm is not by far ſo ancient, and that John the Baptiſt was the firſt adminiſtrator of baptiſm among the Jews.

The learned Grotius, however, is of opinion, that the rite of baptiſm had its origin from the time of the deluge; immediately after which, he thinks, it was inſtituted in memory of the world having been purged by water. Some learned men think it was added to circumciſion, ſoon after the Samaritan ſchiſm, as a mark of diſtinction to the orthodox Jews. Spencer, who is fond of deriving the rites of the Jewiſh religion from the ceremonies of the Pagans, lays it down as a probable ſuppoſition, that the Jews received the baptiſm of proſelytes from

the neighbouring nations, who were wont to prepare candidates for the more ſacred functions of their religion, by a ſolemn ablution; that, by this affinity of ſacred rites, they might draw the Gentiles to embrace their religion, and that the proſelytes (in gaining of whom they were extremely diligent) might the more eaſily comply with the tranſition from Gentiliſm to Judaiſm. In confirmation of this opinion, he obſerves, firſt, that there is no divine precept for the baptiſm of proſelytes, God having enjoined only the rite of circumciſion for the admiſſion of ſtrangers into the Jewiſh religion. Secondly, that, among foreign nations, the Egyptians, Perſians, Greeks, Romans, and others, it was cuſtomary that thoſe who were to be initiated into their myſteries, or ſacred rites, ſhould be firſt purified by dipping their whole body in water. That learned writer adds, as a farther confirmation of his opinion, that the cup of bleſſing likewiſe, added to the paſchal ſupper, ſeems plainly to have been derived from a pagan original: for the Greeks, at their feaſts, had one cup, called ποτηριον αγαθε δαιμονος, *the cup of the good dæmon or god*, which they drank at the concluſion of their entertainment, when the table was removed. Since, then, a rite of Gentile origin was added to one of the Jewiſh ſacraments, viz. the paſſover, there can be no abſurdity in ſuppoſing, that baptiſm, which was added to the other ſacrament, namely circumciſion, might be derived from the ſame ſource. In the laſt place, he obſerves, that Chriſt, in the inſtitution of his ſacraments, paid a peculiar regard to thoſe rites which were borrowed from the Gentiles: for, rejecting circumciſion and the paſchal ſupper, he adopted into his religion baptiſm and the ſacred cup; thus preparing the way for the converſion and reception of the Gentiles into his church.

If baptiſm be indeed practiſed by the Jews, it is ſuppoſed to imply a regeneration, whereby the proſelyte is rendered a new man, and of a ſlave becomes free. The effect of it was that of cancelling all former relations; ſo that thoſe who were before akin to the perſon, after the ceremony ceaſed to be ſo. It is to this ceremony Chriſt is ſuppoſed to have alluded, in his expreſſion to Nicodemus, that it was neceſſary he ſhould be born again, in order to become his diſciple. The neceſſity of baptiſm to ſalvation is grounded on thoſe two ſayings of our Saviour: *He that believeth, and is baptized, ſhall be ſaved;* and, *Except a man be born of water and of the Spirit, he cannot enter into the kingdom of God.* The ancients did not generally think the mere want of baptiſm, where the procuring of it was impracticable, excluded men abſolutely from the hopes of eternal ſalvation. Some few of them, indeed, are pretty ſevere upon infants dying without baptiſm; and ſome others ſeem alſo, in general terms, to deny eternal life to adult perſons dying without it: but when they interpret themſelves, and ſpeak more diſtinctly, they make ſome allowances, and except ſeveral caſes, in which the want of baptiſm may be ſupplied by other means. Such are, martyrdom, which commonly goes by the name of *ſecond baptiſm in men's own blood*, in the writings of the ancients; becauſe of the power and efficacy it was thought to have to ſave men by the inviſible baptiſm of the Spirit, without the external element of water. Faith and repentance were alſo eſteemed a ſupplement to the want of baptiſm, in ſuch catechumens as died while they were piouſly preparing themſelves for baptiſm. Conſtantly communicating with the church was thought to ſupply the want of baptiſm, in perſons who had been admitted to communion, on a preſumption of their being duly baptized, though the contrary afterwards appeared. For infants dying without baptiſm, the caſe was thought more dangerous; as here, no perſonal faith, repentance, or the like, could be pleaded, to ſupply the defect, and waſh away original ſin: on this account, they who ſpoke moſt favourably of them, as Greg. Nazianzen, and Severus biſhop of Antioch, only aſſigned them a middle ſtate, neither in heaven nor hell. But the Latins, as St. Auguſtin, Fulgentius, Marius Mercator, &c. who never received the opinion of a middle ſtate, concluded, as they could not be received into heaven, they muſt go to hell. Pelagius, and his followers, who denied original ſin, aſſerted, that they might be admitted to eternal life and ſalvation, though not to the kingdom of heaven; between which they diſtinguiſhed. Where the fault was not on the ſide of the child, nor his parents, but of the miniſter, or where any unavoidable accident rendered baptiſm abſolutely impoſſible, Hincmar, and others, make an exception, in holding the child ſaved, even though baptiſm may not have taken place.

The ceremony of receiving baptiſm is not limited to any time, or age of life. Some indeed have contended for its being adminiſtered like circumciſion, preciſely on the eighth day, as Greg. Nazianzen; whilſt others would have it deferred till the child is three years of age, and able to hear the myſtic words, and make anſwer thereto, though he may not underſtand them. In the canon law we find various injunctions againſt deferring the baptiſm of infants beyond the 37th day, 30th day, and the 9th day; ſome of them under pecuniary fines and penalties.

Salmaſius, and Suicerus from him, deliver it as authentic hiſtory, that for the two firſt ages, no one received baptiſm, who was not firſt inſtructed in the faith and doctrine of Chriſt, ſo as to be able to anſwer for himſelf, that he believed; becauſe of thoſe words, *He that believeth, and is baptized;* which, in effect, is to ſay, that no infant, for the firſt two ages, was ever admitted to Chriſtian baptiſm. But, afterwards, they own, that pædo-baptiſm came in, upon the opinion that baptiſm was neceſſary to ſalvation. But Voſſius, Dr. Forbes, Dr. Hammond, Mr. Walker, and eſpecially Mr. Wall, who has exactly conſidered the teſtimony and authority of almoſt every ancient writer that has ſaid any thing upon this ſubject, endeavour to evince, that infants were baptized even in the apoſtolical age. It is certain, Tertullian pleads ſtrongly againſt giving baptiſm to infants; which ſhows, at leaſt, that there was ſome ſuch practice in his age, though he diſapproved of it. It is certain, the ordinary ſubjects of this ſacrament, in the firſt ages, were converts from Judaiſm and Gentiliſm, who, before they could be admitted to baptiſm, were obliged to ſpend ſome time in the ſtate of catechumens, to qualify them to make their profeſſions of faith, and a Chriſtian life, in their own perſons: for, without ſuch perſonal profeſſions, there was ordinarily no admiſſion of them to the privilege of baptiſm. Thoſe baptized in their ſick-beds were called *clinici;* and were held in ſome reproach, as not being reputed true Chriſtians. Hence ſeveral cenſures, in councils and eccleſiaſtical writers, of clinic baptiſm. This clinic baptiſm was not ſufficient to qualify the perſon, in caſe of recovery, for ordination. Some had their baptiſm put off by way of puniſhment, when they fell into groſs and ſcandalous crimes, which were to be expiated by a longer courſe of diſcipline and repentance. This was ſometimes 5, 10, 20 years, or more; or even to the hour of death, when their crimes were very notorious.

In the early ages of the church, there was no ſtated time or place for the reception of baptiſm. Afterwards, Eaſter, Whitſuntide, and Epiphany, became ſolemn ſeaſons, out of which baptiſm was not adminiſtered, except in caſes of neceſſity. The catechumens, who were to receive it at theſe times, were called *competentes:* and to theſe it is that St. Cyril addreſſes his catecheſes. In the apoſtolical age, and ſome time after, before churches and baptiſteries were generally erected, they baptized in any place where they had convenience; as John

baptized in Jordan, and Philip baptized the eunuch in the wilderneſs, and Paul the jailor in his own houſe. But in after ages, baptiſteries were built adjoining to the church; and then rules were made, that baptiſm ſhould ordinarily be adminiſtered no where but in theſe buildings. Juſtinian, in one of his novels, refers to ancient laws, appointing that none of the ſacred myſteries of the church ſhould be celebrated in private houſes. Men might have private oratories for prayer in their own houſes; but they were not to adminiſter baptiſm or the euchariſt in them, unleſs by a particular licence from the biſhop of the place. Such baptiſms are frequently condemned in the ancient councils, under the name κατ' οἰκους βαπτισματα, *baptiſms in private conventicles*.

The following were the attendant ceremonies and manner of baptiſm in the ancient church: The perſon to be baptized, if an adult, was firſt examined by the biſhop or officiating prieſt, who put ſome queſtions to him; as, firſt, Whether he abjured the devil and all his works; ſecondly, Whether he gave a firm aſſent to all the articles of the Chriſtian faith: to both which he anſwered in the affirmative. If the perſon to be baptized was an infant, theſe interrogatories were anſwered by his *ſponſores*, or godfathers. Whether the uſe of ſponſors was as old as the apoſtles' days, is uncertain: perhaps it was not, ſince Juſtin Martyr, ſpeaking of the method and form of baptiſm, ſays not a word of them.—After the queſtions and anſwers, followed exorciſm; the manner and end of which was this: The miniſter laid his hands on the perſon's head, and breathed in his face, implying thereby the driving away or expelling of the devil from him, and preparing him for baptiſm, by which the good and holy ſpirit was to be conferred upon him.—After exorciſm, followed baptiſm itſelf: and firſt the miniſter, by prayer, conſecrated the water for that uſe. Tertullian ſays, "any waters may be applied to that uſe: but "then God muſt be firſt invocated; and then the Holy Ghoſt "preſently comes down from heaven, and moves upon them, "and ſanctifies them." The water being conſecrated, the perſon was baptized "in the name of the Father, and of the "Son, and of the Holy Ghoſt;" by which "dedication of "him to the bleſſed Trinity, the perſon (ſays Clemens Alex-"andrinus) is delivered from the corrupt trinity, the devil, "the world, and the fleſh." In performing the ceremony of baptiſm, the uſual cuſtom (except in clinical caſes, or where there was ſcarcity of water), was to immerſe and dip the whole body. Thus St. Barnabas, deſcribing a baptized perſon, ſays, "We go down into the water full of ſin and filth, but we aſ-"cend bearing fruit in our hearts." And this practice of immerſing the whole body was ſo general, that we find no exceptions made in reſpect either to the tenderneſs of infants, or the baſhfulneſs of the other ſex, unleſs in caſe of ſickneſs or other diſability. But to prevent any indecency, men and women were baptized apart. To which end, either the baptiſteries were divided into two apartments, one for the men, the other for the women, as Bingham has obſerved; or the men were baptized at one time, and the women at another, as is ſhown by Voſſius, from the *Ordo Romanus*, Gregory's *Sacramentarium*, &c. Add, that there was anciently an order of deaconeſſes, one part of whoſe buſineſs was to aſſiſt at the baptiſm of women. The precautions, however, rather indicate a ſcrupulous attention to delicacy, than imply any indecency in the circumſtance of immerſion itſelf. From the candidates being immerſed, there is at leaſt no reaſon to infer that they were naked. The preſent Baptiſts never baptize naked, though they always immerſe. After immerſion, followed the unction; by which (ſays St. Cyril) was ſignified that they were now cut off from the wild olive, and were ingrafted into Chriſt, the true Olive-tree; or elſe to ſhow that they were now to be champions for the goſpel, and were anointed thereto, as the old athletæ were againſt their ſolemn games. With this anointing was joined the ſign of the croſs, made upon the forehead of the perſon baptized; which being done, he had a white garment given him, to denote his being waſhed from the defilements of ſin, or in alluſion to that of the apoſtle, "as many as are baptized in Chriſt have put on Chriſt." From this cuſtom the feaſt of Pentecoſt, which was one of the annual ſeaſons of baptiſm, came to be called *Whitſunday*, i. e. *White-ſunday*. This garment was afterwards laid up in the church, that it might be an evidence againſt ſuch perſons as violated or denied that faith which they had owned in baptiſm.—When the baptiſm was performed, the perſon baptized, according to Juſtin Martyr, "was received into the number "of the faithful, who then ſent up their public prayers to "God, for all men, for themſelves, and for thoſe who had "been baptized." The ordinary miniſters, who had the right of adminiſtering this ſacrament, that is, of applying the water to the body, and pronouncing the formula, were preſbyters or biſhops; though, on extraordinary occaſions, laymen were admitted to perform the ceremony.

In the Romiſh church, the preſent form of adminiſtering baptiſm is the following: When a child is to be baptized, the perſons who bring it wait for the prieſt at the door of the church, who comes thither in his ſurplice and purple ſtole, attended by his clerks. He begins with queſtioning the godfathers, whether they promiſe, in the child's name, to live and die in the true catholic and apoſtolic faith, and what name they would give the child. Then follows an exhortation to the ſponſors; after which the prieſt, calling the child by its name, aſks it as follows: *What doſt thou demand of the church?* The godfather anſwers, *Eternal life*. The prieſt goes on: *If you are deſirous of obtaining eternal life, keep God's commandments, thou ſhalt love the Lord thy God*, &c. After which he breathes three times in the child's face, ſaying, *Come out of this child, thou evil ſpirit, and make room for the Holy Ghoſt*. This ſaid, he makes the ſign of the croſs on the child's forehead and breaſt, ſaying, *Receive the ſign of the croſs on thy forehead, and in thy heart*. Then taking off his cap, he repeats a ſhort prayer; and laying his hand gently on the child's head, repeats a ſecond prayer: which ended, he bleſſes ſome ſalt; and putting a little of it into the child's mouth, pronounces theſe words, *Receive the ſalt of wiſdom*. All this is performed at the church-door. The prieſt, with the god-fathers and god-mothers, coming into the church, and advancing towards the font, repeat the Apoſtles-creed and the Lord's-prayer. Being come to the font, he exorciſes the evil ſpirit again; and taking a little of his own ſpittle, with the thumb of his right-hand, rubs it on the child's ears and noſtrils, repeating, as he touches the right-ear, the ſame word *(Ephatha, be thou opened)* which our Saviour made uſe of to the man born deaf and dumb. Laſtly, they pull off its ſwaddling clothes, or ſtrip it below the ſhoulders, during which the prieſt prepares the oils, &c. The ſponſors then hold the child directly over the font, obſerving to turn it due eaſt and weſt: whereupon the prieſt aſks the child, *Whether he renounces the devil and all his works?* and the godfather having anſwered in the affirmative, the prieſt anoints the child between the ſhoulders in the form of a croſs. Then taking ſome of the conſecrated water, he pours part of it thrice on the child's head, at each perfuſion calling on one of the Perſons of the Holy Trinity. The prieſt concludes the ceremony of baptiſm with an exhortation.—The Romiſh church allows midwives, in caſes of danger, to baptize a child before it comes entirely out of its mother's womb: where it is to be obſerved, that ſome part of the body of the child muſt appear before it can be baptized, and that it is baptized on the part which firſt appears. If it be the head, it is not neceſſary to rebaptize the child; but if only a foot or

hand appears, it is neceſſary to repeat baptiſm. A ſtill-born child, thus baptized, may be buried in conſecrated ground.

The Greek church differs from the Romiſh, as to the rite of baptiſm, chiefly, in performing it by immerſion, or plunging the infant all over in the water.

The forms of adminiſtering baptiſm among us being too well known to require a particular deſcription, we ſhall only mention one or two of the more material differences between the form, as it ſtood in the firſt liturgy of King Edward, and that in the Engliſh Common Prayer Book at preſent. Firſt, the form of conſecrating the water did not make a part of the office, in King Edward's liturgy, as it does in the preſent, becauſe the water in the font was changed, and conſecrated, but once a month. The form likewiſe itſelf was ſomething different from that now uſed; and was introduced with a ſhort prayer, that *Jeſus Chriſt, upon whom (when he was baptized) the Holy Ghoſt came down in the likeneſs of a dove, would ſend down the ſame Holy Spirit, to ſanctify the fountain of baptiſm;* which prayer was afterwards left out, at the ſecond review.—By King Edward's firſt book, the miniſter is to dip the child in the water thrice; firſt, dipping the right ſide; ſecondly, the left; the third time, dipping the face toward the foot. This trine immerſion was a very ancient practice in the Chriſtian church, and uſed in honour of the Holy Trinity; though ſome later writers ſay, it was done to repreſent the death, burial, and reſurrection of Chriſt, together with his three days continuance in the grave. Afterwards, the Arians making an ill uſe of it, by perſuading the people that it was uſed to denote that the three Perſons in the Trinity were three diſtinct ſubſtances, the orthodox left it off, and uſed only one ſingle immerſion.

By the firſt common-prayer of King Edward, after the child was baptized, the godfathers and godmothers were to lay their hands upon it, and the miniſter was to put on him the white veſtment commonly called the *chryſome*, and to ſay, "Take this white veſture, as a token of the innocency, which, by God's grace, in this holy ſacrament of baptiſm, is given unto thee; and for a ſign, whereby thou art admoniſhed, ſo long as thou liveſt, to give thyſelf to innocence of living, that after this tranſitory life thou mayeſt be partaker of the life everlaſting. Amen." As ſoon as he had pronounced theſe words, he was to anoint the infant on the head, ſaying, "Almighty God, the father of our Lord Jeſus Chriſt, who hath regenerated thee by water and the Holy Ghoſt, and hath given unto thee remiſſion of all thy ſins; may he vouchſafe to anoint thee with the unction of his Holy Spirit, and bring thee to the inheritance of everlaſting life. Amen." This was manifeſtly done in imitation of the practice of the primitive church.

Sprinkling children, inſtead of dipping them in the font, a cuſtom which at firſt was allowed only in caſe of the weakneſs or ſickneſs of the infant, has now ſo far prevailed, that immerſion is at length quite excluded. What principally tended to confirm the practice of affuſion or ſprinkling, was, that ſeveral of our Proteſtant divines, flying into Germany and Switzerland during the bloody reign of queen Mary, and returning home when queen Elizabeth came to the crown, brought back with them a great zeal for the proteſtant churches beyond ſea, where they had been ſheltered and received; and having obſerved, that at Geneva and ſome other places, baptiſm was adminiſtered by ſprinkling, they thought they could not do the church of England a greater piece of ſervice than by introducing a practice dictated by ſo great an oracle as Calvin. This, together with the coldneſs of our northern climate, was what contributed to baniſh entirely the practice of dipping infants in the font.

A great difference of opinions has exiſted concerning the effects of baptiſm, and theſe it would be endleſs to enumerate. The Remonſtrants and Socinians reduce baptiſm to a mere ſign of divine grace. The Romaniſts, on the contrary, exalt its power; holding, that all ſin is entirely taken away by it; that it abſolutely confers the grace of juſtification, and conſequently grace *ex opere operato*. Some alſo ſpeak of an indelible character impreſſed on the ſoul by it, called *character dominicus*, and *character regius*: but this is held, by others, a mere chimera; for that the ſpiritual character, conferred in regeneration, may eaſily be effaced by mortal ſins. Dodwell maintains, that it is by baptiſm the ſoul is made immortal; ſo that thoſe who die without it will not riſe again. It muſt be added, he reſtrains this effect to epiſcopal baptiſm alone. From the effects ordinarily aſcribed to baptiſm, even by ancient writers, it ſhould ſeem, that the ceremony is as much of heathen as Jewiſh origin; ſince Chriſtians do not reſtrain the uſe of it, like the Jews, to the admiſſion of new members into the church, but hold, with the heathens, a virtue in it for remitting and waſhing away ſins. The Bramins are ſtill ſaid to baptize with this latter view, at certain ſeaſons, in the river Ganges; to the waters whereof they have annexed a cleanſing or ſanctifying quality; and hence it is that they flock from all parts, even of Tartary, driven by the expectation of their being eaſed of their load of ſins. But, in this point, many Chriſtians ſeem to have gone beyond the folly of the heathens. It was only the ſmaller ſins of infirmity which theſe latter held to be expiable by waſhing; for crimes of a blacker dye, they allowed no water could efface them, no purgation could diſcharge them. The Chriſtian doctrine of a total remiſſion of ſins by baptiſm could not fail, therefore, to ſcandalize many among the heathens, and furniſhed Julian an occaſion of ſatirizing Chriſtianity itſelf: "Whoever (ſays he) is guilty of rapes, murders, ſacrilege, or any abominable crime, let him be waſhed with water, and he will become pure and holy."

Baptiſm, in the ancient church, was frequently conferred on Jews by violence: but the church itſelf never ſeems to have allowed of force on this occaſion. By a canon of the fourth council of Toledo, it is expreſsly forbid to baptize any againſt their inclinations. That which looks moſt like force in this caſe, allowed by law, were two orders of Juſtinian; one of which appoints the heathens, and the other Samaritans, to be baptized, with their wives and children and ſervants, under pain of confiſcation. By the ancient laws, baptiſm was not to be conferred on image-makers, ſtage-players, gladiators, *aurigæ* or public drivers, magicians, or even ſtrolling beggars, till they quitted ſuch profeſſions. Slaves were not allowed the privilege of baptiſm without the teſtimony and conſent of their maſters; excepting the ſlaves of Jews, Heathens, and Heretics; who were not only admitted to baptiſm but, in conſequence thereof, had their freedom. Voſſius has a learned and elaborate work *De Baptiſmo*, wherein he accurately diſcuſſes all the queſtions concerning baptiſm according to the doctrine of the ancients.

Baptism *by Fire*, ſpoken of by St. John the Baptiſt, has occaſioned much conjecture. The generality of the fathers held, that believers, before they enter paradiſe, are to paſs through a certain fire, which is to purify them from all pollutions remaining on them unexpiated. Others, with St. Baſil, underſtand it of the fire of hell; others, of that of tribulation and temptation. Others, with St. Chryſoſtom, will have it denote an abundance of grace. Others ſuppoſe it to mean the deſcent of the Holy Ghoſt on the apoſtles, in the form of fiery tongues. Laſtly, others maintain, that the word *fire* here is an interpolation; and that we are only to read the text, *He that ſhall come after me will baptize you with the Holy Ghoſt*. In reality, it is not found in divers manuſcript copies of St. Matthew.

The ancient Selucians and Hermians, underſtanding the paſſage literally, maintained, that material fire was neceſſary in the adminiſtration of baptiſm. But we do not find how or to what part of the body they applied it, or whether they were ſatisfied with obliging the perſon baptized to paſs through the fire. Valentinus rebaptized all who had received water-baptiſm, and conferred on them the baptiſm of fire.

Bis docuit tingi, tradu&ctoque corpore flamma.
TERTULL. Carm. contra Marc. l. 1.

Heracleon, cited by Clemens Alexandrinus, ſays, that ſome applied a red-hot iron to the ears of the perſon baptized, as if to impreſs ſome mark upon him.

BAPTISM *of the Dead*, a cuſtom which anciently prevailed among ſome people in Africa, of giving baptiſm to the dead. The third council of Carthage ſpeaks of it as a thing that ignorant Chriſtians were fond of. Gregory Nazianzen alſo takes notice of the ſame ſuperſtitious opinion prevailing among ſome who delayed to be baptized. In his addreſs to this kind of men, he aſks, whether they ſtayed to be baptized after death? Philaſtrius alſo notes it as the general error of the Montaniſts or Cataphrygians, that they baptized men after death. The practice ſeems to be grounded on a vain opinion, that, when men had neglected to receive baptiſm in their life time, ſome compenſation might be made for this default by receiving it after they were dead.

Baptiſm of the Dead was alſo a ſort of vicarious baptiſm, formerly in uſe, when a perſon dying without baptiſm, another was baptized in his ſtead. St. Chryſoſtom tells us, this was practiſed among the Marcionites with a great deal of ridiculous ceremony; which he thus deſcribes. After any catechumen was dead, they hid a living man under the bed of the deceaſed; then coming to the dead man, they aſked him, whether he would receive baptiſm? and he making no anſwer, the other anſwered for him, and ſaid, he would be baptized in his ſtead: and ſo they baptized the living for the dead.

Epiphanius aſſures us, the like was alſo practiſed among the Corinthians. This practice they pretended to found on the apoſtle's authority; alleging that text of St. Paul for it, *If the dead riſe not at all, what ſhall they do who are baptized for the dead?* a text which has given occaſion to a great variety of different ſyſtems and explications. Boſius enumerates no leſs than nine different opinions among learned divines concerning the ſenſe of the phraſe *being baptized for the dead.*

St. Ambroſe and Walafred Strabo ſeem clearly of opinion, that the apoſtle had reſpect to ſuch a cuſtom then in being; and ſeveral moderns have given into the ſame opinion, as Baronius, Joſ. Scaliger, Juſtellus, and Grotius. Several among the Roman-catholics, as Bellarmine, Salmeron, Menochius, and a number of ſchoolmen, underſtand it of the baptiſm of tears, and penance, and prayers, which the living undergo for the dead; and thus allege it as a proof of the belief of purgatory in St. Paul's time.

Hypothetical BAPTISM, that formerly adminiſtered in certain doubtful caſes, with this formula: *If thou art baptized, I do not rebaptize; if thou art not, I baptize thee in the name of the Father*, &c. This ſort of baptiſm, enjoined by ſome ancient conſtitutions of the Engliſh church, is now fallen into diſuſe.

Solemn BAPTISM, that conferred at ſtated ſeaſons; ſuch, in the ancient church, were the *Paſchal baptiſm*, and that at Whitſuntide. This is ſometimes alſo denominated *general baptiſm.*

Lay BAPTISM, we find to have been permitted by both the Common-prayer Books of King Edward and that of Queen Elizabeth, when an infant is in immediate danger of death, and a lawful miniſter cannot be had. This was founded upon the miſtaken notion of the impoſſibility of ſalvation without the ſacrament of baptiſm: but afterwards, when they came to have clearer notions of the ſacraments, it was unanimouſly reſolved in a convocation, held in the year 1575, that even private baptiſm, in a caſe of neceſſity, was only to be adminiſtered by a lawful miniſter.

BAPTISM is alſo applied, abuſively, to certain ceremonies uſed in giving names to things inanimate. The ancients knew nothing of the cuſtom of giving baptiſm to inanimate things, as bells, ſhips, and the like, by a ſuperſtitious conſecration of them. The firſt notice we have of this is in the Capitulars of Charles the Great, where it is only mentioned to be cenſured: but, afterwards, it crept into the Roman offices by degrees. Baronius carries its antiquity no higher than the year 968, when the greateſt bell of the church of Lateran was chriſtened by Pope John III. At laſt it grew to that ſuperſtitious height, as to be thought proper to be complained of in the *Centum Gravamina* of the German nation, drawn up in the public diet of the empire held at Nuremberg *anno* 1581; where (after having deſcribed the ceremony of baptizing a bell, with godfathers, who make reſponſes as in baptiſm, and give it a name, and clothe it with a new garment as Chriſtians were uſed to be clothed, and all this to make it capable of driving away tempeſts and devils), they conclude againſt it, as not only a ſuperſtitious practice, but contrary to the Chriſtian religion, and a mere ſeduction of the ſimple and undiſcerning multitude.

BAPTISM, in the ſea language, a ceremony in long-voyages on board merchant ſhips, practiſed both on perſons and veſſels who paſs the tropic or line for the firſt time. The baptizing the veſſels is ſimple, and conſiſts only in waſhing them throughout with ſea-water: that of the paſſengers is more myſterious. The oldeſt of the crew, that has paſſed the tropic or line, comes with his face blacked, a groteſque cap on his head, and ſome ſea-book in his hand, followed by the reſt of the ſeamen dreſſed like himſelf, each having ſome kitchen utenſil in his hand, with drums beating; he places himſelf on a ſeat on the deck, at the foot of the main maſt. At the tribunal of this mock magiſtrate, each paſſenger not yet initiated, ſwears he will take care the ſame ceremony be obſerved, whenever he is in the like circumſtances: then, by giving a little money by way of gratification, he is diſcharged with a little ſprinkling of water; otherwiſe he is heartily drenched with ſtreams of water poured upon him; and the ſhip-boys are incloſed in a cage, and ducked at diſcretion.—The ſeamen, on the baptizing a ſhip, pretend to a right of cutting off the beak-head unleſs redeemed by the captain with money.

BAPTISMAL, ſomething belonging to baptiſm; thus we ſay baptiſmal vow, baptiſmal preſents, &c.

BAPTISMAL *Vow* or *Covenant*, a profeſſion of obedience to the laws of Chriſt, which perſons in the ancient church made before baptiſm. It was an indiſpenſable part of the obligation on catechumens, before they were admitted to the ceremony of regeneration. It was made by turning to the Eaſt; for what myſtical reaſons, is not well agreed on.

BAPTISMAL *Preſents* are in uſe in Germany, made by the ſponſors to the infant, conſiſting of money, plate, or even ſometimes fiefs of lands; which by the laws of the country are to be kept for the child till of age, the parents having only the truſt, not the right of diſpoſing of them. An anonymous author has publiſhed a diſcourſe expreſsly on this ſubject, intitled, *De pecunia baſtrica.*

BAPTIST (John), Monnoyer, a painter of flowers and fruit, was born at Liſle in 1635, and educated at Antwerp, where he perfected himſelf in the knowledge of his art, and in his firſt years was intended for a painter of hiſtory: but having ſoon obſerved that his genius more ſtrongly inclined

him to the painting of flowers, he applied his talents to thoſe ſubjects, and in that ſtyle became one of the greateſt maſters. His pictures are not ſo exquiſitely finiſhed as thoſe of Van Huyſum, but his compoſition and colouring are in a bolder ſtyle. The diſpoſition of his objects is ſurpriſingly elegant and beautiful; and in that reſpect his compoſitions are eaſily known, and as eaſily diſtinguiſhed from the performances of others. He died in 1699.

BAPTISTS, in eccleſiaſtical hiſtory, from *βαπτιζω I baptize*; a denomination of Chriſtians, diſtinguiſhed from other Chriſtians by their particular opinions reſpecting the mode and the ſubjects of baptiſm.

It is alleged by this ſect, that inſtead of adminiſtering the ordinance by ſprinkling or pouring water, it ought to be adminiſtered only by immerſion. Such, they inſiſt, is the meaning of the word *βαπτιζω*; ſo that a command to baptize is a command to immerſe. Thus it was underſtood by thoſe who firſt adminiſtered it. John the Baptiſt, and the Apoſtles of Chriſt, adminiſtered it in Jordan and other rivers and places where there was much water. Both the adminiſtrators and the ſubjects are deſcribed as going down into, and coming up again out of, the water; and the baptized are ſaid to be buried in baptiſm, and to be raiſed again: which language could not, they ſay, be properly adopted on ſuppoſition of the ordinance being adminiſtered in any other manner than by immerſion. Thus alſo, they affirm, it was in general adminiſtered in the primitive church. Thus it is now adminiſtered in the Ruſſian and Greek church: and thus it is, at this day, directed to be adminiſtered in the church of England, to all who are thought capable of ſubmitting to it in this manner. With regard to the ſubjects of baptiſm, the Baptiſts ſay, that this ordinance ought not to be adminiſtered to children or infants at all, nor to grown up perſons in general; but to adults only of a certain character and deſcription. Our Saviour's commiſſion to his apoſtles, by which Chriſtian baptiſm was inſtituted, is to go and teach all nations, baptizing them, that is, ſay they, not to baptize all they meet with; but firſt to inſtruct them—to teach all nations, or to preach the goſpel to every creature—and whoever receives it, him to baptize in the name of the Father, and of the Son, and of the Holy Ghoſt. To ſuch perſons, and to ſuch only, baptiſm appears to have been adminiſtered by the apoſtles, and the immediate diſciples of Chriſt. They are deſcribed as repenting of their ſins, as believing in Chriſt, and as having gladly received the word. Without theſe qualifications, Peter acquaints thoſe who were converted by his ſermon, that he could not have admitted them to baptiſm; Philip holds the ſame language in his diſcourſe with the eunuch; and Paul treats Lydia, the jailor, and others, in the ſame manner. Without theſe qualifications, Chriſtians in general think it wrong to admit perſons to the Lord's ſupper; and, for the ſame reaſons, without theſe qualifications, at leaſt a profeſſion of them, the Baptiſts think it wrong to admit any to baptiſm. Wherefore they with-hold it, not only from the impenitently vicious and profane, and from infidels who have no faith; but alſo from infants and children, who have no knowledge, and are incapable of every action civil and religious. They further inſiſt, that all poſitive inſtitutions depend entirely upon the will and declaration of the inſtitutor: and therefore, that reaſoning by analogy from abrogated Jewiſh rites is to be rejected, and the expreſs commands of Chriſt reſpecting the mode and ſubjects of baptiſm ought to be our only rule.

In England the Baptiſts form one of the denominations of Proteſtant Diſſenters. They ſeparate from the eſtabliſhment for the ſame reaſons as their brethren of the other denominations do; and from additional motives derived from their particular tenets reſpecting baptiſm. The conſtitution of their churches, and their modes of worſhip, are congregational or independent: in the exerciſe of which they are protected in common with other diſſenters, by the act of toleration. Before this act, they were liable to pains and penalties as Nonconformiſts, and often for their peculiar ſentiments as Baptiſts. A proclamation was iſſued out againſt them, and ſome of them were burnt in Smithfield in 1538. They bore a conſiderable ſhare in the perſecutions of the laſt and of the preceding centuries; and, as it ſhould ſeem, in thoſe of ſome centuries before; for there were ſeveral among the Lollards and the followers of Wickliff, who diſapproved of infant-baptiſm. There were many of this perſuaſion among the proteſtants and reformers abroad. In Holland, Germany, and the North, they went by the names of ANABAPTISTS, and MENNONITES; and, in Piedmont and the South, they were found among the ALBIGENSES and WALDENSES. See thoſe articles.

The *Baptiſts* go under two denominations, viz. the *Particular* or Calviniſtical, and the *General* or Arminian. The former is by far the moſt numerous. Some of both denominations allow of *mixed communion*, viz. of perſons who have been ſprinkled in their infancy, and therefore unbaptized in the view of the Baptiſts; others diſallow it; and ſome of them obſerve the ſeventh day of the week as the ſabbath, apprehending the law that enjoined it, not to have been repealed by Chriſt or his apoſtles. But a difference of opinion reſpecting theſe and other matters, is not peculiar to the Baptiſts: it is common to all Chriſtians, and to all bodies of men who think and judge for themſelves in religious matters.

BAPTISTERY, in eccleſiaſtical writers, a place in which the ceremony of baptiſm is performed. In the ancient church it was one of the exedræ or buildings diſtinct from the church itſelf; and conſiſted of a porch or anti-room where the perſons to be baptized made their confeſſion of faith, and an inner room where the ceremony of baptiſm was performed. Thus it continued till the ſixth century, when the baptiſteries began to be taken into the church-porch, and afterwards into the church itſelf.

The ancient baptiſteries were commonly called *φωτιστηρια photiſteria*, q. d. places of illumination; an appellation ſometimes given to baptiſm. Or they might have the name for another reaſon, becauſe they were the places of an illumination, or inſtruction, preceding baptiſm: for here the catechumens ſeem to have been trained up and inſtructed in the firſt rudiments of the Chriſtian faith.

Thoſe baptiſteries were anciently very capacious; becauſe, as Dr. Cave obſerves, the ſtated times of baptiſm returning but ſeldom, there were uſually great multitudes to be baptized at the ſame time: and then the manner of baptizing, by immerſion, or dipping under water, made it neceſſary to have a large font likewiſe. In *Venantius Fortunatus*, it is called *aula baptiſmatis*, the large hall of baptiſm; which was indeed ſo capacious, that we ſometimes read of councils meeting and ſitting therein. This hall, or chapel, was always kept ſhut during Lent, and the door ſealed up with the biſhop's ſeal, not to be opened till Maundy-Thurſday.

The baptiſtery was always reputed a ſacred place. In the Roman order, we find the ceremonies uſed in the conſecration of the baptiſteries. They were to be built of a round figure, and diſtinguiſhed with the image of St. John the Baptiſt: over the baſon or font was a figure of a dove in gold or ſilver; to repreſent the Holy Ghoſt.

The name *baptiſtery* is ſometimes alſo given to a kind of chapel in a large church, which ſerved for the ſame office. It is an obſervation of ſome learned men, that anciently there was but one baptiſtery in a city, and that at the biſhop's church; and that afterwards they were ſet up in pariſh churches, with the ſpecial allowance however of the biſhop.

BAR, in a general ſenſe, denotes a ſquare and thick piece of wood or iron, laid acroſs a paſſage to hinder entrance.

Bar, in courts of juſtice, is an incloſure made with a ſtrong wooden partition, where the counſel are placed to plead cauſes. It is alſo applied to the benches where the lawyers or advocates are ſeated, becauſe anciently there was a bar to ſeparate the pleaders from the attornies and ſpectators. Hence our lawyers who are called to the bar, or licenſed to plead, are termed *barriſters*, an appellation equivalent to *licentiate* in other countries.

Bar, or *Barr*, (Latin *barra*, and in French *barre*), in a legal ſenſe, is a plea or peremptory exception of a defendant, ſufficient to deſtroy the plaintiff's action. And it is divided into bar to common intendment, and bar ſpecial; bar temporary, and perpetual. Bar to a common intendment is an ordinary or general bar, which uſually diſableth the declaration of the plaintiff; bar ſpecial is that which is more than ordinary, and falls out upon ſome ſpecial circumſtance of the fact as to the caſe in hand. Bar temporary is ſuch a bar as is good for the preſent, but may afterwards fail; and bar perpetual is that which overthrows the action of the plaintiff for ever.

Bar, Barr, or Barre, in Heraldry, denotes an ordinary nearly reſembling the feſs; from which it only differs by its narrowneſs, and by this, that the bar may be placed in any part of the field, whereas the feſs is confined to a ſingle place. The bar itſelf has its diminutives, which are the cloſet and barrulet. The bar of legitimate cadets proceeds from right to left; that of baſtards from left to right.

Bar-*gemel*, denotes a double bar, or where the bars are placed in couples, at a ſmall diſtance, and more than two in the field, in even number.

Bar, in the manege, the higheſt portion of that part of a horſe's mouth ſituated between the grinders and tuſhes, ſo that the part of the mouth which lies under and at the ſide of the bars retains the name of the gum. A horſe with ſenſible bars has a fine light mouth, with an even and firm appui. See Appui.

To Bar *a Vein*, in farriery, a vulgar term, ſignifying an operation performed upon the veins of the legs and other parts of a horſe. It is ſometimes performed in the diſeaſe called the *blood ſpavin*, which conſiſts in a varicoſe ſtate or morbid enlargement of the veins of the part. It is done by dividing the ſkin above it, diſengaging the vein and tying it both above and below, ſo as to obliterate it entirely.

Bar, in muſic, a ſtroke drawn perpendicularly acroſs the lines of a piece of muſic, including between each a certain quantity or meaſure of time, which is various as the time of the muſic is either triple or common. In common time, between each two bars is included the meaſure of four crotchets; in triple, three. The principal uſe of bars is to regulate the beating of time in a concert. The uſe of bars is not to be traced higher than the time when the Engliſh tranſlation of Adrian le Roy's book on the Tablature was publiſhed, viz. the year 1574; and it was ſome time after that before the uſe of bars became general. To come nearer to the point, Barnard's cathedral muſic, printed in 1641, is without bars; but bars are to be found throughout the *Ayres and Dialogues* of Henry Lawes publiſhed in 1653; from whence it may be conjectured that we owe to Lawes this improvement in muſic.

Bar, in hydrography, denotes a bank of ſand, or other matter, whereby the mouth of a river is in a manner choaked up. —The term *bar* is alſo uſed for a ſtrong beam wherewith the entrance of a harbour is ſecured: though this is more commonly called a *boom*.

Bar of a tavern or coffee-houſe, the place where the waiters attend to anſwer the calls of the cuſtomers.

Bar, among printers, denotes a piece of iron with a wooden handle, whereby the ſcrew of the preſs is turned in printing. See Printing.

Bars *of Iron*, are made of the metal of the ſows and pigs as they come from the furnace. Theſe paſs through two forges called the *finery* and the *chaufery*; where, undergoing five ſeveral heats, they are formed into bars.

Bar, a narrow paſs of Italy, in the valley of Aouſta, which commands the paſſage of that valley into Piedmont.

Bar, a very ſtrong city of Podolia in Poland upon the river Kiow. E. long. 28. 30. N. lat. 50. 6.

Bar, or the Barrois, a late duchy of France, bounded on the eaſt by Lorrain, on the north by Luxembourg, on the weſt by Champagne, on the ſouth by part of the ſame country, and by the ci-devant Franche Comtè. It now forms the department of the Meuſe, and is croſſed by the river Meuſe from north to ſouth, and watered by ſeveral other rivers, which render it very fertile. It is divided into four balliages, viz. Baſſilyni, Bar, St. Michael, and Clermont. The chief towns are Bar-le-duc, Clermont, St. Michael, Longuey, Pont-a-Mouſſon, and Stenay. In 1736, it was given to Staniſlaus then king of Poland.

Bar-*le-duc*, a town of France, capital of the late duchy of Bar, ſeated in a pleaſant country, with a handſome caſtle. It is divided into the upper and lower town; the latter is watered by the rivulet Orney, in which are very fine trouts. The wine is excellent, and as delicate as Champagne. It is ſituated on the ſide of a hill, 30 miles weſt of Toul, and 138 eaſt of Paris. Long. 5. 20. E. Lat. 48. 44. N.

Bar-sur-Aube, an ancient town of France, in the department of Aube and late province of Champagne. It is famous for its wines, and is ſeated at the foot of a mountain, 18 miles S. W. of Joinville. Long. 4. 55. E. Lat. 48. 15. N.

Bar-sur-Seine, a town of France, in the department of Aube and late province of Champagne, 20 miles S. W. of Bar ſur-Aube. Long. 4. 32. E. Lat. 48. 5. N.

Bar-*Maſter*, among miners, the perſon who keeps the gage, or diſh, for meaſuring the ore.

BARA, one of the Hebrides of Scotland, to the South of S. Uiſt. It is 5 miles long and 3 broad. At low water, it almoſt communicates with Benbecula; on which account, both iſlands are ſometimes called the Long Iſland. The W. coaſt of Bara is low and flat; the ſoil, fine ſhell ſand, in many parts very fertile; but the ground riſes to the E. coaſt, where it is barren, and breaks off abrupt, irregular, and ſteep. In ſome parts, where the ſoil is rocky and uneven, it admits not of being ploughed: it is cultivated, therefore, by a kind of crooked ſpade, called here *caſchrom*. Long. 7. 30. W. Lat. 56. 55. N.

Bara, the name of a feſtival celebrated with much magnificence at Meſſina, and repreſenting the aſſumption of the Virgin. The *bara*, though uſed as the general denomination of this feſtival, ſignifies more particularly a vaſt machine 50 feet high, at the top of which a young girl of 14, repreſenting the Virgin, ſtands upon the hand of an image of Jeſus Chriſt. Round him turn vertically, in a circle, 12 little children which repreſent the ſeraphims; below them, in another circle, which turns horizontally, are 12 more repreſenting the cherubims: below theſe a ſun turns vertically, with a child at the extremity of each of the four prineipal *radii* of his circle, who aſcend and deſcend with his rotation, yet ſtill ſtand upright. Below the ſun is the loweſt circle, about ſeven feet from the ground, in which 12 boys turn horizontally without interruption; theſe are intended for the twelve apoſtles, who are ſuppoſed to ſurround the tomb of the Virgin at the moment when ſhe aſcends into heaven. This ſuperſtitious complication of whirligigs may have already nearly turned the ſtomachs of ſome of our readers, through the effects of diſguſt. But think of the poor little cherubims, ſeraphims, and apoſtles, who are twirled about in this proceſſion! for, ſays Mr. Houel, "ſome of them fall aſleep, many of them vomit, and ſeveral do ſtill

worſe:" but theſe unſeemly effuſions are no drawback upon the edification of the people; and nothing is more common than to ſee fathers and mothers ſoliciting with ardour for their boys and girls the pious diſtinction of aſſiſting at the bara. This machine is not drawn by aſſes or mules, but by a multitude of robuſt monks dreſſed for the occaſion.

BARABINZIANS, a tribe of Tartars, living on both ſides of the river Iris. They ſeem to derive their name from the *Barabaian* deſart, whoſe lakes ſupply them abundantly with fiſh, on which and their cattle they chiefly ſubſiſt. They have plenty of game and wild-fowl of every kind, particularly ducks and puffins. Moſt of them are heathens, but Mahometaniſm daily gains ground among them. Some of them pay tribute to the empreſs of Ruſſia, and others to the Khan Taiſha.

BARACOA, a town in the north-eaſt part of the iſland of Cuba. W. long. 76. 10. N. lat. 21. 5.

BARALIPTON, among logicians, a term denoting the firſt indirect mode of the firſt figure of ſyllogiſm. A ſyllogiſm in baralipton, is when the two firſt propoſitions are general, and the third particular, the middle term being the ſubject in the firſt propoſition, and the predicate in the ſecond. The following is of this kind:

B A. Every evil ought to be feared
R. A. Every violent paſſion is an evil;
LIP. Therefore ſomething that ought to be feared is a violent paſſion.

BARALLOTS, in church-hiſtory, a ſect of heretics at Bologna in Italy, who had all things in common, even their wives and children. Their facility in complying with all manner of debauchery made them get the name *obedientes*, compliers.

BARANCA DE MALAMBO, a town of Terra Firma in America, with a biſhop's ſee and a good haven. It is a place of great trade, and is ſeated on the river Magdaline. W. long. 75. 30. N. lat. 11. 10.

BARANGI, officers among the Greeks of the lower empire, whoſe buſineſs it was to keep the keys of the city-gates where the emperor reſided. Codinus ſays, *barangi* were thoſe who ſtood guard at the door of the emperor's bed-chamber and dining-room. Codinus and Curopalata obſerve, that the name is Engliſh, formed from *bar*, *to ſhut*; and that the barangi were Engliſhmen, by country; Anglo-Danes, who, being driven out of England, were received into the ſervice of the emperor of Conſtantinople, and made guards or protectors of his perſon. Whence they are called in Latin, by Cujaccius, *protectores*; by others, *ſecurigeri*, as being armed with a battle-ax, *ſecuris*. Codinus adds, that they ſtill ſpoke the Engliſh tongue. Anna Comnena ſays, the barangi came from the iſland Thule; by which is, doubtleſs, meant our iſland. Yet Nicetas makes them Germans; a miſtake eaſy to be made at that diſtance, conſidering the relation the Anglo-Saxons bore to Germany. There were barangi as early as the emperor Michael Paphlagonius, in the year 1035, as appears from Cedrenus; but they were then only common ſoldiers, not a life-guard. Their commander was called αχονταρχης, as importing a perſon who always followed the emperor.

BARA-*picklet*, bread made of fine flour kneaded with barm, which makes it very light and ſpongy: bara being the Welch for bread. In the north of England it is formed into flat cakes, which are called *picklets*.

BARANWAHR, a town of Lower Hungary, in a county of the ſame name, taken by the emperor of Germany from the Turks in 1684. It is ſeated between Buda and Belgrade, in E. long. 20. 5. N. lat. 46. 0.

BARATHRUM, in antiquity, a deep dark pit at Athens, into which condemned perſons were caſt headlong. It had ſharp ſpikes at the top, that no man might eſcape out; and others at the bottom, to pierce and torment ſuch as were caſt in. Its depth and capaciouſneſs made it to be applied proverbially to a covetous perſon; to a glutton, called *Barathro* by the Romans (Lucretius, Horace), and *Barathrum* in the ſame ſenſe (Horace); and for a common proſtitute (Plautus).

BARATIERE (Philip), a moſt extraordinary inſtance of the early and rapid exertion of mental faculties. This ſurpriſing genius was the ſon of Francis Baratiere, miniſter of the French church at Schwobach near Nuremberg, where he was born Jan. 10, 1721. The French was his mother-tongue, together with ſome words of High Dutch; but by means of his father inſenſibly talking Latin to him, it became as familiar to him as the reſt: ſo that, without knowing the rules of grammar, he at four years of age talked French to his mother, Latin to his father, High Dutch to the maid or neighbouring children; and all this without mixing or confounding the reſpective languages. About the middle of his fifth year he acquired Greek in like manner; ſo that in 15 months he perfectly underſtood all the Greek books in the Old and New Teſtament, which he readily tranſlated into Latin. When he was five years and eight months old, he entered upon Hebrew; and in three years time was ſo expert in the Hebrew text, that from a bible without points, he could give the ſenſe of the original in Latin or French; or tranſlate extempore the Latin or French verſions into Hebrew, almoſt word for word; and had all the Hebrew pſalms by heart. He compoſed at this time a dictionary of rare and difficult Hebrew words, with critical remarks and philological obſervations, in about 400 pages in 4to. and, about his tenth year, amuſed himſelf for twelve months with the Rabbinical writers. With theſe he intermixed a knowledge of the Chaldaic, Syriac, and Arabic; and acquired a taſte for divinity and eccleſiaſtical antiquity, by ſtudying the Greek fathers, and councils of the firſt four ages of the church. In the midſt of theſe occupations, a pair of globes coming into his poſſeſſion, he could in 8 or 10 days time reſolve all the problems on them; and in about three months, in January 1735, deviſed his project for the diſcovery of the longitude, which he communicated to the Royal Society at London and the Royal Academy of Sciences at Berlin. In June 1731, he was matriculated in the univerſity of Altorf; and at the cloſe of the year 1732, he was preſented by his father at the meeting of the reformed churches of the circle of Franconia; who, aſtoniſhed at his wonderful talents, admitted him to aſſiſt in the deliberations of the ſynod; and to preſerve the memory of ſo ſingular an event, it was ordered to be regiſtered in their acts. In 1734, the Margrave of Brandenburg Anſpach granted this young ſcholar the uſe of whatever books he wanted from the Anſpach library, together with a penſion of 50 florins, which he enjoyed three years; and his father receiving a call to the French church at Stetin in Pomerania, young Baratiere was, on the journey, admitted maſter of arts, with univerſal applauſe, at the univerſity of Halle. At Berlin he was honoured with ſeveral converſations with the king of Pruſſia, and was received into the royal academy. Towards the cloſe of his life he acquired a taſte for medals, inſcriptions, and antiquities; metaphyſical inquiries, and experimental philoſophy, intervening occaſionally between theſe ſtudies. But the ſubſtance of this literary meteor was now almoſt exhauſted: he was always weak and ſickly; and died October 5, 1740, aged 19 years 8 months and 16 days. He publiſhed 11 different pieces, and left 26 manuſcripts on various ſubjects, the contents of which may be ſeen in his life written by M. Formey profeſſor of philoſophy at Berlin.

BARATZ (Turkiſh), letters-patent granted by the Turkiſh emperors to the Greek patriarch, biſhops, &c. for the exerciſe of their eccleſiaſtical functions. This *Baratz* gives the biſhops full power and authority to eſtabliſh and depoſe the inferior clergy, and all other religious perſons; to grant li-

rences for marriages, and iſſue out divorces; to collect the revenues belonging to the churches; to receive the pious legacies bequeathed to them; in ſhort, to enjoy all the privileges and advantages belonging to their high ſtation: and all this (as it is expreſſed in the baratz itſelf) "according to the vain and idle ceremonies of the Chriſtians."

BARB, or BARBE, a horſe brought from Barbary.

EQUUS, the *horſe*, in zoology, is a genus of quadrupeds belonging to the order of belluæ. This genus comprehends the horſe, the mule, the aſs, the zebra, and the quagga. They have ſix erect and parallel fore-teeth in the upper jaw, and ſix ſomewhat prominent ones in the under jaw; the dog-teeth are ſolitary, and at a conſiderable diſtance from the reſt; and the feet have the hoof undivided.

1. The *caballus*, or HORSE, has a long flowing mane, and the tail covered on all parts with long hairs.—This animal, even in a domeſtic ſtate, is bold and fiery: equally intrepid as his maſter, he faces danger and death with ardour and magnanimity. He delights in the noiſe and tumult of arms, and ſeems to feel the glory of victory: he exults in the chaſe; and his eyes ſparkle with emulation in the courſe. But though bold and intrepid, he is docile and tractable: he knows how to govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but ſeems to conſult the inclination of his rider. Conſtantly obedient to the impreſſion he receives, his motions are entirely regulated by the will of his maſter. He in ſome meaſure reſigns his very exiſtence to the pleaſure of man. He delivers up his whole powers; he reſerves nothing; he will rather die than diſobey. Who could endure to ſee a character ſo noble abuſed! who could be guilty of ſuch groſs cruelty! Yet this character, though natural to the animal, is in ſome meaſure the effect of education, which commences with the loſs of liberty, and is finiſhed by conſtraint. The ſlavery of the horſe is ſo ancient and ſo univerſal, that he is but rarely ſeen in a natural ſtate. Several ancient writers talk of wild horſes, and even mention the places where they were to be found: but as Europe is almoſt equally inhabited, theſe are not now to be met with. The horſes running wild in America were originally tranſported from Europe by the Spaniards; for this ſpecies of animals did not exiſt in the new world. In thoſe vaſt deſarts they roamed at large without any reſtraint; and M. de Salle relates, that he ſaw, in the year 1685, horſes feeding in the meadows of North America, near the bay of St. Louis, which were ſo ferocious that nobody durſt come near them. Oexmelin ſays, that he has ſeen large troops of them in St. Domingo running in the valleys: and that when any perſon approached, they all ſtopped; and one of them would advance till within a certain diſtance, then ſnort with his noſe, take to his heels, and the whole troop after him. Every author who takes notice of theſe horſes of America, agrees that they are ſmaller and leſs handſome than thoſe of Europe. Theſe relations ſufficiently prove, that the horſe, when at full liberty, though not a fierce or dangerous animal, has no inclination to aſſociate with mankind; that all the ſoftneſs and ductility of his temper proceeds entirely from the culture and poliſh he receives in his domeſtic education, which in ſome meaſure commences as ſoon as he is brought forth.

The horſe is chiefly regulated in his motions by the bit and the ſpur; the former teaching him how to direct his courſe, and the ſpur quickening his pace. The mouth of the horſe is endowed with great ſenſibility; ſince the ſlighteſt motion or preſſure of the bit gives him warning, and inſtantly determines his courſe.

The horſe has not only a grandeur in his general appearance, but there is the greateſt ſymmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightneſs, which is well ſupported by the ſtrength and beauty of his cheſt. He erects his head, as if willing to exalt himſelf above the condition of other quadrupeds: his eyes are open and lively; his ears are handſome, and of a proper height; his mane adorns his neck, and gives him the appearance of ſtrength and boldneſs.

At the age of two years, or two years and a half, the horſe is in a condition to propagate; and the mare, like moſt other females, is ready to receive him ſtill ſooner. But the foals produced by ſuch early copulations are generally ill made and weakly. The horſe ſhould never be admitted to the mare till he is four or four and a half; but this is only meant with regard to draught-horſes. Fine horſes ſhould not be admitted to the mare before they are ſix years old; and Spaniſh ſtallions not till ſeven. The mares are generally in ſeaſon from the beginning of April to the end of June; but their chief ardour for the horſe laſts but about 15 or 20 days, and this critical ſeaſon ſhould always be embraced. The ſtallion ought to be ſound, well made, vigorous, and of a good breed. For fine ſaddle-horſes, foreign ſtallions, as Arabians, Turks, Barbs, and Andaluſians, are preferable to all others. Next to theſe, Britiſh ſtallions are the beſt; becauſe they originally ſprang from thoſe above-mentioned, and are very little degenerated. The ſtallions of Italy, and eſpecially the Neapolitans, are very good. The beſt ſtallions for draught or carriage horſes, are thoſe of Naples, Denmark, Holſtein, and Frieſland. The ſtallions for ſaddle horſes ſhould be from 14 to 15 hands high, and for draught horſes at leaſt 15 hands. Neither ought the colour of ſtallions to be overlooked; as a fine black, grey, bay, ſorrel, &c. Beſides theſe external qualities, a ſtallion ought to have courage, tractability, ſpirit, agility, a ſenſible mouth, ſure limbs, &c. Theſe precautions in the choice of a ſtallion are the more neceſſary, becauſe he has been found by experience to communicate to his offſpring almoſt all his good or bad qualities, whether natural or acquired.

The mare contributes leſs to the beauty of her offſpring than the ſtallion; but ſhe contributes perhaps more to their conſtitution and ſtature: for theſe reaſons, it is neceſſary that the mares for breed be perfectly ſound, and make good nurſes. For elegant horſes, the Spaniſh and Italian mares are beſt; but for draught-horſes, thoſe of Britain and Normandy are preferable. However, when the ſtallions are good, the mares of any country will produce fine horſes, provided they be well made and of a good breed. Mares go with young 11 months and ſome days. They bring forth ſtanding; contrary to the courſe of moſt other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horſes and mares live between 25 and 30 years. Horſes caſt their hair once a-year, generally in the ſpring, but ſometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other ſeaſon.

In Perſia, Arabia, and moſt eaſtern countries, they never geld their horſes, as is done in Europe and China. This operation greatly diminiſhes their ſtrength, courage, and ſpirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: ſome geld their horſes when a year old, and others at 18 months. But the beſt and moſt general practice is to delay the operation till they be two years old at leaſt: becauſe, when the gelding is delayed for two years or more, the animals retain more of the ſtrength and other qualities which naturally belong to the male.

As the utility of horſes ſurpaſſes that of all other domeſtic animals, it may be of uſe to ſubjoin ſome marks by which the age and other properties may be diſtinguiſhed.—In old horſes, the eye-pits are generally deep; but this is only an equivocal

mark, being alſo found in young horſes begot by old ſtallions. The moſt certain knowledge of the age is to be obtained from the teeth. Of theſe a horſe has 40; 24 grinders or double-teeth, four tuſhes, and 12 fore-teeth: mares have no tuſhes, or at leaſt very ſhort ones. It is not from the grinders that we know the age; it is diſcovered firſt by the fore-teeth, and afterwards by the tuſhes. The 12 fore-teeth begin to ſhoot within 12 days after the colt is foaled. Theſe firſt, or foal-teeth, are round, ſhort, not very ſolid, and are caſt at different times, to be replaced by others. At the age of two years and a half, the four middle fore-teeth are caſt, two in the upper jaw, and two in the lower. In one year more, four others drop out, one on each ſide of the former, which are already replaced. When he is about four years and a half old, he ſheds four others, and always next to thoſe which have fallen out and been replaced. Theſe four foal-teeth are replaced by four others, but are far from growing ſo faſt as thoſe which replaced the eight former, and are called the *corner-teeth*; they replace the four laſt foal-teeth, and by theſe the age of a horſe is diſcovered. They are eaſily known, being the third both above and below, counting from the middle of the jaw. They are hollow, and have a black mark in their cavity. When the horſe is four years and a half old, they are ſcarce viſible above the gum, and the cavity is very ſenſible: at ſix and a half, they begin to fill; and the mark continually diminiſhes and contracts till ſeven or eight years, when the cavity is quite filled up, and the black ſpot effaced. After eight years, theſe teeth ceaſing to afford any knowledge of the age, it is judged of by the tuſhes: which are four teeth adjoining to thoſe laſt mentioned; and, like the grinders, are not preceded by any other teeth. The two in the lower jaw uſually begin to ſhoot at three years and a half, and thoſe of the upper jaw at four; continuing very ſharp-pointed till ſix. At 10, the upper ſeem blunted, worn out, and long, the gum contracting itſelf as its years increaſe; the barer therefore they are, the older is the horſe. From 10 to 13 or 14 years, little can be ſeen to indicate the age; but at that time ſome hairs of the eye-brows begin to turn grey. This mark, however, is equivocal, like that drawn from the depth of the eye-pits; horſes from old ſtallions or mares, having grey hairs in the eye-brows when they are not above nine or ten years old. In ſome horſes the teeth are of ſuch a hardneſs as not to wear; and in ſuch the black mark always ſubſiſts, being never effaced by time: but the age of theſe horſes, which are called *beguts* by the French, is eaſily known; the hollow of the tooth being filled up, and at the ſame time the tuſhes very long. It has been further obſerved, that this is more common in mares than in horſes. The age of a horſe may be alſo known, though leſs accurately, by the bars in his mouth, which wear away as he advances in years.

When the horſe is without blemiſh, the legs and thighs are clean, the knees ſtraight, the ſkin and ſhank thin, and the back-ſinew ſtrong and well-braced. The ſinews and the bones ſhould be ſo diſtinct, as to make the legs appear thin and lathy, not full and round. The paſtern joints ſhould never be large and round; nor muſt there be any ſwelling near the coronet. The hock ſhould be lean and dry, not puffed up with fat. With regard to the hoof, the coronet ſhould be equally thick, and the horn ſhining and greyiſh, but by no means white, which is always bad. A ſtrong foot ſhews the fibres of the hoof running in a direct line from the coronet to the toe, like the grain of wood. In this caſe, care muſt be taken to keep the foot moiſt and pliable; for the hoof may be too hard and thick, as well as too thin and yielding. A hard ſtrong foot, is generally ſubject to rifts and fiſſures, which cleave the hoof quite through, ſometimes from the coronet downwards.

A narrow heel is likewiſe a very important defect; and when it is not above two fingers in breadth, which it frequently is from bad ſhoeing, the foot is faulty. A high heel cauſes a horſe to trip and ſtumble often; and a low one, with long yielding paſterns, is very apt to be worn quite away on a journey. Too large a foot in proportion to the reſt of the body, alſo renders a horſe weak and heavy.

The head of a horſe ſhould be ſmall, and rather lean than fleſhy. The ears ſhould be ſmall, erect, thin, ſprightly, and pointed. The forehead ſhould be neither too broad nor too flat, and ſhould have a ſtar or ſnip on it. The noſe ſhould riſe a little, and the noſtrils ſhould be wide. The muzzle ſhould be ſmall, and the mouth neither too deep nor too ſhallow. The jaws ſhould be thin, and not approach too near together at the throat, nor too high upwards towards the onſet, that the horſe may have ſufficient room to carry his head in an eaſy graceful poſture. The eyes ſhould be of a middle ſize, bright, lively, and full of fire; and the tongue ſhould be ſmall, that it may not be too much preſſed by the bit. The neck ſhould be arched towards the middle, growing ſmaller by degrees from the breaſt and ſhoulders to the head. The hair of the mane ſhould be long, ſmall, and fine; and if it be a little frizzled, ſo much the better. The ſhoulders ſhould be pretty long; the withers thin, and enlarging gradually from thence downwards; but ſo as to render his breaſt neither too narrow nor too groſs. A thick-ſhouldered horſe ſoon tires, and trips and ſtumbles every minute; eſpecially if he has a thick large neck at the ſame time. When the breaſt is ſo narrow that the fore-thighs almoſt touch, the animal is never good for much. A horſe of a middle ſize ſhould have the diſtance of five or ſix inches between his fore-thighs, and there ſhould be leſs diſtance between his feet than his thighs near the ſhoulders when he ſtands upright. The body or carcaſe of a horſe ſhould be proportioned to his bulk, and the back ſhould ſink a little below the withers; but the other parts ſhould be ſtraight, and no higher behind than before. He ſhould alſo be home-ribbed; but the ſhort ribs ſhould not approach too near the haunches, and then he will have room for greater exertion. When a horſe's back is ſhort in proportion to his bulk, and yet otherwiſe well limbed, he will hold out a journey, though he will travel ſlow. When he is tall, at the ſame time with very long legs, he is but of little value.

The wind ſhould never be overlooked in the choice of a horſe; and it may eaſily be known by his flanks, if he is broken winded, when he ſtands quiet in the ſtable; becauſe he always pinches them in with a very ſlow motion, and drops them ſuddenly. A thick-winded horſe fetches his breath often, and ſometimes rattles and wheezes. This may be always diſcovered when he is put to briſk exerciſe.

The temper of a horſe ſhould always be regarded: a vicious horſe generally lays his ears cloſe to his pole, ſhows the whites of his eyes, and looks ſullen and dogged. An angry horſe may be known by his frowning looks; and he generally ſeems to ſtand in a poſture of defence. When he is very vicious, he pays no regard to the groom that feeds him: however, ſome horſes that are tickliſh will lay back their ears, and yet be of a good diſpoſition. A fearful horſe is apt to ſtart, and never leaves it off till he is old and uſeleſs. A fretful horſe is very unfit for a journey; and you may diſcover his temper as ſoon as he gets out of the ſtable. A dull, heavy, ſluggiſh horſe may be eaſily known, whatever tricks are uſed to rouſe his ſpirits by artful jockies.

With regard to the colour of a horſe, all kinds of bays are accounted good. The cheſnut horſe is generally preferable to the ſorrel, unleſs the former happens to be bald, or party-coloured, with white legs. Brown horſes have generally black manes and tails, and their joints are of a ruſty black. Thoſe of this colour that are dappled, are much handſomer than the

reſt. Horſes of a ſhining black, and well marked without too much white, are alſo much admired. Of greys, the dappled are accounted beſt; though the ſilver grey make a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be ſo hardy. Greys of every kind will turn white ſooner or later; but the nutmeg grey, when the dappled parts incline to bay or cheſnut, are ſaid to be good hardy horſes. Roan horſes have a diverſity of colours mixed together; but the white is more predominant than the reſt. They are all generally hardy, and fit for the road; and ſome are very good animals. Thoſe of a ſtrawberry colour moſt reſemble the ſorrel, and they are often marked with white on the face and legs. Dun, ſallow, and cream-coloured horſes have a liſt down their backs; and their manes and tails are black. Dun horſes are ſeldom choſen by gentlemen, and yet they may be very uſeful to the country farmer. The ſallow and cream-coloured are more eſteemed, both for beauty and uſe. Horſes that are finely ſpotted with gay colours are a great rarity, and are only in the hands of men of great fortune.

There is ſome difference in horſes, according to the different countries where they are bred. For inſtance, in France, thoſe of the late province of Bretagne are pretty ſtrong made, and have generally black hair, or brown bay; and they have good legs and feet, with a hardy mouth, and a head ſhort and fleſhy; but in general they are pretty clumſy. The horſes of Franche Compté are ſaid to have the legs of tigers, and the belly of a hind; but they are ſhort and thick, and of a middle ſize; being much more proper for drawing than riding. The horſes of Gaſcony are not unlike thoſe of Spain; but they are not ſo handſome nor ſo active, and therefore they are more proper to draw carriages. The Limoſin horſes are very vicious, and are good for little till they are ſix years old. Their colour is generally bay, or a bay brown. The horſes of Normandy are much like thoſe of Bretagne; and thoſe of Poitou have good bodies, legs, feet, and eyes; but they are far from being handſome.

The horſes of Germany are much better and more handſome than thoſe of the Low Countries. They are of great uſe for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, eſpecially about the legs. They are not large, but they are well ſet; and yet they have tender feet. The Hungarian horſes are excellent for the coach, as well as for riding; but they are large, though well proportioned; and they are of all colours, and in general very ſwift.

The Daniſh horſes are low, ſhort, and ſquare; but they have a fine head, and ſhort hair. The horſes of the Low Countries are very fit for the coach, and they are beſt known by the name of *Flanders mares*. The Poliſh horſes are like the Daniſh; only they have not ſo fine a fore-hand: their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horſes of Switzerland are pretty much like thoſe of Germany; which is no wonder, ſince the Germans purchaſe a great number of them. The horſes of Piedmont are fiery, of a middle ſize, and of all ſorts of colours: their legs are good and handſome, their eyes fine, their ears ſmall, and their mouths good; but they do not carry their heads well.

The horſes of Naples and Italy are generally ill-made and lean; and yet they are good and uſeful, for they are light and proper for racing, though not for a long courſe; they never do well in a colder climate. The Spaniſh horſes are very well made and handſome, as well as very active and nimble; they have good eyes, handſome legs and heads, and are eaſily managed; they are alſo good for racing, if they are well kept: however, they are not ſo good in northern climates as in their own country. The Turkiſh horſes are of different ſhapes; but they are generally ſwift, though their mouths are bad. Moſt of them are white; though there are other colours; and they are large, hardy, ſtrong, and fit for the road.

The horſes of Barbary, commonly called *barbs*, have ſtrong hoofs: and are more proper for racing than any other whatever; ſome have ſaid they never grow old, becauſe they preſerve their vigour to the laſt. They are excellent ſtallions; and ſome of them are uſed as ſuch in Britain: however, the Arabian horſes are not quite ſo good as the Barbary, though ſome think they are both of the ſame kind; only thoſe that are uſed to the deſerts of Arabia are always in action. The horſes of the Gold Coaſt of Guinea are very few in number, and in other parts of that coaſt there are none at all; for many of the negroes, when they have been firſt brought over to our American plantations, have expreſſed great admiration at the ſight of a horſe, and even been afraid to come near one.

The horſes of the Cape of Good Hope were originally brought from Perſia: and they are generally ſmall, and of a cheſnut colour; for thoſe that are natives of that country are all wild, and could never yet be tamed. The horſes of China are good, and more particularly thoſe in the province of Yun Nan; for they are very vigorous, though a little low. The horſes of the Eluth Tartars are good and full of fire; and their ſize is much the ſame as the Poliſh horſes: they are afraid of nothing; not even of lions and tigers: but perhaps this may be owing to uſe. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle ſize, though there are ſome as large and as handſome as thoſe in Europe. The wild horſes of Tartary differ very little from the tame; but they are ſo ſwift, that they avoid the arrows of the moſt ſkilful hunters.

The breed of horſes in Great Britain is as mixed as that of its inhabitants; the frequent introduction of foreign horſes has given us a variety that no ſingle country can boaſt of. Moſt other countries produce only one kind; while ours, by a judicious mixture of the ſeveral ſpecies, by the happy difference of our ſoils, and by our ſuperior ſkill in management, may triumph over the reſt of Europe, in having brought each quality of this noble animal to the higheſt perfection. In the annals of Newmarket may be found inſtances of horſes that have literally outſtripped the wind, as the celebrated M. Condamine has lately ſhown in his remarks on thoſe of Great Britain. Childers is an amazing inſtance of rapidity; his ſpeed having been more than once exerted equal to 82½ feet in a ſecond, or near a mile in a minute.

The ſpecies uſed in hunting is a happy combination of the blood horſe with others ſuperior in ſtrength, but inferior in point of ſpeed and lineage. An union of both is neceſſary; for the fatigues of the chace muſt be ſupported by the ſpirit of the one, as well as by the vigour and power of the other.

No country can bring a parallel to the ſtrength and ſize of our horſes deſtined for the draught; or to the activity and ſtrength united of thoſe that form our cavalry. In London, there are inſtances of ſingle horſes that are able to draw on a plain, for a ſmall ſpace, the weight of three tuns; but could with eaſe, and for a continuance, draw half that weight. The pack-horſes of Yorkſhire, employed in conveying the manufactures of that country to the moſt remote parts of the kingdom, uſually carry a burden of 420 pounds; and that indifferently over the higheſt hills of the north, as well as the moſt level roads. But the moſt remarkable proof of the ſtrength of our Britiſh horſes, is to be drawn from that of our mill-horſes: ſome of theſe will carry at one load 13 meaſures, which at a moderate computation of 70 pounds each, will amount to 910; a weight ſuperior to that which the leſſer ſort

of camels will bear: this will appear leſs ſurpriſing, as theſe horſes are by degrees accuſtomed to the weight; and the diſtance they travel no greater than to and from the adjacent hamlets. In military ſervice, our troops of cavalry have evinced a great ſuperiority both of ſtrength and activity over thoſe of other countries, and over the German horſes in particular.

But the fact is, that the Engliſh were ever attentive to improve theſe animals; and in very early times have been accuſtomed to ſet a high value on their breed. The eſteem that our horſes were held in by foreigners ſo long ago as the reign of Athelſtan, may be collected from a law of that monarch, prohibiting their exportation, except they were deſigned as preſents. Theſe muſt have been the native kind, or the prohibition would have been needleſs; for our commerce was at that time too limited to receive improvement from any but the German kind, to which country their own breed could be of no value. But when our intercourſe with the other parts of Europe was enlarged, we ſoon laid hold of the advantages this gave of improving our breed. Roger de Beleſme, earl of Shrewſbury, is the firſt that is on record: he introduced the Spaniſh ſtallions into his eſtate in Pow-iſland, from which that part of Wales was for many ages celebrated for a ſwift and generous race of horſes. Giraldus Cambrenſis, who lived in the reign of Henry II. takes notice of it; and Michael Drayton, cotemporary with Shakeſpear, ſings their excellence. This kind was probably deſtined to mount our gallant nobility, or courteous knights for feats of chivalry, in the generous conteſts of the tilt-yard. From theſe ſprung, to ſpeak the language of the times, the flower of courſers, whoſe elegant form added charms to the rider, and whoſe activity and managed dexterity gained him the palm in that field of gallantry and romantic honour.

The increaſe of our inhabitants, and the extent of our manufactures, together with the former neglect of internal navigation to convey thoſe manufactures, multiplied the number of our horſes. An exceſs of wealth, before unknown in theſe iſlands, increaſed the luxury of carriages, and added to the neceſſity of an extraordinary culture of theſe animals. Their high reputation abroad has alſo made them a branch of commerce, and proved another cauſe of their vaſt increaſe.

To what has been ſaid on the ſubject of this noble animal, it may not be improper to add a ſhort technical deſcription of thoſe parts of the horſe with which inexperienced perſons may not be ſufficiently acquainted. In plate 50, we have given the figure of an horſe, in which fig. 1. repreſents the withers. 2. The ſhoulder. 3. The cheſt. 4. The elbow. 5. The arm. 6. The knee. 7. The ſhank. 8. The fetlock joint. 9. The fetlock. 10. The paſtern. 11. The coronet. 12. The hoof. 13. The quarters. 14. The toe. 15. The heel. 16. The loins. 17. The fillets. 18. The ribs. 19. The belly. 20. The flank. 21. The rump. 22. The haunches. 23. The ſtifle. 24. The thigh. 25. The hock. 26. The kerb. 28. The point of the hock.

The breeding, rearing, &c. of horſes are conſidered under the different articles, Colt, Horse, and Stallion: for the method of training and managing them, ſee Horsemanship; and for their diſeaſes and cure, ſee Farriery.

2. *Aſinus*, the Ass, has long ſlouching ears, a ſhort mane, the tail covered with long hairs at the end. The body is uſually of an aſh colour, with a black bar croſſing the ſhoulders, and extending downwards.

The *Koulan*, or aſs in a wild ſtate, which is the *onager* of the ancients, varies from the tame aſs in ſeveral reſpects, and requires a more particular deſcription. The forehead is very much arched; the ears are always erect, ſharp-pointed, and lined with whitiſh curling hairs; the irides are of a livid brown; the lips thick; and the end of the noſe ſloping ſteeply down to the upper lip: the noſtrils are large and oval. It is much higher on its limbs than the tame aſs, and its legs are much finer, but it again reſembles it in the narrowneſs of its cheſt and body; it carries its head much higher; and its ſkull is of a ſurpriſing thinneſs. The mane is duſky, about three or four inches long, compoſed of ſoft woolly hair, and extends quite to the ſhoulders: the hairs at the end of the tail are coarſe, and about a ſpan long. The colour of the hair in general is a ſilvery white; the upper part of the face, the ſides of the neck and body, are of a flaxen-colour; the hind part of the thighs are the ſame; the fore part divided from the flank by a white line, which extends round the rump to the tail: the belly and legs are alſo white: along the very top of the back, from the mane quite to the tail, runs a ſtripe of buſhy waved hairs of a coffee-colour, broadeſt above the hind part, growing narrower again towards the tail; another of the ſame colour croſſes it at the ſhoulders (of the males only), forming a mark, ſuch as diſtinguiſhes the tame aſſes: the dorſal band and the mane are bounded on each ſide by a beautiful line of white, well deſcribed by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, ſoft, and ſilky, much undulated, not unlike the hair of the camel; greaſy to the touch; and the flaxen colour, during that ſeaſon, more exquiſitely bright. Its ſummer coat is very ſmooth, ſilky, and even, with exception of certain ſhaded rays that mark the ſides of the neck, pointing downwards.

Theſe animals inhabit the dry and mountainous parts of the deſerts of Great Tartary, but not higher than lat. 48. They are migratory, and arrive in vaſt troops to feed, during the ſummer, in the tracts eaſt and north of lake Aral. About autumn they collect in herds of hundreds, and even thouſands, and direct their courſe towards the north of India, to enjoy a warm retreat during winter. But Perſia is their moſt uſual place of retirement, where they are found in the mountains of Caſbin, ſome even at all times of the year. If we can depend on Barboga, they penetrate even into the ſouthern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild aſſes of an aſh-colour are found in the deſerts of northern Africa. The Arabs take them in ſnares, for the ſake of their fleſh. If freſh killed, it is hot and unſavory: if kept two days after it is boiled, it becomes excellent meat. Theſe people, the Tartars and Romans, agreed in their preference of this to any other food: the latter indeed choſe them young, at a period of life in which it was called *Laliſio* (vide *Martial.* xiii. 97.). The epicures of Rome preferred thoſe of Africa to all others. The grown onagri were introduced among the ſpectacles of the theatre; and their combats were preferred even to thoſe of the elephants.

The manners of the wild aſs are very much the ſame with thoſe of the wild horſe and the diſhikketei. They aſſemble in troops under the conduct of a leader; and are very ſhy. They will, however, ſtop in the midſt of their courſe, and even ſuffer the approach of man at that inſtant, but will then dart away with the rapidity of an arrow ſent from a bow. This Herodotus alleges in his account of thoſe of Meſopotamia; and Leo Africanus, in that of the African wild aſs.

They are extremely wild. Holy writ is full of alluſions to their ſavage nature. "He ſcorneth the multitude of the city, neither regardeth he the crying of the driver," Job, xxxix. 7. Yet they are not untameable. The Perſians catch and break them for the draught: they make pits half-filled with plants to weaken the fall, and thus take them alive. They break, and hold them in great eſteem, and ſell them at a high price. The famous breed of aſſes in the eaſt is produced from the koulan reclaimed from the ſavage ſtate, which highly improves the breed. The Romans reckoned the breed of aſſes

produced from the onager and tame aſs to excel all others The Tartars, who kill them only for the ſake of the fleſh and ſkins, lie in ambuſh and ſhoot them. They have been at all times celebrated for their amazing ſwiftneſs; for which reaſon the Hebreans called them *Pere*; as they ſtyled them *Arod*, from their braying. Their food is the ſalteſt plants of the deſerts, ſuch as the kalis, atriplex, chenopodium, &c.; and alſo the bitter milky tribe of herbs: they alſo prefer ſalt-water to freſh. This is exactly conformable to the hiſtory given of this animal in the book of Job; for the words "barren land," expreſſive of its dwelling, ought, according to the learned Bochart, to be rendered "ſalt places." The hunters lie in wait for them near the ponds of brackiſh water, to which they reſort to drink: but they are not of a thirſty nature, and ſeldom have recourſe to water. Theſe animals were anciently found in the Holy Land, Syria, the land of Uz or Arabia Deſerta, Meſopotamia, Phrygia, and Lycaonia. But at preſent they are entirely confined to the countries above mentioned. Chagrin, a word derived from the Tartar *ſoghré*, is made of the ſkin of theſe animals, which grows about the rump, and alſo thoſe of horſes, which is equally good. There are great manufactories of it at Aſtracan and in all Perſia. It is a miſtake to ſuppoſe it to be naturally granulated, for its roughneſs is entirely the effect of art. The Perſians uſe the bile of the wild aſs as a remedy againſt dimneſs of ſight.

The tame or *domeſtic aſs* (ſee Plate 50.) is a humble, patient, and tranquil animal. He ſubmits with firmneſs to ſtrokes and chaſtiſement: he is temperate both as to the quantity and quality of his food; he contents himſelf with the rigid and diſagreeable herbage which the horſe and other animals leave to him and diſdain to eat: he is more delicate with regard to his drink, never uſing water unleſs it be perfectly pure. As his maſter does not take the trouble of combing him, he often rolls himſelf on the turf among thiſtles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, ſeeming to reproach his maſter for neglect and want of attention. When very young, the aſs is a gay, ſprightly, nimble, and gentle animal. But he ſoon loſes theſe qualities, probably by the bad uſage he meets with; and becomes lazy, untractable, and ſtubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is ſtrong: Pliny aſſures us, that when an experiment was made to diſcover the ſtrength of maternal affection in a ſhe-aſs, ſhe ran through the flames in order to come at her colt. Although the aſs be generally ill uſed, he diſcovers a great attachment to his maſter; he ſmells him at a diſtance, ſearches the places and roads he uſed to frequent, and eaſily diſtinguiſhes him from the reſt of mankind. The aſs has a very fine eye, an excellent ſcent, and a good ear. When overloaded, he hangs his head, and ſinks his ears: when too much teaſed or tormented, he opens his mouth and retracts his lips in a diſagreeable manner, which gives him an air of ridicule and deriſion. If you cover his eyes, he will not move another ſtep; if you lay him on his ſide, and place his head ſo that one eye reſts on the ground, and cover the other with a cloth, he will remain in this ſituation without making any attempt to get up. He walks, trots, and gallops in the ſame manner as the horſe; but all his motions are ſlower. Whatever be the pace he is going at, if you puſh him, he inſtantly ſtops.

The cry of the horſe is known by the name of *neighing*; that of the aſs, by *braying*, which is a long, diſagreeable noiſe, conſiſting of alternate diſcords from ſharp to grave and from grave to ſharp; he ſeldom cries but when preſſed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The aſs is leſs ſubject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardneſs and dryneſs of his ſkin; and it is probably for the ſame reaſon that he is leſs ſenſible to the whip and ſpur than the horſe. The teeth of the aſs fall out and grow at the ſame age and in the ſame manner as thoſe of the horſe; and he has nearly the ſame marks in his mouth.

Aſſes are capable of propagating when two years old. The females are in ſeaſon during the months of May and June. The milk appears in the dugs ten months after impregnation; ſhe brings forth in the twelfth month, and always one at a time. Seven days after the birth, the ſeaſon of the female returns, and ſhe is again in a condition to receive the male. The colt ſhould be taken from her at the end of five or ſix months, that the growth and nouriſhment of the fœtus may not be obſtructed. The ſtallion or jack-aſs ſhould be the largeſt and ſtrongeſt that can be found; he ſhould be at leaſt three years old, and never ought to exceed ten. The aſs, like the horſe, takes three or four years in growing, and lives till he be 25 or 30: he ſleeps leſs than the horſe, and never lies down to ſleep but when exceſſively fatigued. He is more robuſt, and leſs ſubject to diſeaſes, than the horſe.

Travellers inform us that there are two ſorts of aſſes in Perſia; one of which is uſed for burdens, as being ſlow and heavy: the other is kept like horſes for the ſaddle; for they have ſmooth hair, carry their heads well, and are much quicker in their motion; but when they ride them, they ſit nearer their buttocks than when on a horſe: they are dreſſed like horſes, and are taught to amble like them; but it is uſual to cleave their noſtrils to give them more room for breathing. Dr. Ruſſel likewiſe tells us they have two ſorts in Syria; one of which is like ours; and the other very large, with remarkably long ears; but they are both put to the ſame uſe, which is, to carry burdens.

In America there were originally no aſſes at all, nor yet horſes: but they were carried thither long ago, at firſt by the Spaniards, and afterwards by other nations, where they multiplied greatly; inſomuch, that, in ſome places, there are whole droves of them that run wild, and are very hard to be caught. Aſſes in general carry the heavieſt burdens in proportion to their bulk; and, as their keeping coſts little or nothing, it is a great wonder that they are not put to more uſes than they generally are among us. The fleſh of the common aſs is never eaten in theſe parts of the world; though ſome pretend their colts are tender, and not diſagreeable.

3. The *Hemionus* of Pallas, or Wild Mule, is of the ſize and appearance of the common mule; with a large head, flat forehead growing narrow toward the noſe, eyes of a middle ſize, the irides of an obſcure aſh-colour; 38 teeth in all, being two in number fewer than in a common horſe; ears much longer than thoſe of a horſe, quite erect, lined with a thick whitiſh curling coat; neck ſlender, compreſſed; mane upright, ſhort, ſoft, of a greyiſh colour; in place of the foretop, a ſhort tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breaſt protuberant and ſharp. The limbs are long and elegant; the thighs thin, as in a mule's. Within the fore-legs there is an oval callus; in the hind legs none. The hoofs are oblong, ſmooth, and black; the tail is like that of a cow, ſlender, and for half of its length naked, the reſt covered with long aſh-coloured hairs. Its winter coat grey at the tips, of a browniſh aſh-colour beneath; about two inches long, in ſoftneſs like the hair of a camel, and undulated on the back. Its ſummer coat is much ſhorter, of a moſt elegant ſmoothneſs, and in all parts marked moſt beautifully with ſmall vortexes. The end of the noſe is white: from thence to the foretop inclining to tawny. The buttocks are white; as are the inſide of the limbs and belly. From the mane a blackiſh teſtaceous line extends along the top of the

back to the tail, broadeſt on the loins, and growing narrower towards the tail. The colour of the upper part of the body is a light yellowiſh grey, growing paler towards the ſides. The length, from the tip of the noſe to the baſe of the tail, is ſix feet ſeven inches; length of the trunk of the tail one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This ſpecies inhabits the deſerts between the rivers Onon and Argun in the moſt ſouthern part of Siberia, and extends over the vaſt plains and deſerts of weſtern Tartary, and the celebrated ſandy deſert of Gobi, which reaches even to India. In Siberia they are ſeen only in ſmall numbers, as if detached from the numerous herds to the ſouth of the Ruſſian dominions. In Tartary they are particularly converſant about Taricnoor, a ſalt lake at times dried up. They ſhun wooded tracts and lofty ſnowy mountains. They live in ſeparate herds, each conſiſting of a chief, a number of mares and colts, in all to the number of about 20; but ſeldom ſo many, for commonly each male has but five and ſometimes fewer females. They copulate towards the middle or end of Auguſt; and bring for the moſt part but one at a time, which by the third year attains its full growth, form, and colour. The young males are then driven away from their paternal herds, and keep at a diſtance till they can find mates of their own age which have quitted their dams. Theſe animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horſe. They fight by biting and kicking, as uſual with the horſe: they are fierce and untameable; and even theſe which have been taken young, are ſo intractable as not to be broken by any art which the wandering Tartars could uſe. Yet, were it poſſible to bring them into fit places, and to provide all the conveniences known in Europe, the taſk might be effected: but it is doubted whether the ſubdued animal would retain the ſwiftneſs it is ſo celebrated for in its ſtate of nature. In exceeding that of the antelope it is even proverbial; and the inhabitants of Thebet, from the fame of its rapid ſpeed, mount on it Chammo their god of fire. The Mongalians deſpair of ever taking them by the chace; but lurk behind ſome tomb, or in ſome ditch, and ſhoot them when they come to drink or eat the ſalt of the deſert. They are exceſſively fearful animals, and provident againſt danger. A male takes on him the care of the herd, and always is on the watch. If they ſee a hunter, who by creeping along the ground has got near them, the ſentinel takes a great circuit, and goes round and round him, as diſcovering ſomewhat to be apprehended. As ſoon as the animal is ſatisfied, it rejoins the herd, which ſets off with great precipitation. Sometimes its curioſity coſts it its life; for it approaches ſo near as to give the hunter an opportunity of ſhooting it. But it is obſerved, that in rainy or in ſtormy weather theſe animals ſeem very dull, and leſs ſenſible of the approach of the hunter. The Mongalians and Tunguſi, according to Du Halden, kill them for the ſake of the fleſh, which they prefer to that of horſes, and even to that of the wild boar, eſteeming it equally nouriſhing and wholeſome. The ſkin is alſo uſed for the making of boots. The ſenſes of hearing and ſmelling are moſt exquiſite in theſe animals: ſo that they are approached with the utmoſt difficulty. The Mongalians call them *dſhikketaei*, which ſignifies "the eared;" the Chineſe, *yo to tſe*, or "mule." In ancient times the ſpecies extended far to the ſouth. It was the hemionos or half aſs of Ariſtotle, found in his days in Syria, and which he celebrates for its amazing ſwiftneſs and its fecundity, a breeding mule being thought a prodigy; and Pliny, from the report of Theophraſtus, ſpeaks of this ſpecies being found in Cappadocia, but adds they were a particular kind.

The domeſtic MULES of our own times (*equus mulus* of Geſner and Linnæus) are the offspring of the horſe and the aſs, or aſs and mare; are very hardy, and have more the form and ſitpoſition of the aſs than the horſe. The fineſt are bred i Spain; but there are very large ones in Savoy.

4. The ZEBRA. This animal unites in itſelf the figure an gracefulneſs of the horſe, joined to the ſwiftneſs and activity o the ſtag. He is about ſeven feet long, from the point of th muzzle to the origin of the tail, and about four feet high. Th colour of his ſkin is beautiful and uniform, conſiſting of alte nate parallel rings of black and white, diſpoſed in the moſt re gular manner, as repreſented in the plate. He is generally lef than the horſe and larger than the aſs. The zebra is found a where but in the eaſtern and ſouthern provinces of Africa from Ethiopia to the Cape of Good Hope, and from th Cape of Good Hope to Congo. The Dutch have been a great pains to tame and uſe them for domeſtic purpoſes, bu with little ſucceſs. He is hard-mouthed, and kicks when an perſon attempts to touch or come near him. He is reſtleſ and obſtinate as a mule: but perhaps the wild horſe is naturally as untractable as the zebra; for it is probable, if he wer early accuſtomed to obedience and a domeſtic life, he woul become as docile as the horſe. See a repreſentation of th zebra in Plate 50.

5. The quacha, or quagga, is ſtriped like the former on th head and body, but with fewer lines. The flanks are ſpotted the rump is plain; the ground colour of the head, neck, body and rump, a bright bay: the belly, thighs, and legs are white and free from all marks. This ſpecies, till of late, has bee ſuppoſed to be the female of the zebra; but recent obſerva tions prove that the male and female zebra are marked alike This differs likewiſe in being thicker and ſtronger made, an in being more tractable; for inſtance, one had been ſo fa broken as to draw in a cart. The Hottentots alſo diſtinguiſh them from the former, by the names of *quagga* and *ofeagha*.

BARBA, in botany, a ſpecies of *pubes*, or down, with which the ſurface of ſome plants is covered. The term was invented by Linnæus; and by its application in the *Species Plantarum*, ſeems to ſignify a tuft or bunch of ſtrong hairs terminating the leaves. *Meſembryanthemum barbatum* furniſhes an example.

The word is alſo often uſed in compoſition with ſome other, to form the trivial names of ſeveral plants, as, *barba jovis*, *barba capræ*, &c.

BARBACAN, or BARBICAN, an outer defence or fortification to a city or caſtle, uſed eſpecially as a fence to the city or walls; alſo, an aperture made in the wall of a fortreſs, to fire through upon an enemy.

BARBACAN is alſo uſed to denote a fort at the entrance of a bridge, or the outlet of a city, having a double wall with towers.

BARBADOES, the moſt eaſterly of all the Caribbee Iſlands, ſubject to Great Britain, and, according to the beſt geographers, lying between 59. 50. and 60. 2. of weſt longitude, and between 12. 56. and 13. 16. of north latitude. Its extent is not certainly known: the moſt general opinion is, that it is 25 miles from north to ſouth, and 15 from eaſt to weſt; but theſe menſurations are ſubject to ſo many difficulties and uncertainties, that it will perhaps convey a more adequate idea of this iſland to tell the reader that in reality it does not contain above 107,000 acres. The climate is hot, but not unwholeſome, the heat being qualified by ſea-breezes; and a temperate regimen renders this iſland as ſafe to live in as any climate ſouth of Great Britain; and, according to the opinion of many, as even Great Britain itſelf. This iſland has on its eaſt ſide two ſtreams that are called *rivers*, and in the middle is ſaid to have a bituminous ſpring which ſends forth a liquor like tar, and ſerves for the ſame uſes as pitch or lamp oil. The iſland abounds in wells of good water, and has ſeveral reſervoirs

for rain-water. Some parts of the ſoil are ſaid to be hollowed into caves, ſome of them capable of containing 300 people. Theſe are imagined to have been the lurking-places of run-away negroes, but may as probably be natural excavations. The woods that formerly grew upon the iſland have been all cut down, and the ground converted into ſugar plantations. When thoſe plantations were firſt formed, the ſoil was prodigiouſly fertile, but has ſince been worn out, inſomuch that, about the year 1730, the planters were obliged to raiſe cattle for the ſake of their dung, by which means the profit of their plantations was reduced to leſs than a tenth of its uſual value. Notwithſtanding the ſmallneſs of Barbadoes, its ſoil is various; being in ſome places ſandy and light, yet very rich, and in others ſpungy; but all of it is cultivated according to its proper nature, ſo that the iſland preſents to the eye the moſt beautiful appearance that can be imagined. Oranges and lemons grow in Barbadoes in great plenty, and in their utmoſt perfection. The lemon juice here has a peculiar fragrancy. The citrons of Barbadoes afford the beſt drams and ſweetmeats of any in the world, the Barbadoes ladies excelling in the art of preſerving the rind of the citron fruit. The juice of the limes, or dwarf lemons, is the moſt agreeable ſouring we know, and great quantities of it have of late been imported into Britain and Ireland. The pine apple is alſo a native of Barbadoes, and grows there to much greater perfection than it can be made to do in Europe by any artificial means. A vaſt number of different trees peculiar to the climate are alſo found to flouriſh in Barbadoes in great perfection; ſuch as the aloe, mangrove, calabaſh, cedar, cotton, maſtic, &c. Here likewiſe are produced ſome ſenſitive plants, with a good deal of garden ſtuff, which is common in other places. In ſhort, a native of the fineſt, the richeſt, and moſt diverſified country in Europe, can hardly form an idea of the variety of delicious and at the ſame time nutritive vegetable productions which this iſland affords.

When firſt diſcovered by the Engliſh, there were few or no quadrupeds in Barbadoes, except hogs, which had been left there by the Portugueſe. For convenience of carriage to the ſea-ſide, ſome of the planters at firſt procured camels; which undoubtedly would in all reſpects have been preferable to horſes for their ſugar and other works; but the nature of the climate diſagreeing with that animal, it was found impoſſible to preſerve the breed. They then applied for horſes to Old and New England: from the former they had thoſe that were fit for ſhow and draught; from the latter thoſe that were proper for mounting their militia, and for the ſaddle. They had likewiſe ſome of an inferior breed from Curaſſao, and other ſettlements. They are reported to have had their firſt breed of black cattle from Bonaviſta and the iſle of May; which now breed upon the iſland, and often do the work of horſes. Their aſſes are very ſerviceable in carrying burdens to and from the plantations. The hogs of Barbadoes are finer eating than thoſe of Britain, but the few ſheep they have are not near ſo good. They likewiſe have goats, which when young are excellent food. Racoons and monkeys are alſo found here in great abundance. A variety of birds are produced on Barbadoes, of which the humming bird is the moſt remarkable. Wild fowl do not often frequent this iſland; but ſometimes teal are found near their ponds. A bird which they call the *man of war*, is ſaid to meet ſhips at 20 leagues from land, and their return is, to the inhabitants, a ſure ſign of the arrival of theſe ſhips. When the wind blows from the ſouth and ſouth-weſt, they have flocks of curlews, plovers, ſnipes, wild pigeons, and wild ducks. The wild pigeons are very fat and plentiful at ſuch ſeaſons, and rather larger than thoſe of England. The tame pigeons, pullets, ducks, and poultry of all kinds, that are bred at Barbadoes, have alſo a fine flavour, and are accounted more delicious than thoſe of Europe. Their rabbits are ſcarce; they have no hares; and if they have deer of any kind, they are kept as curioſities. The inſects of Barbadoes are not venomous, nor do either their ſnakes or ſcorpions ever ſting. The muſkettos are troubleſome, and bite; but are more tolerable in Barbadoes than on the continent. Various other inſects are found on the iſland, ſome of which are troubleſome, but in no greater degree than thoſe that are produced by every warm ſummer in England. Barbadoes is well ſupplied with fiſh; and ſome caught in the ſea ſurrounding it are almoſt peculiar to itſelf; ſuch as the parrot-fiſh, ſnappers, grey cavallos, terbums, and concy fiſh. The mullets, lobſters, and crabs, caught here are excellent; and the green turtle is perhaps the greateſt delicacy that ancient or modern luxury can boaſt of. At Barbadoes this delicious ſhell-fiſh ſeldom ſells for leſs than a ſhilling a pound, and often for more. There is found in this iſland a kind of land-crab which eats herbs wherever it can find them, and ſhelters itſelf in houſes and hollows of trees. According to report, they are a ſhell-fiſh of paſſage; for in March they travel to the ſea in great numbers. See CANCER.

The inhabitants may be reduced to three claſſes; viz. the maſters, the white ſervants, and the blacks. The former are either Engliſh, Scots, or Iriſh: but the great encouragement given by government to the peopling of this and other Weſt Indian iſlands, induced ſome Dutch, French, Portugueſe, and Jews, to ſettle among them with their eſtates; by which, after a certain time, they acquire the rights of naturalization in Great Britain. The white ſervants, whether by covenant or purchaſe, lead more eaſy lives than the day-labourers in England; and when they come to be overſeers, their wages and other allowances are conſiderable. As to the treatment of the negro ſlaves in this and the other iſlands, that falls to be ſpoken of under the ſeveral heads to which the ſubject belongs. The manners of the white inhabitants, in general, are the ſame as in moſt polite towns and countries in Europe. The capital of the iſland is called *Bridge-Town*.

The hiſtory of this iſland furniſhes no very remarkable events, the following ſhort hints concerning it may therefore ſuffice. When the Engliſh, ſome time after the year 1625, firſt landed here, they found it the moſt ſavage and deſtitute place they had hitherto viſited. It had not the leaſt appearance of ever having been peopled even by ſavages. There was no kind of beaſts of paſture, or of prey, no fruit, no herb, no root fit for ſupporting the life of man. Yet as the climate was ſo good, and the ſoil appeared fertile, ſome gentlemen of ſmall fortune in England reſolved to become adventurers thither. The trees were ſo large, and of a wood ſo hard and ſtubborn, that it was with great difficulty they could clear as much ground as was neceſſary for their ſubſiſtence. By unremitting perſeverance, however, they brought it to yield them a tolerable ſupport; and they found that cotton and indigo agreed well with the ſoil; and that tobacco, which was beginning to come into repute in England, anſwered tolerably. Theſe proſpects, together with the ſtorm between the king and parliament, which was beginning to break out in England, induced many new adventurers to tranſport themſelves into this iſland. And what is extremely remarkable, ſo great was the increaſe of people in Barbadoes, 25 years after its firſt ſettlement, that in 1650 it contained more than 50,000 whites, and a much greater number of negro and Indian ſlaves. The latter they acquired by means not at all to their honour: for they ſeized upon all thoſe unhappy men, without any pretence, in the neighbouring iſlands, and carried them into ſlavery; a practice which has rendered the Caribbee Indians irreconcileable to us ever ſince. They had begun a little before this to cultivate ſugar, which ſoon rendered them extremely wealthy. The

number of ſlaves, therefore, was ſtill augmented; and in 1676 it is ſuppoſed that their number amounted to 100,000, which, together with 50,000 whites, make 150,000 on this ſmall ſpot: a degree of population unknown in Holland, in China, or any other part of the world moſt renowned for numbers. At this time Barbadoes employed 400 ſail of ſhips, one with another, of 150 tons in their trade. Their annual exports, in ſugar, indigo, ginger, cotton, and citron-water, were above 35,000l. and their circulating caſh at home was 200,000l. Such was the increaſe of population, trade, and wealth, in the courſe of 50 years. But ſince that time this iſland has been much on the decline; which is to be attributed partly to the growth of the French ſugar colonies, and partly to our own eſtabliſhments in the neighbouring iſles. Their numbers at preſent are ſaid to be 20,000 whites and 100,000 ſlaves. Their commerce conſiſts of the ſame articles, though they do not deal in them to ſo great an extent as formerly.

Barbadoes-*Tar*, *Petroleum Barbadenſe*, a mineral fluid of the nature of the thicker fluid bitumens, of a naſeous bitteriſh taſte, and very ſtrong and diſagreeable ſmell, found in many parts of America trickling down the ſides of the mountains, and ſometimes floating on the ſurface of the waters. It has been found very beneficial in coughs and other diſorders of the breaſt and lungs, and it is on this account that a ſolution of the flowers of ſulphur in this fluid, is included in the reviſed pharmacopœia of the London College, under the name of *petroleum ſulphuratum*.

BARBARA, among logicians, the firſt mode of the firſt figure of ſyllogiſms. A ſyllogiſm in barbara is one whereof all the propoſitions are univerſal and affirmative; the middle term being the ſubject of the firſt propoſition, and attribute in the ſecond.

Examp. Bar. Every wicked man is miſerable;
Ba. All tyrants are wicked men;
Ra. Therefore all tyrants are miſerable.

BARBARIAN, a name given by the ancient Greeks and Romans to all who were not of their own country, or were not initiated in their language, manners, and cuſtoms. In this ſenſe, the word ſignified with them no more than foreigner; not ſignifying, as among us, a wild, rude, or uncivilized perſon. Strabo derives the word βαρβαρος from βαρβαζειν, *balbutire*, becauſe foreigners coming to Athens uſed to ſtammer, or ſpeak coarſely. Others derive it from βαρβω, a word that foreigners frequently ſtumbled on, which yet had no meaning.

BARBARICARII, in *Antiquity*, a kind of Artiſts, who, with threads of divers colours, expreſſed the figures of men, animals, and other things; or, as others deſcribe them, thoſe whoſe buſineſs was to gild, and decorate ſhields and helmets with gold and ſilver. The *barbaricarii* were ſo called, becauſe they learned this kind of painting from the Phrygians, who were particularly denominated *barbarians*, in regard of their oppoſition to the Greeks; though the name is ſometimes alſo written *branbaricarri*.

Barbaricarii ſeems alſo to have been uſed for ſoldiers or officers, who wore maſks and vizards thus adorned with gold and ſilver.

BARBARICUM, in *Ancient Writers*, is uſed for a military ſhout, raiſed by ſoldiers on the point of engaging an enemy. This is called *barbaricum* from the barbarians, in whoſe armies this method of ſhouting much obtained.—The ſame appellation was given to a war, or expedition undertaken againſt the barbarians. *Quouſque ad ipſum tempus quo barbaricum extortum eſt inter nos & vos.*

Barbaricum was alſo uſed for an armoury, or magazine, wherein the Greek emperors kept the ſpoils, and donaries, taken from the barbarians in time of war or peace.

Barbaricum is alſo an appellation given by the modern Greeks to rhubarb. It was thus called from the *Sinus Barbaricus*, by the way of which this root was firſt brought to them.

BARBARISM, in *Grammar*, denotes an offence againſt the purity of ſtyle or language. A *barbariſm* differs, according to Iſidore, from a *barbarous term*, as the former, for inſtance, is Latin, though corrupt or miſuſed; whereas the latter, which this writer called *barbarologia*, is a word merely foreign, intruded into Latin ſpeech.

In general, under the term *barbariſms* are comprehended things written, ſpoken, declined, or conjugated wrong; or uſed in a wrong quantity, or in an unuſual ſenſe; as when a word is uſed which is foreign to the language, and not received by the better and purer ſort of writers. Such are *liper* for *liber*, *ſyllăba* for *ſyllăba*, *patri* for *patris*, *lexi* for *legi*, *bannus* for *proſcriptio*, &c. *Barbariſm* is often charged, with great juſtice, on modern writers in the learned languages. The Latin books of late ages are full of Angliciſms, Galliciſms, Germaniciſms, &c. according to the country of the author. But what ſhall we ſay to Caſp. Scioppius, who accuſes Cicero himſelf of *barbariſms* in his own language?

There are great diſputes among critics concerning *barbariſms* in the New Teſtament. Pious perſons are indeed ſtartled at the apprehenſion of any thing like a *barbariſm* in the inſpired books, as ſuppoſing it an objection to the authenticity of them; yet this does not by any means render them dubious. It is true, many of the Jews, after Abarbanel and others, ſtill point out *barbariſms* in the Old Teſtament; and in this they are ſeconded by M. Simon, Le Clerc, and others. Several of the prophets are ſaid to have been unacquainted with the language they wrote in, particularly Jeremiah.

Barbarism, *barbaries*, is alſo uſed for that rudeneſs of mind, wherein the underſtanding is neither furniſhed with uſeful principles, nor the will with good inclinations.

BARBAROSSA (Aruch, and Hayradin), were two famous corſairs, the ſons of a potter in the iſle of Leſbos; who, turning pirates, carried on their depredations with ſuch ſucceſs and conduct, that they were ſoon poſſeſſed of 12 galleys beſide ſmaller veſſels. Of this fleet Aruch the elder brother called *Barbaroſſa* from the redneſs of his beard, was admiral and Hayradin the ſecond in command: they called themſelves the *friends of the ſea*, and the *enemies of all who ſailed upon it*; and their names became terrible from the ſtraits of Dardanelles to thoſe of Gibraltar. With ſuch a power they wanted an eſtabliſhment; and the opportunity of ſettling themſelves offered in 1516, by the inconſiderate application of Eutemi king of Algiers to them for aſſiſtance againſt the Spaniards. Aruch, leaving his brother to command the fleet, carried 5,000 men to Algiers, where he was received as their deliverer; and ſecretly murdering the prince he came to aid, cauſed himſelf to be proclaimed king in his ſtead. To this uſurpation he added the conqueſt of Tremecen; when his exploits and piracies induced the Emperor Charles V. to furniſh the Marquis de Gomarez governor of Oran with troops to ſuppreſs him: by whom he was defeated and killed near Tremecen. His brother Hayradin, known alſo by the name of *Barbaroſſa*, aſſumed the ſceptre at Algiers with the ſame abilities, and with better fortune; for the Spaniards, ſufficiently employed in Europe, giving him no diſturbance, he regulated the interior police of his kingdom with great prudence, carried on his naval operations with vigour, and extended his conqueſts on the continent of Africa. He put his dominions under the protection of the Grand Signior, Solyman the Magnificent, and obtained the command of the Turkiſh fleet. With ſo powerful a protector, he acquired the kingdom of Tunis in a manner ſimilar to that by which his brother gained Algiers. Since the time of the Barbaroſſas, Algiers has been underſtood

to be dependent on the Porte; but this dependence is now little more than merely a nominal kind of ſubmiſſion.

BARBAROUS, in a general ſenſe, denotes ſomething that partakes of the quality of BARBARISM. In this ſenſe we ſay a *barbarous* nation, age, writer, &c. *Barbarous* Latin words are innumerable; the ſchoolmen are full of them. The chemiſts, phyſicians, lawyers, can ſcarcely write without employing them. Du-Cange has given two large volumes in folio of barbarous Latin words, and as many of barbarous words from the Greek. The modern or vulgar Greek is ſometimes called *barbarous* Greek, *barbaro Greca*, or *Greco-barbara-lingua*. Langius has publiſhed *Philologia Barbaro-Greca*, *Grammatica Barbaro-Greca*, or *Gloſſarium Barbaro-Grecum*.

BARBARY, a country of Africa, included between the Atlantic Ocean, the Mediterranean Sea, and Egypt, and containing the kingdoms of Barca, Tripoli, Tunis, Algiers, Fez, and Morocco. It is near 2000 miles in length, and, in ſome places, 750 in breadth. It was known to the ancients by the names of Mauritania, Numidia, Proper Africa, and Libya. It is the beſt country in all Africa, except Egypt; and fertile in corn, maize, wine, citrons, oranges, figs, almonds, olives, dates, and melons. Their chief trade conſiſts in their fruits, in the horſes called barbs, Morocco leather, oſtrich-feathers, indigo, wax, tin, and coral. The eſtabliſhed religion is the Mahometan, and there are ſome Jews; but no Chriſtians, except the ſlaves.

Concerning the origin of the name *Barbary*, there are many conjectures. According to ſome, the Romans, after they had conquered this large country, gave it that name out of contempt and diſlike to the barbarous manners of the natives, according to the cuſtom of calling all other people but themſelves *Barbarians*. Marmol, on the contrary, derives the word *Barbary* from *Berber*, a name which the Arabs gave to its ancient inhabitants, and which they retain to this day in many parts of the country, eſpecially along the great ridge of the mountains of Atlas; and which name was given them on account of the barrenneſs of their country. According to Leo Africanus, the name of Barbary was given by the Arabs on account of the ſtrange language of the natives, which appeared to them more like a murmur or grumbling of ſome brute animals than articulate ſounds. Others, however, derive it from the Arabic word *bar*, ſignifying a deſert, twice repeated; which was given by one *Iſric*, or *Africus*, a king of Arabia, from whom the whole continent of Africa is pretended to have taken its name. According to them, this king being driven out of his own dominions, and cloſely purſued by his enemies, ſome of his retinue called out to him *Bar*, *bar*; that is, *To the deſert*, *To the deſert*; from which the country was afterwards called *Barbary*.

Among the Romans this country was divided into the provinces of Mauritania, Africa Propria, &c. and they continued abſolute maſters of it from the time of Julius Cæſar till the year of Chriſt 428.

BARBATED *leaf*, in Botany, is a leaf terminated by a bunch of ſtrong hairs.

BARBATELLI (Bernardino), otherwiſe called *Pochetti*, a painter of hiſtory, fruit, animals, and flowers, was born at Florence in 1542. He was the diſciple of Ridolfo Ghirlandaio at Florence; from whoſe ſchool he went to Rome, and ſtudied there with ſuch uncommon aſſiduity, that he was frequently ſo abſtracted, and ſo abſolutely engroſſed by the objects of his contemplations, as to forget the neceſſary refreſhments of ſleep and food. He excelled in painting every ſpecies of animals, fruit, or flowers; and in thoſe ſubjects was thought not only to imitate, but equal nature. His touch was free, light, and delicate, and the colouring of his objects inexpreſſibly true; and, beſide his merit in his moſt uſual ſtyle of painting, the hiſtorical ſubjects which he deſigned from ſacred or profane authors were much eſteemed and admired. He died in 1612.

BARBATINA, or SEMEN *contra*, a kind of ſeed formerly much uſed for extirpating worms from children. It comes from Perſia, and from the borders of Muſcovy. This ſeed, to be good, ought to be plump, of an agreeable ſcent, and very green. Great care muſt be taken that it be not dyed green, and that the ſeed of ſouthern-wood, which has a near reſemblance, be not ſold inſtead of it.

BARBATULA, in Ichthyology, a ſpecies of the COBITIS.

BARBATUS *Piſcis*, in Ichthyology, a name given by Salvian, and ſome others, to the SILURUS, called in Engliſh the *ſkeat-fiſh*; the *glanus* of Pliny and the ancients. This Artedi deſcribes under the name of the *ſilurus* with four *cirri*, or beards, at the mouth. By this it is diſtinguiſhed from the fiſh called the *lake* or *alkuſſa*, which, though a genuine ſpecies of *ſilurus*, has only one beard.

BARBE, or BARB. See BARB.

BARBE, in the military art. To fire in barbe, means to fire the cannon over the parapet, inſtead of firing through the embraſures; in which caſe, the parapet muſt not be above three feet and a half high.

BARBE, or BARDE, is an old word, denoting the armour of the horſes of the ancient knights and ſoldiers, who were accoutred at all points. It is ſaid to have been an armour of iron and leather, wherewith the neck, breaſt, and ſhoulders of the horſe were covered.

BARBE (St.), a town of Biſcay in Mexico, near which are rich ſilver mines W. long. 109. 55. N. lat. 26. 0.

BARBED, in a general ſenſe, bearded like a fiſh-hook ſet with barbs; alſo ſhaved or trimmed.

BARBED *and Creſted*, in Heraldry, an appellation given to the combs and gills of a cock, when particularized for being of a different tincture from the body.

A *barbed croſs*, is a croſs the extremities whereof are like the barbed irons uſed for ſtriking great fiſh.

BARBEL, in Ichthyology, a ſpecies of *Cyprinus*; a genus of fiſhes of the order abdominales. In this genus, the mouth is toothleſs; there are three rays in the gills; the body is ſmooth and white; and the belly-fins have frequently nine rays. There are 31 ſpecies, principally diſtinguiſhed by the number of rays in the vent-fin. The moſt remarkable are,

1. The *barbus*, or barbel, is ſo extremely coarſe as to be overlooked by the ancients till the time of the poet Auſonius, who gives it no great character. They frequent the ſtill and deep parts of rivers, and live in ſociety, rooting like ſwine with their noſes in the ſoft banks. It is ſo tame as to ſuffer itſelf to be taken by the hand; and people have been known to take numbers by diving for them. In ſummer they move about during night in ſearch of food; but towards autumn, and during winter, confine themſelves to the deepeſt holes The barbel is about the length of three feet, and will weigh 18 pounds; the belly white; the dorſal fin is armed with a remarkably ſtrong ſpine, ſharply ſerrated, with which it can inflict a very ſevere and dangerous wound on the incautious handler, and even do much damage to nets. They are the worſt and coarſeſt of freſh-water fiſh, and ſeldom eaten but by the poorer ſort of people, who ſometimes boil them with a bit of bacon to give them a reliſh. Their roe is very noxious, affecting thoſe who unwarily eat of it with a nauſea, vomiting, purging, and a ſlight ſwelling over the whole body.

2. The *carpio*, or carp. This was introduced into England about the year 1514, by Leonard Muſchal, to whom we are alſo indebted for that excellent apple the *pepin*. Ruſſia wants

theſe fiſh at this day. Sweden has them only in the ponds of people of faſhion. They chiefly abound in the rivers and lakes of Poliſh Pruſſia, where they are ſometimes taken of a vaſt ſize. They are there a great article of commerce, and ſent in well-boats to Sweden and Ruſſia. The merchants purchaſe them out of the waters, of the nobleſſe of the country, who draw a good revenue from this article. The ancients do not ſeparate the carp from the ſea-fiſh. They are ſometimes found in the harbour of Dantzic between the town and a place called *Hela*.

It is ſaid that carp are very long-lived. Geſner brings an inſtance of one that was near 100 years old. They grow alſo to a very great ſize; ſome authors ſpeak of carp weighing 200 pounds weight, and five feet in length. The carp is a prodigious breeder: its quantity of roe has been ſometimes found ſo great, that when taken out and weighed againſt the fiſh itſelf, the former has been found to preponderate. From the ſpawn of this fiſh, caviare is made for the Jews, who hold the ſturgeon in abhorrence. The carp is extremely cunning, and on that account is ſometimes ſtyled the *river-fox*. They will ſometimes leap over the nets and eſcape that way; at other times they will immerſe themſelves ſo deep in the mud as to let the net paſs over them. They are alſo very ſhy in taking a bait; yet at the ſpawning-time they are ſo ſimple as to ſuffer themſelves to be tickled, handled, and caught by any body that will attempt it. This fiſh is apt to mix its milt with the roe of other fiſh; from which is produced a ſpurious breed, as has been obſerved in the offſpring of the carp and tench, which bore the greateſt reſemblance to the firſt. The ſame has alſo been obſerved of the carp and bream.

In Poliſh Pruſſia, and many other parts of Germany, the ſale of carp conſtitutes a part of the revenue of the nobility and gentry: ſo that the proper management of that fiſh is reduced to a kind of ſyſtem, founded on the experience of ſeveral generations. Of the methods there practiſed, we have an account in the Philoſophical Tranſactions for 1771, art. 37. communicated by Mr. J. Reinhold Forſter, who ſays, he has ſeen carp treated and maintained according to thoſe methods, "above a yard long, and of 25 pounds weight:" but had no opportunity of aſcertaining their age. "In the pond, however, at Charlottenburg (he adds), a palace belonging to the king of Pruſſia, I ſaw more than two or three hundred carp, between two and three feet long; and I was told by the keeper they were between 50 and 60 years ſtanding. They were tame, and came to the ſhore in order to be fed; they ſwallowed with eaſe a piece of white bread of the ſize of half a halfpenny roll." Mr. Forſter, in this paper, alſo vouches a moſt extraordinary circumſtance, namely, the poſſibility of the carp's not only living for a conſiderable time out of water, but of its growing fat in its new element. The author has ſeen the experiment ſucceſsfully tried, and attended to the whole proceſs, in a nobleman's houſe where he then reſided, in the principality of Anhalt-Deſſau. The fiſh, being taken out of the water, is wrapped up in a large quantity of wet moſs, ſpread on a piece of net, which is then gathered into a purſe; in ſuch a manner, however, as to allow him room to breathe. The net is then plunged into water, and hung up to the ciel-ing of a cellar. At firſt the dipping muſt be repeated every three or four hours; but afterwards the carp need only to be plunged into the water once in about ſix or ſeven hours. Bread ſoaked in milk is firſt given him in ſmall quantities. In a ſhort time, the fiſh will bear more, and grow fat under this ſeemingly unnatural treatment. Mr. Daines Barrington, in a note, confirms a part of the preceding account, by mentioning the practice of a certain fiſhmonger near Claremarket, who, in the winter, frequently expoſes a buſhel at leaſt of carp and tench, for ſale, in the ſame dry veſſel, for ſix or ſeven hours; many of which are not ſold, and yet continue in health, though breathing nothing but air, during the time above-mentioned, for ſeveral days ſucceſſively.

3. The *tinca*, or tench, was treated with the ſame diſreſpect by the ancients as the barbel; but is now in much more repute. It has by ſome been called the *phyſician* of the fiſh; and its ſlime has been ſaid to be of ſo healing a nature, that the wounded fiſhes apply it as a ſtyptic. In this country it is reckoned a wholeſome and delicious food; but the Germans are of a different opinion. By way of contempt they call it the *ſhoemaker*. Geſner even ſays, that it is inſipid and unwholeſome. It does not commonly exceed four or five pounds in weight, though ſome have been known to weigh ten or twenty. They love ſtill waters, and are rarely found in rivers: they are very fooliſh and eaſily caught. The tench is thick and ſhort in proportion to its length. The colour of the back is duſky; the dorſal and ventral fins of the ſame colour; the head, ſides, and belly, of a greeniſh caſt, moſt beautifully mixed with gold, which is in its greateſt ſplendor when the fiſh is moſt in ſeaſon.

4. The *gudgeon* is generally found in gentle ſtreams, and is of a ſmall ſize, the largeſt not exceeding half a pound weight. They bite eagerly; and are aſſembled by raking the bed of the river; to this ſpot they immediately crowd in ſhoals, in expectation of food.

5. The *brama*, or bream, is an inhabitant of lakes, or the deep parts of ſtill rivers. It is a fiſh that is very little eſteemed, being extremely inſipid and taſteleſs.

6. The *rutilus*, or roach, is a common fiſh, found in many of the ſtill deep rivers of this country. They are gregarious, keeping in large ſhoals. It has never been known to exceed five pounds in weight.

7. The *luciſcus*, or dace, like the roach, is gregarious, haunts the ſame places, is a great breeder, very lively, and during ſummer is very fond of frolicking near the ſurface of the water. It never exceeds the weight of a pound and a half; the ſcales are ſmaller than thoſe of the roach.

8. The *cephalus*, or chub, is a very coarſe fiſh and full of bones. It frequents the deep holes of rivers; and in ſummer commonly lies on the ſurface beneath the ſhade of ſome tree or buſh. They are timid, and ſink to the bottom on the leaſt alarm, even at the paſſing of a ſhadow; but they will ſoon reſume their former ſituation. It feeds on worms, caterpillars, graſshoppers, and other coleopterous inſects that happen to fall into the water; and it will even feed on cray-fiſh. It will riſe to a fly. Some of this kind have been known to weigh eight or nine pounds.

9. The *alburnus*, or bleak. Theſe fiſh are very common in many of our rivers, and keep together in large ſhoals. At certain ſeaſons they ſeem to be in great agonies: they tumble about near the ſurface of the water, and are incapable of ſwimming far from the place; but in about two hours they recover and diſappear. Fiſh thus affected, the Thames fiſhermen call *mad* bleaks. They ſeem to be troubled with a ſpecies of *gordius*, or hair worm, which torments them ſo, that they riſe to the ſurface and then die. The bleak ſeldom exceeds five or ſix inches in length. Artificial pearls are made with the ſcales of this fiſh, and probably alſo with thoſe of the dace. They are beat into a fine powder, then diluted with water, and introduced into a thin glaſs bubble, which is afterwards filled with wax. The French were the inventors of this art. During the month of July there appear in the Thames, near Blackwall and Greenwich, innumerable multitudes of ſmall fiſh, known to the Londoners by the name of *white bait*. They are eſteemed very delicious when fried with fine flour; and occaſion, during the ſeaſon, a vaſt reſort of the lower order of epicures to the taverns at the places where they are taken. There are va-

rious ſuppoſitions concerning theſe fiſhes, all of which terminate in reckoning them the fry of ſome other fiſh. Mr. Pennant thinks they are of the carp kind, though he cannot determine the ſpecies to which they belong. They have a greater ſimilarity to the bleak than to any other, but he thinks they cannot be the young fry of this ſpecies; becauſe the bleak is found in many of the Britiſh ſtreams, but the white bait only in the Thames. The uſual length of this fiſh is two inches or thereabouts.

10. The *auratus*, or golden fiſh, a ſmall fiſh domeſticated by the Chineſe, and generally kept for ornament by great people in their courts and gardens. They breed them in ſmall ponds made for the purpoſe, in baſons, and even in porcelain veſſels. This fiſh is no larger than our pilchard. The male is of a bright red colour from the top of the head to the middle of the body: the reſt is of a gold colour; but it is ſo bright and ſplendid, that the fineſt gilding, according to F. le Comte, cannot approach it. The female is white; but its tail and half of its body reſemble the luſtre of ſilver. F. du Halde, however, obſerves, that a red and white colour are not always the diſtinguiſhing marks of the male and female; but that the females are known by ſeveral white ſpots which are ſeen round the orifices that ſerve them as organs of hearing, and the males, by having theſe ſpots much brighter. Gold-fiſh are light and lively; they love to ſport on the ſurface of the water, ſoon become familiariſed, and may even be accuſtomed to come and receive their food on ſounding a ſmall rattle. Great care is neceſſary to preſerve them; for they are extremely delicate, and ſenſible of the leaſt injuries of the air; a loud noiſe, ſuch as that of thunder or cannons; a ſtrong ſmell, a violent ſhaking of the veſſel, or a ſingle touch, will oft-times deſtroy them. Theſe fiſh live with little nouriſhment: thoſe ſmall worms which are engendered in the water, or the earthy particles that are mixed with it, are ſufficient for their food. The Chineſe, however, take care, from time to time, to throw into the baſons and reſervoirs where they are kept ſmall balls of paſte, which they are very fond of when diſſolved; they give them alſo lean pork dried in the ſun and reduced to a fine and delicate powder, and ſometimes ſnails: the ſlime which theſe inſects leave at the bottom of the veſſel is a great delicacy for them, and they eagerly haſten to feed on it. In winter they are removed from the court to a warm chamber, where they are kept generally ſhut up in a porcelain veſſel. During that ſeaſon they receive no nouriſhment; however, in ſpring, when they are carried back to their former baſon, they ſport and play with the ſame ſtrength and livelineſs as they did the preceding ſeaſon.

Theſe fiſh multiply faſt in warm countries, provided care be taken to collect their ſpawn, which floats on the water, and which they almoſt entirely devour. This ſpawn is put into a particular veſſel expoſed to the ſun, and preſerved there until viviſied by the heat: gold-fiſh, however, ſeldom multiply when they are kept in cloſe vaſes, becauſe they are then too much confined. In order to render them fruitful, they muſt be put into reſervoirs of conſiderable depth in ſome places at leaſt, and which are conſtantly ſupplied with freſh water. At a certain time of the year, a prodigious number of barks may be ſeen in the great river *Yangtſe-kiang*, which go thither to purchaſe the ſpawn of theſe fiſh. Towards the month of May, the neighbouring inhabitants ſhut up the river in ſeveral places with mats and hurdles, which occupy an extent of almoſt nine or ten leagues; and they leave only a ſpace in the middle ſufficient for the paſſage of barks. The ſpawn of the fiſh, which the Chineſe can diſtinguiſh at firſt ſight, although a ſtranger could perceive no traces of it in the water, is ſtopped by theſe hurdles. The water mixed with ſpawn is then drawn up, and after it has been put into large veſſels, it is ſold to merchants, who tranſport it afterwards to every part of the empire. This water is ſold by meaſure, and purchaſed by thoſe who are deſirous of ſtocking their ponds and reſervoirs with fiſh.

Notwithſtanding the tenderneſs of theſe fiſh even in their native climates, they are now naturalized in Britain, where they even breed. They were firſt introduced into England about the year 1691; but were not generally known till 1728, when a great number were brought over, and preſented firſt to Sir Matthew Dekker, and by him circulated round the neighbourhood of London, from whence they have been diſtributed to moſt parts of the kingdom.

Though a cruel ſort of confinement to theſe poor animals, many perſons think extremely amuſing a glaſs bowl containing ſuch fiſhes. The double refractions of the glaſs and water repreſent them, when moving, in a ſhifting and changeable variety of dimenſions, ſhades, and colours; while the two mediums, aſſiſted by the concavo-convex ſhape of the veſſel, magnify and diſtort them vaſtly; not to mention that the introduction of another element and its inhabitants into our parlours engages the fancy in a very agreeable manner. Some people exhibit this ſort of fiſh in a very fanciful way; for they cauſe a glaſs bowl to be blown with a large hollow ſpace within that does not communicate with it. In this cavity they put a bird occaſionally; ſo that you may ſee a goldfinch or a linnet hopping as it were in the midſt of the water, and the fiſhes ſwimming in a circle round it. This whimſical ſight is often exhibited in the metropolis, in the windows of birdcage makers and others deſirous of drawing the attention of paſſengers to their ſhops.

BARBELICOTÆ, an ancient ſect of Gnoſtics, ſpoken of by Theodoret. Their doctrines were abſurd, and their ceremonies abominable. The doctrine of the *Barbelicotæ* was, that one of the æons, poſſeſſed of immortality, had commerce with a virgin ſpirit named *Barbeloth*, who demanded of him, firſt preſcience, then incorruptibility, and laſtly eternal life; all of which were granted to her: that being one day in a gayer humour than ordinary, ſhe conceived, and afterwards brought forth light, which being perfected by the unction of the Spirit, was called *Chriſt*. The child Chriſt deſired to have underſtanding, νους, and obtained it: after which, underſtanding, reaſon, incorruptibility, and Chriſt, united together; and from their union aroſe autogenes, αυτογενης. To theſe fables they add divers others. They were alſo denominated *Barbariani*.

BARBER, one who makes a trade of ſhaving or trimming the beards of other men for money. Anciently, a lute or viol, or ſome ſuch muſical inſtrument, was part of the furniture of a barber's ſhop, which was uſed then to be frequented by perſons above the ordinary level of the people, who reſorted to the barber either for the cure of wounds, or to undergo ſome chirurgical operations, or, as it was then called, to be *trimmed*, a word that ſignified either ſhaving or cutting and curling the hair; theſe, together with letting blood, were the ancient occupations of the barber-ſurgeon. As to the other important branch of ſurgery, the ſetting of fractured limbs, that was practiſed by another claſs of men called *bone-ſetters*, of whom there are hardly any now remaining. The muſical inſtruments in his ſhop were for the entertainment of waiting cuſtomers; and anſwered the end of a newſpaper, with which at this day thoſe who wait for their turn at the barber's amuſe themſelves.

BARBERINI (Francis), one of the moſt excellent poets of his age, was born at Barberino, in Tuſcany, in the year 1264. As his mother was of Florence, he ſettled in that city; where his profeſſion of the law, but eſpecially the beauty of his poetry, raiſed him a very conſiderable character. The greateſt part of his works are loſt; but that which is en-

titled the *Precepts of Love*, which is a moral poem calculated to inſtruct thoſe in their duty who have a regard for glory, virtue, and eternity, has had a better fate. It was publiſhed at Rome, adorned with beautiful figures, in 1640, by Frederic Ubaldini: he prefixed the author's life; and, as there are in the poem many words which are grown obſolete, he added a gloſſary to explain them, which illuſtrates the ſenſe by the authority of contemporary poets.

BARBERINO, a town of Tuſcany in Italy, ſituated at the foot of the Apennine mountains, in E. long. 12. 15. N. lat. 43, 40.

BARBERRY, in Botany. See BERBERIS.

BARBET, in Natural Hiſtory, a name given by M. Reaumur, and other of the French writers, to a peculiar ſpecies of the worms which feed on the pucerons or aphides. See APHIS.

BARBETS, the name of the inhabitants of ſeveral valleys in Piedmont, particularly thoſe of Lucern, Angrona, Perufa, and St. Martin.

BARBEZIEUX, a town of France, the department of Charente, and late province of Angoumois; and lies in W. long. 0. 5. N. lat. 45. 23.

BARBICAN, or BARBACAN. See BARBACAN.

BARBIERI (Giovanni Franceſco), otherwiſe called *Guercino da Cento*, an eminent hiſtorical painter, was born at Cento, a village not far from Bologna, in 1590. At firſt he was the diſciple of Benedetto Gennari; but he afterwards ſtudied for ſome time in the ſchool of the Caracci, though he did not adopt the manner of that famous academy. He ſeemed to prefer the ſtyle of Caravaggio to that of Guido or Albano, imagining it impoſſible to imitate nature truly, without the aſſiſtance of ſtrong lights, and ſtrong ſhadows; and from that principle, his light was admitted into his painting room from above. In effect, by the oppoſition of his ſtrong lights and ſhadows, he gave ſuch force to his pictures, that few, except thoſe of Caravaggio, can ſtand near them, and not ſeem feeble in their effect: however, that manner is cenſured as not being like nature, becauſe it makes objects appear as if they were ſeen by candle light, or by the brightneſs of a ſun-beam, which alone can juſtify the deepneſs of his ſhadowing. The principal attention of Guercino ſeems to have been fixed on arriving at perfection in colouring; he ſaw the aſtoniſhing effects produced by the colouring of the celebrated Venetian maſters; and obſerved, that notwithſtanding any imperfections in regard to grace, correctneſs, or elegance, the works of thoſe maſters were the objects of univerſal admiration. From which obſervation, he ſeems to have devoted his whole ſtudy to excel in colouring; as if he were convinced, that few are qualified to diſcern the elevation of thought, which conſtitutes the excellence of a compoſition; few may be touched with the grandeur or beauty of the deſign, or perhaps have a capacity to examine even the correctneſs of any part of a painting; and yet every eye, and even every imperfect judge of a picture, may be ſenſibly affected by the force and beauty of the colouring. His taſte of deſign was natural, eaſy, and often grand, but without any extraordinary ſhare of elevation, correctneſs, or elegance. The airs of his heads often want dignity, and his local colours want truth. However, there is great union and harmony in his colours, although his carnations are not very freſh; and in all his works there is a powerful and expreſſive imitation of life, which will for ever render them eſtimable. Towards the decline of his life, he obſerved that the clearer and brighter ſtyle of Guido and Albano had attracted the admiration of all Europe; and therefore he altered his manner, even againſt his own judgment. But he apologized for that conduct, by declaring, that in his former time he painted for fame, and to pleaſe the judicious; and he now painted to pleaſe the ignorant, and enrich himſelf. He died in 1666. The moſt capital performance of Guercino, is the hiſtory of S. Petronilla, which is conſidered as one of the ornaments of St. Peter's at Rome, and is much admired by travellers.

BARBIERI (Paolo Antonio) da Cento, painter of ſtill life and animals, was the brother of Guercino, and born at Cento in 1596. He choſe for his ſubjects fruit, flowers, inſects, and animals; which he painted after nature with a lively tint of colour, great tenderneſs of pencil, and a ſtrong character of truth and life. He died in 1640.

BARBILLONS, in the natural hiſtory of inſects, are certain bodies, uſually two in number, placed under the creature's head, and moveable at pleaſure, ſomewhat reſembling hands or fingers placed on a ſhort or broken arm. The word is a diminutive of the French *barbe*, beard.

BARBING is ſometimes uſed in Ancient Statutes for ſheering. Cloth is not to be exported till it be *barbed*, rowed, and ſhorn. 3 Hen. VII. c. 11.

BARBITOS, or BARBITON, an ancient inſtrument of muſic, mounted with three, others ſay ſeven, ſtrings; much uſed by Sappho and Alcæus, whence it is alſo denominated *Leſboum*. The *barbitos* is ſaid to have differed from the lyre and *cithara*; but wherein the preciſe difference lay, does not appear. Strabo makes it the ſame with the *ſambuca*. It is repreſented as yielding a grave, deep ſound, and, on that account, peculiarly fitted for Doric compoſitions. Anacreon is ſaid to be the inventor of the barbitos.

BARBLES, or BARBS, in Farriery, the Knots or ſuperfluous fleſh that grow up in the channels of a horſe's mouth that is, in the intervals that ſeparate the bars, and lie under the tongue. Theſe, which are alſo called *barbs*, obtain in black cattle as well as horſes, and obſtruct their eating. For the cure, they caſt the beaſt, take out his tongue, and clip off the barbles with a pair of ſciſſars, or cut them with a ſharp knife; others chooſe to burn them off with a hot iron.

BARBONI, in Ichthyology, a name given by many to the *mullus barbatus*, a fiſh greatly eſteemed at table, and caught in the Mediterranean, and ſome other ſeas.

BARBOTINE, a ſeed, otherwiſe called *ſemen ſantonicum* and *ſemen contra vermes*, in Engliſh, *wormſeed*.

BARBUDA, one of the Britiſh Caribbee iſlands, about 20 miles long and 12 broad. It is low land, but fruitful and pretty populous. The inhabitants addict themſelves to huſbandry, and find always a ready market for their corn and cattle in the ſugar iſlands. Barbuda is the property of the Codrington family, who have a great many negroes here as well as in Barbadoes. It lies in W. long. 61. 3. N. lat. 18. 5.

BARBULÆ, in Botany, a name given by Pliny to the *ſemi floſculi*.

BARBUS, in Ichthyology. See BARBEL.

BARBYLA, in Botany, a name by which Theocritus, another of the early writers, have called the common damaſk prune.

BARCA, a large country of Africa, lying on the coaſts of the Mediterranean ſea, between the kingdoms of Egypt and Tripoli, extending itſelf in length from eaſt to weſt from the 39th to the 46th degree of eaſt longitude, and in breadth from north to ſouth about 30 leagues, as is generally ſuppoſed. It is for the moſt part, eſpecially in the middle, a dry ſandy deſert; on which account the Arabs call it *Sahart*, or *Ceyara Barka*, that is, the deſert, or road of whirlwinds or hurricanes. It labours almoſt every where under a great ſcarcity of water, and except in the neighbourhood of towns and villages, where the ground produces ſome ſmall quantities of grain, ſuch as millet, and ſome maize, the reſt is in a manner quite barren and uncultivated, or, to ſpeak more properly, unimprovable; and even of that ſmall quantity which thoſe few ſpots produce

the poor inhabitants are obliged to exchange ſome part, with their indigent neighbours, for dates, ſheep, and camels, which they ſtand in much the greater need of, by reaſon of their great ſcarcity of graſs and other proper food; for want of which, thoſe that are brought to them ſeldom thrive or live long. In this country ſtood the famed temple of Jupiter Ammon; and notwithſtanding the pleaſantneſs of the ſpot where it ſtood, this part of the country is ſaid to have been the moſt dangerous of any, being ſurrounded with ſuch quick and burning ſands as are very dangerous to travellers; not only as they ſink under their feet, but, being light, and heated by the rays of the ſun, are eaſily raiſed by every breath of wind; which, if it chance to be in their faces, almoſt burns their eyes out, and ſtifles them for want of breath; or, if vehement, often overwhelms whole caravans. Againſt this temple Cambyſes, king of Perſia, diſpatched an army of 50,000 men. They ſet out from Thebes in Upper Egypt, and under the conduct of proper guides reached the city of Oaſis, ſeven days journey from that place: but what was their fate afterwards is uncertain; for they never returned either to Egypt or to their own country. The Ammonians informed Herodotus, that after the army had entered the ſandy deſert which lies beyond Oaſis, a violent wind began to blow from the ſouth at the time of their dinner, and raiſed the ſand to ſuch a degree, that the whole army was overwhelmed and buried alive in it.

With reſpect to the government or commerce of this country we know nothing certain. Moſt probably the maritime towns are under the protection of the Porte: but whether under the baſha of Egypt or Tripoli, or whether they have formed themſelves into independent ſtates like thoſe of Algiers and Tunis, we cannot ſay; only we are told that the inhabitants of the maritime towns are more civilized than thoſe that dwell in the inland parts. The firſt profeſs Mahometaniſm, and have imbibed ſome notions of humanity and juſtice; whilſt the latter, who have neither religion nor any ſign of worſhip among them, are altogether ſavage and brutiſh. They are a ſort of Arabs, and like them live entirely upon theft and plunder. By them this tract, which before was a continued deſert, was firſt inhabited. At their firſt coming in, they ſettled themſelves in one of the beſt places of the country; but as they multiplied, and had frequent wars with one another, the ſtrongeſt drove the weakeſt out of the beſt ſpots, and ſent them to wander in the deſert parts, where they live in the moſt miſerable manner, their country hardly affording one ſingle neceſſary of life. Hence it is that they are ſaid to be the ugliеſt of all the Arabs: their bodies being ſcarcely any thing but ſkin and bone, their faces meagre, with fierce ravenous looks; their garb, which is commonly what they take from the paſſengers who go through theſe parts, tattered with long wearing; while the pooreſt of them have ſcarce a rag to cover their nakedneſs. They are moſt expert and reſolute robbers, that being their chief employment and livelihood; but the travellers in theſe parts are ſo few, that the Barcans are often neceſſitated to make diſtant excurſions into Numidia, Libya, and other ſouthern countries. Thoſe that fall into their hands are made to drink plenty of warm milk; then they hang them up by the feet, and ſhake them, in order to make them vomit up any money they think they have ſwallowed; after which, they ſtrip them of all their clothes, even to the laſt rag: but with all this inhumanity, they commonly ſpare their lives, which is more than the other African robbers do. Yet notwithſtanding every artifice they can uſe, the Barcans are ſo poor, that they commonly let, pledge, or even ſell, their children to the Sicilians and others from whom they have their corn, eſpecially before they ſet out on journeys of any length.

BARCALAO, a Spaniſh word, which the French pronounce *baccala*, or *laccaliau*. By this laſt name the Baſques moſt commonly call the fiſh which we ſtyle cod; and thoſe people call alſo the iſland which we call Newfoundland, the iſle of *Baccaliau* (*Cod Iſland*), becauſe of the great plenty of cod caught there. There is, however, a league to the weſt of that large iſland, another ſmall one, which is more particularly called *Baccaliau*.

BARCALON, an appellation given to the prime miniſter of the king of Siam. The barcalon has in his department every thing relating to commerce, both at home and abroad. He is likewiſe ſuperintendant of the king's magazines.

BARCA-Longa, a large Spaniſh fiſhing-boat, navigated with lug ſails, and having two or three maſts. Theſe are very common in the Mediterranean.

BARCES, or Berches, were formerly a kind of ſhip-guns, not unlike ſakers, only ſhorter, thicker in metal, and wider in the bore.

BARCELONA, a handſome, large, and rich city of Spain, in Catalonia, of which it is the capital, with a biſhop's ſee, and a good harbour, on the Mediterranean ſea. It is of an oblong form, containing about 15,000 houſes, and is defended by a fort, called Mont Joy, which ſtands on a rocky mountain, a mile to the W. of the town. It has double walls on the N. and E. and the ſea on the S. with a mole running out for the ſecurity of ſhips. It is divided into the new and old town, ſeparated from each other by a wall and a ditch. There are ſeveral beautiful ſtreets and ſquares, which are very clean, and paved with large flag ſtones. It has a fine univerſity, beſide an inquiſition. It is adorned with ſeveral handſome ſtructures; the cathedral has two lofty towers; the palace of the viceroy is much admired; and the arſenal contains arms for ſeveral thouſand men. There is an exchange, and docks for the building of gallies. It is a place of great trade, and they make curious works in glaſs. The knives are likewiſe in great reputation, as well as the blankets. The inhabitants are induſtrious and polite, and the women handſome, lively, and free in their converſation. In 1705, Barcelona was taken by the earl of Peterborough, after a ſiege of three weeks. In 1706, Philip V. inveſted it with a numerous army; but Sir John Leake obliged him to raiſe the ſiege. In 1714, it was taken by the French and Spaniards, when it was deprived of all its privileges, and the citadel built to keep it in awe. It is 250 miles E. of Madrid. Lon. 2. 13. E. Lat. 41. 26. N.

BARCELONETTA, a town of France, in the department of the Lower Alps, and late province of Dauphiny, 12 miles S. E. of Embrun. Long. 6. 39. E. Lat. 44. 23. N.

BARCELORE, a town of Aſia, in the Eaſt Indies, on the coaſt of Malabar. It is a Dutch factory, where they carry on a conſiderable trade in pepper. E. long. 74. 15. N. lat. 13. 45.

BARCELOS, a town of Portugal, with the title of a duchy. It is ſeated on the river Cavado, over which there is a handſome bridge. W. long. 7. 0. N. lat. 41. 20.

BARCLAY (Robert), one of the moſt eminent among the Quakers, was the ſon of Colonel David Barclay, deſcended of the ancient family of Barclays, and born at Edinburgh in 1648. He was educated under an uncle at Paris, where the Papiſts uſed all their efforts to draw him over to their religion. He joined the Quakers in 1669, and diſtinguiſhed himſelf by his zeal and abilities in defence of their doctrines. In 1676 he publiſhed in Latin at Amſterdam his *Apology for the Quakers*; which is the moſt celebrated of his works, and eſteemed the ſtandard of the doctrine of the Quakers. The *Theſes Theologicæ*, which were the foundation of this work, and addreſſed to the clergy of what ſort ſoever, were publiſhed before the writing of the *Apology*, and printed in Latin, French, High-Dutch, Low-Dutch, and Engliſh. The dedication of his *Apology* to King Charles II. is very remarkable for the uncom-

mon frankneſs and ſimplicity with which it is written. Amongſt many other extraordinary paſſages, we meet with the following: "There is no king in the world who can ſo experimentally teſtify of God's providence and goodneſs; neither is there any who rules ſo many free people, ſo many true Chriſtians; which thing renders thy government more honourable, thyſelf more conſiderable, than the acceſſion of many nations filled with ſlaviſh and ſuperſtitious ſouls. Thou haſt taſted of proſperity and adverſity; thou knoweſt what it is to be baniſhed thy native country, to be over-ruled as well as to rule and ſit upon the throne; and being oppreſſed, thou haſt reaſon to know how hateful the oppreſſor is both to God and man: if, after all thoſe warnings and advertiſements, thou doſt not turn unto the Lord with all thy heart, but forget him who remembered thee in thy diſtreſs, and give up thyſelf to follow luſt and vanity, ſurely great will be thy condemnation." He travelled with the famous Mr. William Penn through the greateſt part of England, Holland, and Germany, and was every where received with the higheſt reſpect; for though both his converſation and behaviour were ſuitable to his principles, yet there was ſuch livelineſs and ſpirit in his diſcourſe, and ſuch ſerenity and cheerfulneſs in his deportment, as rendered him extremely agreeable to all ſorts of people. When he returned to his native country, he ſpent the remainder of his life in a quiet and retired manner. He died at Ury on the 3d of October 1690, in the 42d year of his age, greatly lamented.

BARCOCHEBAS, or rather BARCOCHAB, a Jewiſh impoſtor, whoſe real name was *Akiba;* but he took that of *Barcochab*, which ſignifies the *Son of a Star*; in alluſion to the prophecy of Balaam, "There ſhall a ſtar ariſe out of Jacob." He proclaimed himſelf the Meſſiah; and talking of nothing but wars, victories, and triumphs, made his countrymen riſe againſt the Romans, by which means he was the author of innumerable diſorders: he ravaged many places, took a great number of fortreſſes, and maſſacred an infinite multitude of people, particularly the Chriſtians. The emperor ſent troops to Rufus, governor of Judea, to ſuppreſs the ſedition. Rufus, in obedience, exerciſed a thouſand cruelties, but could not finiſh his attempt. The emperor was therefore obliged to ſend Julius Severus, the greateſt general of that time; who attained his end without a direct battle. He fell on them ſeparately; cut off their proviſions; and at laſt the whole conteſt was reduced to the ſiege of Bitter, in the 18th year of Hadrian. The impoſtor periſhed there. This war coſt the Romans a great number of lives.

BARCONE, a ſhort broad veſſel, of a middle ſize, uſed in the Mediterranean ſea for the carriage of corn, wood, ſalt, and other proviſions, from one place to another.

BARD, a word denoting one who was a poet by his genius and profeſſion; and "who ſung of the battles of heroes, or the heaving breaſts of love." *Oſſian's Poems*, I. 37.

The curioſity of man is unbounded with reſpect to the tranſactions of his own ſpecies; and when theſe are deſcribed in excellent verſe, accompanied with muſic, the performance is enchanting. An ear, a voice, ſkill in inſtrumental muſic, and, above all, a poetical genius, are requiſite to excel in that complicated art. As ſuch talents are rare, the few that poſſeſſed them were highly eſteemed; and hence the profeſſion of a bard, which, beſides natural talents, required more culture and exerciſe than any other known art. Anciently, bards were capital perſons at every feſtival and at every ſolemnity. Their ſongs, which, in recording the achievements of heroes, animated each hearer, muſt have been the entertainment of every warlike nation. We have Heſiod's authority, that in his time bards were as common as potters or joiners, and as liable to envy. Demodocus is mentioned by Homer as a celebrated bard; and Phemius, another bard, is introduced by him deprecating the wrath of Ulyſſes in the following emphatic terms:

"O King! to mercy be thy ſoul inclin'd,
"And ſpare the poet's ever-gentle kind:
"A deed like this thy future fame would wrong,
"For dear to gods and men is ſacred ſong.
"Self-taught I ſing; by heav'n, and heav'n alone,
"The genuine ſeeds of poeſy are ſown;
"And (what the gods beſtow) the lofty lay,
"To gods alone, and godlike worth, we pay.
"Save then the poet, and thyſelf reward;
"'Tis thine to merit, mine is to record."

ODYSSEY, viii.

According to Cicero, the virtues and exploits of their great men were ſung at the Roman feſtivals. The ſame cuſtom prevailed in Peru and Mexico, as we learn from Garcilaſſo and other authors. We have for our authority Father Gobien, that even the inhabitants of the Marian iſlands have bards, who are greatly admired, becauſe in their ſongs are celebrated the feats of their anceſtors.

In no part of the world, however, did the profeſſion of a bard appear with ſo great luſtre as in Gaul, in Britain, and in Ireland. Wherever the Celtæ or Gauls are mentioned by ancient writers, we ſeldom fail to hear of their druids and their bards; the inſtitution of which two orders was the capital diſtinction of their manners and policy. The druids were their philoſophers and prieſts; the bards, their poets and recorders of heroic actions: and both theſe orders of men ſeem to have ſubſiſted among them, as chief members of the ſtate, from time immemorial. The Celtæ poſſeſſed, from very remote ages, a formed ſyſtem of diſcipline and manners, which appears to have had a deep and laſting influence. Ammianus Marcellinus gives them this expreſs teſtimony, that there flouriſhed among them the ſtudy of the moſt laudable arts; introduced by the bards, whoſe office it was to ſing in heroic verſe the gallant actions of illuſtrious men; and by the druids, who lived together in colleges or ſocieties, after the Pythagorean manner, and philoſophizing upon the higheſt ſubjects, aſſerted the immortality of the human ſoul. Though Julius Cæſar, in his account of Gaul, does not expreſsly mention the bards; yet it is plain, that, under the title of *Druids*, he comprehends that whole college or order; of which the bards, who, it is probable, were the diſciples of the druids, undoubtedly made a part. It deſerves remark, that, according to his account, the druidical inſtitution firſt took riſe in Britain, and paſſed from thence into Gaul; ſo that they who aſpired to be thorough maſters of that learning were wont to reſort to Britain. He adds too, that ſuch as were to be initiated among the druids, were obliged to commit to their memory a great number of verſes, inſomuch that ſome employed 20 years in this courſe of education; and that they did not think it lawful to record theſe poems in writing, but ſacredly handed them down by tradition from generation to generation.

Indeed, ſo ſtrong was the attachment of the Celtic nations to their poetry and their bards, that amidſt all the changes of their government and manners, even long after the order of the druids was extinct, and the national religion altered, the bards continued to flouriſh; not as a ſet of ſtrolling ſongſters, like the Greek Ἀοιδοὶ or *rhapſodiſts*, in Homer's time, but as an order of men highly reſpected in the ſtate, and ſupported by a public eſtabliſhment. We find them, according to the teſtimonies of Strabo and Diodorus, before the age of Auguſtus Cæſar; and we find them remaining under the ſame name, and exerciſing the ſame functions as of old, in Ireland, and in the north of Scotland, almoſt down to our own times. It is well known, that, in both theſe countries, every *regulus* or chief

had his own bard, who was conſidered as an officer of rank in his court.

Of the honour in which the bards were held, many inſtances occur in Oſſian's poems. On all important occaſions, they were the ambaſſadors between contending chiefs; and their perſons were held ſacred. "Cairbor feared to ſtretch his ſword to the bards, though his ſoul was dark. Looſe the bards (ſaid his brother Cathmor), they are the ſons of other times. Their voice ſhall be heard in other ages, when the kings of Temora have failed." The bards, as well as the druids, were exempted from taxes and military ſervices, even in times of the greateſt danger; and when they attended their patrons in the field, to record and celebrate their great actions, they had a guard aſſigned them for their protection. At all feſtivals and public aſſemblies they were ſeated near the perſon of the king or chieftain, and ſometimes even above the greateſt nobility and chief officers of the court. Nor was the profeſſion of the bards leſs lucrative than it was honourable. For, beſides the valuable preſents which they occaſionally received from their patrons when they gave them uncommon pleaſure by their performances, they had eſtates in land allotted for their ſupport. Nay, ſo great was the veneration which the princes of theſe times entertained for the perſons of their poets, and ſo highly were they charmed and delighted with their tuneful ſtrains, that they ſometimes pardoned even their capital crimes on that account.

We may very naturally ſuppoſe, that a profeſſion that was at once ſo honourable and advantageous, and enjoyed ſo many flattering diſtinctions and deſirable immunities, would not be deſerted. It was indeed very much crowded; and the accounts which we have of the numbers of the bards in ſome countries, particularly in Ireland, are hardly credible. We often read, in the poems of Oſſian, of a hundred bards belonging to one prince, ſinging and playing in concert for his entertainment. Every chief bard, who was called *Allah Redan*, or *doctor in poetry*, was allowed to have 30 bards of inferior note; and every bard of the ſecond rank was allowed a retinue of 15 poetical diſciples conſtantly about his perſon.

Although the ancient Britons of the Southern parts of this iſland had originally the ſame taſte and genius for poetry with thoſe of the North, yet none of their poetical compoſitions of this period have been preſerved. Nor have we any reaſon to be ſurpriſed at this. For after the provincial Britons had ſubmitted quietly to the Roman government, yielded up their arms, and had loſt their free and martial ſpirit, they could take little pleaſure in hearing or repeating the ſongs of their bards in honour of the glorious achievements of their brave anceſtors. The Romans too, if they did not practiſe the ſame barbarous policy which was long after practiſed by Edward I. of putting the bards to death, would at leaſt diſcourage them, and diſcountenance the repetition of their poems, for very obvious reaſons. Theſe ſons of the ſong being thus perſecuted by their conquerors, and neglected by their countrymen, either abandoned their country or their profeſſion; and their ſongs being no longer heard, were ſoon conſigned to oblivion.

It is probable that the ancient Britons, as well as many other nations of antiquity, had no idea of poems that were made only to be repeated, and not to be ſung to the ſound of muſical inſtruments. In the firſt ſtages of ſociety in all countries, the two ſiſter-arts of poetry and muſic ſeem to have been always united; every poet was a muſician, and ſung his own verſes to the ſound of ſome muſical inſtrument. This, we are directly told by two writers of undoubted credit, was the caſe in Gaul, and conſequently in Britain, in this period. "The bards (ſays Diodorus Siculus) ſung their poems to the ſound of an inſtrument not unlike a lyre." "The bards (according to Ammianus Marcellinus, as above hinted) celebrated the brave actions of illuſtrious men in heroic poems, which they ſung to the ſweet ſounds of the lyre." This account of theſe Greek and Latin writers is confirmed by the general ſtrain, and by many particular paſſages, of the poems of Oſſian. "Beneath his own tree, at intervals, each bard ſat down with his harp. They raiſed the ſong, and touched the ſtring, each to the chief he loved."

The invention of writing made a conſiderable change in the bard profeſſion. It is now an agreed point, that no poetry is fit to be accompanied with muſic, but what is ſimple: for a complicated thought or deſcription requires the utmoſt attention, and leaves none for the muſic: or, if it divide the attention, it makes but a faint impreſſion. The ſimple operas of Quinault bear away the palm from every thing of the kind compoſed by Boileau or Racine. But when a language, in its progreſs to maturity, is enriched with variety of phraſes fit to expreſs the moſt elevated thoughts, men of genius aſpired to the higher ſtrains of poetry, leaving muſic and ſong to the bards: which diſtinguiſhed the profeſſion of a poet from that of a bard. Homer, in a lax ſenſe, may be termed a bard; for in that character he ſtrolled from feaſt to feaſt. But he was not a bard in the original ſenſe: he, indeed, recited his poems to crowded audiences; but his poems are too complex for muſic, and he probably did not ſing them, nor accompany them with the lyre. The Trovadores of Provence were bards in the original ſenſe, and made a capital figure in the days of ignorance, when few could read, and fewer write. In later times, the ſongs of the bards were taken down in writing, which gave every one acceſs to them without a bard; and the profeſſion ſunk by degrees into neglect. Among the Highlanders of Scotland, reading and writing in their own tongue is not common even at preſent; and that circumſtance tended long to ſupport the bard profeſſion among them, even after it was laid aſide in other countries.

BARDANA, or BURDOCK. See ARCTIUM.

BARDARIOTÆ, in Antiquity, were a kind of ancient guard attending the Greek emperors, armed with rods, wherewith they kept off the people from crowding too near the prince when on horſeback. Their captain, or commander, was denominated *primivergius*. The word was probably formed from the *bardæ*, or houſings on their horſes.

BARDAS, the brother of the empreſs Theodora, and uncle of the famous Photius, is ſaid to have had no other good quality beſides that of loving the ſciences and polite literature, which he eſtabliſhed in the Eaſtern empire; for he was treacherous, cruel, and ambitious. In the year 856, he aſſaſſinated Theoctiſtes, general of the Emperor Michael's forces, and obtained his poſt. At length he cauſed the diſgrace of the Empreſs Theodora; and St. Ignatius, patriarch of Conſtantinople, reproaching him for his vices, he had him depoſed in 858, in order to make room for Photius. Bardas was aſſinated by Baſilius the Macedonian, in 866.

BARDED, in Heraldry, is uſed in ſpeaking of a horſe that is capariſoned. He bears ſable, a *cavalier d'or*, the horſe *barded*, argent.

BARDESANISTS, a ſect of ancient heretics, thus denominated from their leader Bardeſanes, a Syrian of Edeſſa in Meſopotamia. Bardeſanes, born in the middle of the ſecond century, became eminent, after his converſion to Chriſtianity, for his zeal againſt heretics; againſt whom, we are informed by St. Jerome and Euſebius, he wrote a multitude of books: yet had he the misfortune to fall, himſelf, into the errors of Valentinus, to which he added ſome others of his own. He adopted the oriental philoſophy concerning the two principles; maintaining, that the ſupreme God is free from all evil and imperfection, and that he created the world and its inhabitants pure and incorrupt: that in proceſs of time the prince of

darkneſs, who is the fountain of all evil and miſery, enticed men to ſin; in conſequence of which, the ſupreme God permitted them to be diveſted of thoſe etherial bodies with which he had endued them, and to fall into ſluggiſh and groſs bodies formed by the evil principle: and that Jeſus deſcended from heaven, clothed not with a real but aerial body, in order to recover mankind from that body of corruption which they now carry about them; and that he will raiſe the obedient to manſions of felicity, clothed with aerial vehicles, or celeſtial bodies. Strunzius has given the hiſtory of the Bardeſaniſts.

BARDEWICK, a town of Germany, in the circle of Lower Saxony and duchy of Lunenburg; formerly a very large place; but being ruined in 1189, by the Duke of Saxony, has never yet recovered itſelf. It is ſeated on the river Ilmenau, in E. long. 10. 6. N. lat. 53. 40.

BARDT, a ſtrong and rich town of Germany, in the duchy of Pomerania, with a caſtle and ſpacious harbour. It is ſubject to the Swedes; and is ſituated near the Baltic Sea, in E. long. 13. 20. N. lat. 54. 23.

BARE, in a general ſenſe, ſignifies *not covered*. Hence we ſay bare-headed, bare-footed, &c. The Roman women, in times of public diſtreſs and mourning, went bare-headed, with their hair looſe.

Among the Greeks, Romans, and Barbarians, we find a feaſt called *nudipedalia*, at which perſons were to attend bare-footed. The Abyſſinians never enter their churches but bare-footed; not on account of Moſes, who was commanded to put off his ſhoes on Mount Sinai, but in reverence of the place; as is alſo done by them in entering the palaces of kings and great men.

Sagittarius has an expreſs diſſertation on thoſe who went bare-footed among the ancients, *De Nudipedalibus Veterum*; wherein he treats of ſuch as went bare-footed in journies or otherwiſe, either out of choice, or neceſſity: alſo of bare-footed religious mourners and penitents; who went bare-footed; and, laſtly, of the *leviri*.

BARE, in reſpect of manufacture. A cloth is ſaid to be bare or naked, when the nap is too ſhort, as having been ſhorn too near, or not being ſufficiently covered with wool by the teazel.

BARE is alſo uſed for a ſort of bowling-ground, not covered with green ſwarth.

BARE-*Foot Carmelites and Auguſtines*, are religious of the order of St. Carmel and St. Auſtin, who live under a ſtrict obſervance, and go without ſhoes, like the capuchins. There are alſo barefoot fathers of mercy. Formerly there were barefoot dominicans, and even barefoot nuns of the order of St. Auguſtin.

BAREITH, a town of Germany in Franconia, in the margravate of Culembach, with a famous college belonging to the margrave of Brandenburg Bareith. E. long. 11. 50. N. lat. 50. 0.

BARENT (Diteric), an excellent painter, was born at Amſterdam, and was the ſon of a very induſtrious painter. He ſtudied in Italy, and became the favourite diſciple of Titian, with whom he lived a long time; but at length returned to Amſterdam, where he produced many extraordinary pieces. He died in 1582, aged 48.

BAR-FEE, a fee of 20 pence, which every perſon acquitted of felony pays the gaoler.

BARFLEUR, a town of France, in the department of the Channel, and late province of Normandy. The Cape of that name is 12 miles eaſt of Cherburg, and near it part of the French fleet was deſtroyed in 1692. W. long. 1. 6. N. lat. 49. 40.

BARGAIN AND SALE, a ſpecies of conveyance in the Engliſh law. It is a kind of a real contract, whereby the bargainer for ſome pecuniary conſideration bargains and ſells, that is, contracts to convey the land of the bargainee; and becomes by ſuch bargain a truſtee for, or ſeized to the uſe of the bargainee; and then the ſtatute of uſes completes the purchaſe: or, as it has been well expreſſed, the bargain firſt veſts the uſe, and then the ſtatute veſts the poſſeſſion. But as it was foreſeen that conveyances, thus made, would want all thoſe benefits of notoriety which the old common-law aſſurances were calculated to give; to prevent therefore clandeſtine conveyances of freeholds, it was enacted in the ſame ſeſſion of parliament, by ſtatute 27 Hen. VIII. c. 16. that ſuch bargains and ſales ſhould not enure to paſs a freehold, unleſs the ſame be made by indenture, and enrolled within ſix months in one of the courts of Weſtminſter-Hall, or with the *cuſtos rotulorum* of the county. Clandeſtine bargains and ſales of chattel intereſts, or leaſes for years, were thought not worth regarding, as ſuch intereſts were very precarious till about ſix years before; which alſo occaſioned them to be overlooked in framing the ſtatute of uſes: and therefore ſuch bargains and ſales are not directed to be enrolled. But how impoſſible is it to foreſee, and provide againſt, all the conſequences of innovations! This omiſſion has given riſe to the ſpecies of conveyance by LEASE and RELEASE.

BARGAINS, in commerce, are of divers kinds: *verbal*, thoſe made only by word of mouth, and giving earneſt; *written*, thoſe where the terms are entered in form on paper, &c. At Amſterdam they diſtinguiſh three kinds of bargains.

BARGAINS, *conditional*, for goods which the ſeller has not yet in his poſſeſſion; but which he knows have been bought for him by his correſpondents abroad, and which he obliges himſelf to deliver to the buyer, on their arrival, at the price and the conditions agreed on.

BARGAIN, *firm*, that wherein the ſeller obliges himſelf to deliver to the buyer a certain quantity of goods, at the price and in the time agreed on.

BARGAINS, *optional*, thoſe wherein a dealer obliges himſelf, in conſideration of a premium received in hand, either to deliver or take a certain quantity of goods at a fixed price, and within a time limited; but with a liberty, nevertheleſs, of not delivering or not receiving them, if they think proper, upon forfeiture of their premium.

BARGAINS, *forehand*, are thoſe wherein goods are bought or ſold, in order to be delivered at a certain time afterwards, ſome part of the price being advanced.

BARGE (*bargie*, Dutch), a veſſel or boat of ſtate, furniſhed with elegant apartments, canopies, and cuſhions; equipped with a band of rowers, and decorated with flags and ſtreamers: they are generally uſed for proceſſions on the water, by noblemen, officers of ſtate, or magiſtrates of great cities. Of this ſort, too, we may naturally ſuppoſe the famous barge or galley of Cleopatra, which, according to Shakeſpear,

> ——— Like a burniſh'd throne
> Burnt on the water: the poop was beaten gold:
> Purple her ſails; and ſo perfumed, that
> The winds were love-ſick with them: the oars were ſilver,
> Which to the tune of flutes kept time, and made
> The water which they beat to follow faſter,
> As amorous of their ſtrokes———
> ——— At the helm
> A ſeeming mermaid ſteer'd: the ſilken tackles
> Swell'd with the touches of thoſe flower-ſoft hands
> That yarely 'form'd their office.———

There are likewiſe other barges of a ſmaller kind, for the uſe of admirals and captains of ſhips of war. Theſe are of a lighter frame, and may be eaſily hoiſted into and out of the ſhips to which they occaſionally belong.

Barge is alſo the name of a flat-bottomed veſſel of burden, for lading and diſcharging ſhips, and removing their cargoes from place to place in a harbour.

Barge, in Ornithology, a name uſed by ſome authors for the *godwit*, or as it is called in ſome places, the *ſtone-plover*, the *œgocephalus*.

Barge-Couples, in Architecture, a beam mortiſed into another, to ſtrengthen the building.

Barge-Course, with bricklayers, a term uſed for that part of the tiling which projects over without the principal rafters, in all ſorts of buildings where there is either a gable or a kirkin-head.

BARGH, is uſed in ſome places of England for a ſteep horſe-way up a hill.—It ſeems to come from the German *berg*, a hill.

BARGHMASTER, Barmer, or Bar-Master, in the royal mines, the ſteward or judge of the barghmote. The word is formed of the German *berg-meiſter*, q. d. maſter of the mines.—The bar-maſter is to keep two great courts of barmote yearly; and every week a ſmall one, as occaſion requires.

BARGHMOTE, or Barmote, a court which takes cognizance of cauſes and diſputes between miners.—By the cuſtom of the mines, no perſon is to ſue any miner for ore-debt, or for ore, or for any ground in variance, but only in the court of barmote, on penalty of forfeiting the debt, and paying the charges at law.

BARI, a very handſome and rich town of Italy in the kingdom of Naples, the capital of Terra di Bari, and an archbiſhop's ſee. It is well fortified, is ſeated on the gulph of Venice, and had formerly a good harbour, but it was deſtroyed by the Venetians. E. long. 17. 40. N. lat. 41. 31.

Bari, or *Terra di Bari*, a territory of Italy in the kingdom of Naples, of which the above-mentioned city is the capital. It is bounded on the north by the Capitanata, on the north-weſt by the Ulterior Principato, on the ſouth by the Baſilicata, on the ſouth-eaſt by the Terra de Otranto, and on the north-eaſt by the gulph of Venice. It has no conſiderable river except the Offanto, which ſeparates it from the Capitanata. The air is temperate; and the ſoil produces plenty of corn, fruit, and ſaffron: but there are a great many ſerpents, and ſpiders called *tarantulas*. (See Aranea.) The principal towns are Bari the capital, Frani, Andria, Bavo, Bilonto, Converſano, Monopoli, Poligniano, Barletta, and Malfetto. The two firſt are archiepiſcopal, and all the reſt epiſcopal.

BARILLA, or Barilha, the name of a plant cultivated in Spain for the ſake of the ſalt produced by its aſhes, from which the pureſt kinds of mineral alkali are obtained. There are four plants, which, in the early part of their growth, bear ſo ſtrong a reſemblance to each other as would deceive any common obſerver. Theſe four are, *barilla*, *gazul* (or, as ſome call it, *algazul*), *ſoza*, and *falicornia* or *ſalicor*. They are all burnt to aſhes; but applied to different uſes, as their qualities are ſomewhat different. Some of the farmers mix more or leſs of the three laſt with the firſt; and it requires a complete knowledge of the colour, taſte, and ſmell of the aſhes to be able to detect the fraud.

Barilla is ſown afreſh every year. Its greateſt height above ground is four inches: each root puſhes out a vaſt number of little ſtalks, which again are ſubdivided into ſmaller ſprigs reſembling ſamphire; and all together form a large ſpreading tufted buſh. The colour is bright green; as the plant advances towards maturity, this colour vaniſhes away till it comes at laſt to be a dull green tinged with brown.—*Gazul* bears the greateſt affinity to barilla, both in quality and appearance: the principal difference conſiſts in its growing on a ſtill drier ſalter earth, conſequently it is impregnated with a ſtronger ſalt. It does not riſe above two inches out of the ground, ſpreading out into little tufts. Its ſprigs are much flatter and more pulpy than thoſe of barilla, and are ſtill more like ſamphire. It is ſown but once in three, four, or five years, according to the nature of the ſoil.—*Soza*, when of the ſame ſize, has the ſame appearance as gazul; but in time grows much larger, as its natural ſoil is a ſtrong ſalt marſh, where it is to be found in large tufts of ſprigs, treble the ſize of barilla, and of a bright green colour, which it retains to the laſt.—*Salicor* has a ſtalk of a deep green colour inclining to red, which laſt becomes by degrees the colour of the whole plant. From the beginning it grows upright, and much reſembles a buſh of young roſemary. Its natural ſoil is on the declivities of hills near the ſalt marſhes, or on the edges of the ſmall drains or channels cut by the huſbandmen for the purpoſe of watering the fields: before it has acquired its full growth, it is very like the barilla of thoſe ſeaſons in which the ground has been dunged before ſowing. In thoſe years of manuring, barilla, contrary to its uſual nature, comes up with a tinge of red; and when burnt falls far ſhort of its wonted goodneſs, being bitter, more impregnated with ſalts than it ſhould be, and raiſing a bliſter if applied for a few minutes to the tongue. Barilla contains leſs ſalt than the others; when burnt, it runs into a maſs reſembling a ſpongy ſtone, and has a faint blueneſs of colour.

Gazul, after it has been burnt, comes as near barilla in its outward appearance as it does while growing in its vegetable form; but, if broken, the inſide is of a deeper and more gloſſy blue. Soza and ſalicor are darker, and almoſt black within, of a heavier conſiſtence, with very little or no ſponginеſs of texture.

All theſe aſhes contain a ſtrong alkali; but barilla the beſt and pureſt, though not in the greateſt quantity. Upon this principle, it is fitteſt for making glaſs and bleaching linen; the others are uſed in making ſoap. Each of them would whiten linen; but all, except barilla, would burn it. A good crop of barilla impoveriſhes the land to ſuch a degree, that it cannot bear good barilla a ſecond time, being quite exhauſted. For this reaſon the richer farmers lay manure upon the ground, and let it lie fallow for a ſeaſon; at the end of which it is ſown afreſh without any danger, as the weeds that have ſprung up in the year of reſt have carried off all the pernicious effects of the dung. A proper ſucceſſion of crops is thus ſecured by manuring and fallowing the different parts of the farm, each in their turn. The poorer tribe of cultivators cannot purſue the ſame method for want of capital; and are therefore under the neceſſity of ſowing their lands immediately after manuring, which yields them a profit juſt ſufficient to afford a preſent ſcanty ſubſiſtence, though the quality and price of their barilla be but trifling. The method uſed in making barilla is the ſame as that followed in Britain in burning kelp. The plant, as ſoon as ripe, is plucked up and laid in heaps, then ſet on fire. The ſalt juices run out below into an hole made in the ground, where they run into a vitrified lump, which is left about a fortnight to cool. An acre may yield about a ton.

BARILLARIUS, an ancient officer in monaſteries and great houſeholds, who had the care of the caſks and veſſels of wine, &c. in the cellars.

BARILLIA, or Bariglia, in the *Glaſs Trade*, a ſort of pot-aſhes imported from Spain, inferior in goodneſs to that of the Levant, called *polverine* when looſe, ſmall, and in powder, and *rochetta* when in hard, rocky lumps. The frit made of theſe makes fine and clear cryſtal glaſs, eſpecially that from the *rochetta*, or the *polverine* in lumps; but the *barilla* of Spain, though it be uſually fatter, yet makes not a glaſs ſo white, but uſually inclining a little to a bluiſh colour.

BARING of trees, in Agriculture, the taking away ſome

of the earth about the roots, that the winter-rain and ſnow-water may penetrate farther towards them. This is frequently practiſed in the autumn.

BARJOLS, a ſmall populous town of France in the department of Var, and late province of Provence. E. long. 5. 23. N. lat. 43. 35.

BARITONO, in muſic, denotes a voice of low pitch, between a tenor and baſs.

BARK, in the Anatomy of Plants, the exterior part of trees, correſponding to the ſkin of an animal. As animals are furniſhed with a panniculus adipoſus, uſually repletc with fat, which inveſts and covers all the fleſhy parts, and protects them from external injury; plants are encompaſſed with a bark, by means whereof the cold is kept out, and in winter-time the ſpiculæ of ice prevented from fixing and freezing the juices in the veſſels; whence it is, that ſome ſorts of trees remain ever-green the year round. The bark of trees in general is of a ſpongy texture; and, by many little fibres which paſs through the capillary tubes, whereof the wood conſiſts, it communicates with the pith; ſo that the proper nutriment of the tree, being imbibed by the roots, and carried up through the veſſels of the tree by the warmth of the ſoil, &c. to the top of the plant, is uſually ſuppoſed to be there condenſed, and in that form returns by its own gravity down the veſſels, which do the office of veins, lying between the wood and inner bark; leaving as it paſſes by, ſuch parts of its juice as the texture of the bark requires for its ſupport. That ſoft whitiſh rind or ſubſtance between the inner *bark* and the *wood*, which Mr. Bradley thinks does the office of veins, ſome account a third bark, only differing from the other two in that its fibres are cloſer. It is this contains the liquid ſap, gums, &c. found in plants in the ſpring and ſummer months. It hardens by little and little, by means of the ſap it tranſmits, and is converted imperceptibly into the woody part of the tree. There are few trees without it; yet it is ſtill found in leſs quantity as the tree is more expoſed to the ſun: that of the oak is ordinarily about an inch thick. It is here that the decay of trees generally begins; whence thoſe who fell and cut out trees, ought always to take care to leave as little of it on as poſſible.

The *bark of roots* is ſometimes yellow, as in dock; ſometimes red, as in biſtort; but oftenеſt white. It is derived from the ſeed itſelf, being only the extenſion of the *parenchyma* of the radicle. It is of various degrees of ſubſtance, being ſometimes very thin, as in the Jeruſalem artichoke, and in moſt trees: yet ſometimes it is very thick, and makes the greater part of the ſubſtance of the root, as in aſparagus and dandelion. In beet root, the bark ſcarce exceeds a good thick ſkin; whereas in a carrot, it is half the ſemi-diameter of the root, being in ſome places above an inch over. This too is found common to the generality of roots, that their barks are proportionably thicker at bottom than at top.

The inner part of the bark, we have obſerved, annually lignifies, or turns to wood. The bark of a tree is found each year to divide and diſtribute itſelf two contrary ways: the outer part gives towards the ſkin, till it becomes ſkin itſelf, and at length falls off, like the human cuticle, or the *exuviæ* of ſerpents; while the inmoſt portion is yearly diſtributed and added to the wood.

The bark is found truly continuous to the body of a tree, as the ſkin of our body is to the fleſh; contrary to the common opinion, that the bark only ſurrounds the tree, as a ſcabbard does a ſword, or a glove the hand; which ſeems confirmed by the eaſy ſlipping of the bark of willow, and moſt other trees, when full of ſap, from the wood. Their continuity is effected by means of the *parenchyma*, which is one entire body, running from the bark into the wood, and thus uniting both together. The reaſon why the bark ſlips ſo eaſily from the wood is, that moſt of the parenchymous parts are young veſſels, formed every year ſucceſſively between the wood and the bark, and are much in the condition of the tender veſſels or fibres of the embryo in a womb, or egg; a thouſand of which are broke with the ſmalleſt force. That trees only live by the aſcent of the ſap in or between the bark and the wood, and that if a circle be drawn round any tree (except, perhaps, aſh) by inciſion to the timber, how thin ſoever the knife be, provided no part of the thickneſs of the bark remain uncut, the tree will die from that part upwards, has been the ſtanding doctrine of naturaliſts of all ages, and is delivered for fact by Pliny and others. Dr. Plott aſſerts this to be a popular error from the inſtance of a large old elm in Magdalen-college grove, quite diſbarked around, at moſt places two feet, at ſome four feet, from the ground, which yet grew and flouriſhed many years, as well as any tree in the grove. Beſides, it was entirely without pith, being hollow within as a drum: and the ſame is confirmed from the hiſtory of the elm in the Thuilleries, related by M. Parent, which lived and put out leaves, though entirely ſtripped of bark from top to bottom. Add to this, that the plane and cork trees diveſt themſelves yearly of all their old bark, and acquire new, as ſnakes do their ſkins; and in the change from one to the other, it is evidently not by the bark that they are nouriſhed. Some infer from hence, that the bark never feeds the wood; but Dr. Plott is more reſerved in his concluſion, arguing only, that hence it ſeems to follow, that there muſt be other veſſels, beſides the ſap-veſſels of the bark, capable of the office of conveying ſap. It is probable when the ordinary conveyance fails, ſome of the woody part, which had all once been ſap-veſſels, reſumes its ancient office; or, as the author laſt mentioned conjectures, they ſtill ſo far retain their office of conveying ſap, as to keep a tree alive, though not to augment it; which may, perhaps, be one different uſe of thoſe ſap-veſſels in the wood from thoſe in the bark, the former being ſufficient for the continuation of a tree, and the latter ſerving only for its augmentation.

Mr. Brotherton however has related ſome experiments, which ſeem to decide the controverſy by ſhewing that the *bark* is not the vehicle of vegetation. He hacked a crab-tree all round with a hatchet, ſo as, beſides cutting off the *bark*, to cut pretty deep into the wood, for the breadth of about four inches; yet the ſame year it was obſerved to increaſe very conſiderably in thickneſs above the divided part, and to ſhoot in length of wood about one foot. The next year it alſo grew conſiderably, and ſhot in length five inches; but on the third year it died to the very root. The ſame happened to another tree, part of whoſe *bark* was eaten off by the canker: the lower part ſtood without increaſe, and by degrees the wood rotted: the upper part increaſed to the third year, and then died alſo. The ſame writer found, that, in the branches of Scotch fir, the joints above the rings *barked* would grow much larger in three years, than in five if the rings were not cut off. A ring of *bark* three inches broad being cut off a Scotch fir, near the bottom of the ſtem, below the uppermoſt knot or joint, was found to grow and ſhoot out at its top half a yard, and all the parts above the ring to increaſe in thickneſs the ſame year, much more than they would have done, had not the ſection been made; but all the part of the ſtem between the ring and the next knot below it did not grow at all: the part below the ring next under that, increaſed in ſome degree, though leſs than it would have done, if the bark had not been cut off. The ſecond year the increaſe was alſo conſiderable; but on the third year it died. Phil. Tranſ. N°. 187.

M. Magnol mentions an olive-tree, from which a circular

ring of bark, being cut away, the tree that year bore, above the place of inciſion, double the quantity of flowers and fruit which it uſed to bear. Mr. Reneaume relates a fact nearly ſimilar to this. In the country about Aix and Marſeilles, when an olive-tree grows old, and almoſt ready for felling, they have a method of making it firſt yield all the fruit which it is capable of producing, by cutting a circular ring of bark, an inch broad, from one of its young branches, and in its place putting an equal ring of bark taken from the branch of a young bearing olive-tree. The effect of this engraftment is, that the branches of the old tree bear plentifully the enſuing year, and thoſe of the young one die away. Hiſt. Acad. Sc. 1711. On the whole, Mr. Brotherton concludes, that moſt of the ſap, if not all, aſcends in the veſſels of the woody part, and not by the bark, nor between the bark and the wood. Mr. Lewenhoeck, on the other hand, has given ſeveral experiments and obſervations with the microſcope, to ſhew that the bark of trees is produced from the wood, and not the wood from the bark. See Philoſ. Tranſact. N°. clxxxvii and N°. ccii. Be this at it may, it is very remarkable, that trees ſtripped in the time of the ſap, and ſuffered to die, afford timber heavier, more uniformly denſe, ſtronger, and fitter for ſervice, than if the tree had been cut down in its healthy ſtate. Something of a like nature has been obſerved by Vitruvius and Evelyn. Mem. Acad. Scienc. 1738.

As animals are furniſhed with a *panniculus adipoſus*, uſually replete with fat, which inveſts and covers all the fleſhy parts, and ſcreens them from external cold, plants are encompaſſed with a bark replete with fatty juices, by means whereof the cold is kept out, and, in winter-time, the *ſpiculæ* of ice prevented from fixing and freezing the juices in the veſſels: whence it is, that ſome ſort of trees remain ever green the year round; becauſe their barks contain more oil than can be ſpent and exhaled by the ſun, &c. Ray's Wiſd. of God, &c. part i. p. 103.

Boerhaave mentions eight different ſpecies of juices lodged in the bark, viz. the watery ſap or chyle, an oil, balm, pitch, reſin, colophony, gum, and gummous reſin.

The bark has its peculiar diſeaſes, and is infected with inſects peculiar to it. Moſs is a diſeaſe of the bark. Wounds of the bark often prove mortal. See CANKER.

Of the bark of willows and linden trees is ordinarily made a kind of ropes. The Siameſe make their cordage of the bark of the cocoa tree, which is alſo the caſe in moſt of the Aſiatic and African nations. In reality, flax and hemp, with all their toughneſs, are only the ſap-veſſels, or ligneous fibres of the bark of thoſe plants.

There are a great many kinds of barks in uſe in the ſeveral arts: ſome in Medicine, as the CINCHONA, or JESUIT'S bark, *macer*, *caſcarilla*, &c. others in Dyeing, as the bark of the alder; others in Spicery, as CINNAMON, *caſſia lignea*, &c. Oak bark is uſed in Tanning: others on other occaſions, as cork; that of a kind of birch is uſed by the Indians for canoes capable of holding twenty-four perſons.

The ancients wrote their books on barks, eſpecially thoſe of the aſh, and *tilia* or lime-tree; not on the exterior or outer bark, but on the inner and finer, called *philyra*; which are of ſo durable a texture, that there are manuſcripts on it, ſtill extant, a thouſand years old.

In the Eaſt Indies they manufacture the barks of a certain tree into a kind of ſtuff or cloth. It is ſpun and dreſſed much after the manner of hemp. The long filaments ſeparated from it, upon beating and ſteeping it in water, compoſe a thread, of a middle kind between ſilk and common thread; neither ſo ſoft nor bright as ſilk, nor ſo hard or flat as hemp. See Neumann's Works, p. 428, note. Some of theſe ſtuffs are pure bark, and are called pinaſſes, biambonnes, &c. In others they mix ſilk with the bark, and call them ginghams and nillas: the fountalungees too are part ſilk, part bark, and are only diſtinguiſhed by being ſtriped.

Bark alſo makes a good manure, eſpecially that of oak, which is rich in ſalt; but the better ſort is reſerved for tanning.

In the iſland of Otaheite, the natives make their cloth, which is of three kinds, of the bark of three different trees; the paper mulberry above-mentioned, the bread-fruit tree, and the cocoa-tree. That made of the mulberry is the fineſt and whiteſt, and worn chiefly by the principal people. It is manufactured in the following manner. When the trees are of a proper ſize, they are drawn up, and ſtripped of their branches; after which, the roots and tops are cut off: the bark of theſe rods being then ſlit up longitudinally, is eaſily drawn off; and, when a proper quantity has been procured, it is carried down to ſome running water, in which it is depoſited to ſoak, and ſecured from floating away by heavy ſtones: when it is ſuppoſed to be ſufficiently ſoftened, the women ſervants go down to the brook, and, ſtripping themſelves, ſit down in the water, to ſeparate the inner bark from the green part on the outſide: to do this, they place the under ſide upon a flat ſmooth board, and with a kind of ſhell ſcrape it very carefully, dipping it continually in the water till nothing remains but the fine fibres of the inner coat. Being thus prepared in the afternoon, they are ſpread out upon plantain leaves in the evening: they are placed in lengths of about 11 or 12 yards, one by the ſide of another, till they are about a foot broad, and two or three layers are alſo laid one upon the other: care is taken that the cloth ſhall be in all parts of an equal thickneſs, ſo that if the bark happens to be thinner in any one particular part of one layer than the reſt, a piece that is ſomewhat thicker is picked out to be laid over in the next. In this ſtate it remains till the morning, when a great part of the water which it contained when it was laid out is either drained off or evaporated, and the ſeveral fibres adhere together, ſo as that the whole may be raiſed from the ground in one piece. It is then taken away, and laid upon the ſmooth ſide of a long piece of wood prepared for the purpoſe, and beaten by the women ſervants. The inſtrument uſed for this purpoſe is a ſquare wooden club, having each of its four ſides or faces marked, length-ways, with ſmall grooves, or furrows, of different degrees of fineneſs; thoſe on one ſide being of a width and depth ſufficient to receive a ſmall pack-thread, and the others finer in a regular gradation, ſo that the laſt are not more than equal to ſewing ſilk. They beat it firſt with the coarſeſt ſide of this mallet, keeping time like our ſmiths; it ſpreads very faſt under the ſtrokes, chiefly however in the breadth, and the grooves in the mallet mark it with the appearance of threads; it is ſucceſſively beaten with the other ſides, laſt with the fineſt, and is then fit for uſe. Of this cloth there are ſeveral ſorts, of different degrees of fineneſs, in proportion as it is more or leſs beaten. The other cloth alſo differs in proportion as it is beaten: but they are unlike each other in conſequence of the different materials of which they are made. The bark of the bread-fruit is not taken till the trees are conſiderably longer and thicker than thoſe of the mulberry; the proceſs afterwards is the ſame. Of the bark, too, of a tree that they call *poerou*, which is the *Hibiſcus tiliaceus* of Linnæus, they manufacture excellent matting; both a coarſe ſort which ſerves them to ſleep upon, and a finer to wear in wet weather. Of the ſame bark they alſo make ropes and lines, from the ſize of a ſmall pack-thread to the thickneſs of an inch.

BARK, *Peruvian*, or *Jeſuit's Bark*, are names given to the cinchona, or quinquina, as it has heretofore been called. CINCHONA, in botany, is a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe plants the order of which is doubt-

ful. The corolla is funnel-ſhaped, with a woolly ſummit; the capſule inferior, bilocular, with a parallel partition. Linnæus deſcribes two ſpecies: 1. The corymbifera, corymb-bearing cinchona, or white Peruvian bark, with oblong lanceolate leaves and axillary corymbs; and, 2. The officinalis, or coloured Peruvian bark, with elliptic leaves downy underneath, and the leaves of the corolla woolly. Both ſpecies are natives of Peru, where the trees attain the height of 15 or 20 feet. The former particularly abounds in the hilly parts of Quito, growing promiſcuouſly in the foreſts, and is ſpontaneouſly propagated from its ſeed. Both ſorts have alſo been found in the province of Santa Fe.

The bark has an odour, to many people not unpleaſant, and very perceptible in water diſtilled from it, in which floating globules, like eſſential oil, have been obſerved. Its taſte is bitter and aſtringent, accompanied with a degree of pungency, and leaving a pretty laſting impreſſion on the palate.

Some authors allege, that the Peruvians learned the uſe of this bark by obſerving certain animals affected with intermittents inſtinctively led to eat it; while others ſay that a Peruvian having an ague, was cured by happening to drink of a pool which, from ſome trees having fallen into it, was impregnated with cinchona; and its being employed in gangrene is ſaid to have originated from its curing it in a patient affected with an ague. About the year 1640, the lady of the Spaniſh viceroy, the Comitiſſa del Cinchon, was cured by the bark, which has therefore been called *Cortex* or *Pulvis Comitiſſæ*, *Cinchona*, *Chinachina*, or *Chinchina*, *Kinakina* or *Kinkina*, *Quinaquina* or *Quinquina*; and from the intereſt which the Cardinal de Lugo and the Jeſuit fathers took in its diſtribution, it has been called *Cortex* or *Pulvis-Cardinalis de Lugo*, *Jeſuiticus*, *Patrum*, &c.

When it was firſt brought into Europe, it was reprobated by many eminent phyſicians; and at different periods long after, it was conſidered a dangerous remedy; but its character, in proceſs of time, became very univerſally eſtabliſhed. For a number of years, the bark which is rolled up into ſhort thick quills, with a rough coat, and a bright cinnamon colour in the inſide, which broke brittle, and was found, had an aromatic flavour, a bitteriſh aſtringent taſte, with a degree of aromatic warmth, was eſteemed the beſt: though ſome eſteemed the large pieces as of equal goodneſs. During the time of the late war, in the year 1779, the Huſſar frigate took a Spaniſh ſhip, laden principally with Peruvian bark, which was much larger, thicker, and of a deeper reddiſh colour, than the bark in common uſe. Soon after it was brought to London, it was tried in St. Bartholomew's Hoſpital, and in other hoſpitals in the metropolis, and was ſaid to be more efficacious than the quill bark. This put practitioners on examining into the hiſtory of the bark, on trying experiments with it, and on making comparative trials of its effects with thoſe of the bark in common uſe on patients labouring under intermitting complaints. In 1782, there was publiſhed an account of this red bark; in which the author ſays, that the ſmall quill bark uſed in England, is either the bark of young trees, or of the twigs or branches of the old ones; and that the large bark, called the *red bark* from the deep colour, is the bark of the trunk of the old trees; and he mentions a Mr. Arnot, who himſelf gathered the bark from the trees in Peru; and Monſ. Condamine, who gives an account of the tree in the Memoirs of the Academy of Sciences at Paris in the year 1738. Theſe both ſay, that taking the bark from an old tree effectually kills it; but that moſt of the young trees which are barked, recover, and continue healthy; and that for theſe reaſons the Spaniards now barked the younger trees for foreign markets, though they ſtill imported into Spain ſome of the bark of the old trees, which they eſteemed to be much more efficacious than what was got from the young. From theſe facts it is inferred, that the large red bark brought to London in the year 1779 was of the ſame kind as that uſed by Sydenham and Morton, as it anſwers to the deſcription of the bark uſed in their time, which is given by Dale and other writers on the materia medica, who were their contemporaries. On the whole it is aſſerted, that the bark in queſtion is not only ſtronger and more reſinous, but likewiſe more efficacious and certain in its effect, than the common bark, and that it cured many agues after the other had failed.

Another ſpecies of cinchona has alſo been diſcovered in the Weſt India iſlands, particularly in Jamaica, which is accurately deſcribed by Dr. Wright, under the title of *Cinchonæ Jamaicenſis*, in a paper publiſhed in the Philoſophical Tranſactions. In Jamaica it is called the *ſea-ſide beech*, and grows from 20 to 40 feet high. The white, furrowed, thick outer bark is not uſed, the dark-brown inner bark has the common flavour, with a mixed kind of a taſte, at firſt of horſe-radiſh and ginger, becoming at laſt bitter and aſtringent. It ſeems to give out more extract than the cinchona officinalis. Some of it was imported from St. Lucia, in conſequence of its having been uſed with advantage in the army and navy during the laſt war. The freſh bark is found to be conſiderably emetic and cathartic, which objectionable properties it is ſaid to loſe on being dried.

The pale and the red barks are chiefly in uſe in Britain, though, in addition to theſe, another ſpecies has lately been introduced called *yellow* bark, the virtues of which have been deſcribed in a treatiſe by Dr. Relph. The common pale bark is brought to us in pieces of different ſizes, either flat or quilled, and the powder is rather of a lighter colour than that of cinnamon. The red is generally in much larger, thicker, flattiſh pieces, but ſometimes alſo in the form of quills, and its powder is reddiſh like that of Armenian bole. As already obſerved, it is much more reſinous, and poſſeſſes the ſenſible qualities of the cinchona in a much higher degree than the other ſorts; and the more nearly the other kinds reſemble the red bark, the better they are now conſidered. The red bark is heavy, firm, ſound, and dry; friable between the teeth; does not ſeparate into fibres; and breaks, not ſhivery, but ſhort, cloſe, and ſmooth. It has three layers: the outer is thin, rugged, of a reddiſh brown colour, but frequently covered with moſſy matter: the middle is thicker, more compact, darker coloured, very reſinous, brittle, and yields firſt to the peſtle: the inmoſt is more woody, fibrous, and of a brighter red.

All the barks yield their virtues both to cold and boiling water; but the decoctions are thicker, give out the taſte more readily, and form an ink with a chalybeate more ſuddenly than the freſh cold infuſions. The infuſion, however, contains at leaſt as much extractive matter, but more in a ſtate of ſolution; and its colour, on ſtanding ſome time with the chalybeate, becomes darker, while that of the decoction becomes more faint. When they are of a certain age, the addition of a chalybeate renders them green; and when this is the caſe, they are found to be in a ſtate of fermentation, and effete. Mild or cauſtic alkalies, or lime, precipitate the extractive matter, which in the caſe of the cauſtic alkali is redilſolved by a farther addition of the alkali. Lime-water precipitates leſs from a freſh infuſion than from a freſh decoction; and in the precipitate of this laſt ſome mild earth is perceptible. The infuſion is by age reduced to the ſame ſtate with the freſh decoction, and then they depoſit nearly an equal quantity of mild earth and extractive matter; ſo that lime-water, as well as chalybeate, may be uſed as a teſt of the relative ſtrength and periſhable nature of the different preparations, and of different barks. Accordingly cold infuſions are found by experiment to be leſs periſhable than decoctions; infuſions and decoctions of the red bark

than thoſe of the pale: thoſe of the red bark, however, are found by length of time to ſeparate more mild earth with the lime-water, and more extractive matter. Lime-water, as precipitating this matter, appears an equally improper menſtruum.

Water is found to ſuſpend the reſin by means of much leſs gum than has been ſuppoſed. Rectified ſpirit of wine extracts a bitterneſs, but no aſtringency, from a reſiduum of 20 effuſions of cold water; and water extracts aſtringency, but no bitterneſs, from the reſiduum of as many effuſions of rectified ſpirit. The reſidua in both are inſipid.

From many ingenious experiments made on the Peruvian bark by Dr. Irvine, the power of different menſtrua, acting upon that ſubſtance was aſcertained with greater accuracy than had before been done; and it appears, that with reſpect to comparative power, the fluids after mentioned act in the order in which they are placed. 1. Dulcified ſpirit of vitriol.—2. Cauſtic ley.—3. French brandy.—4. Rheniſh wine.—5. Soft water.—6. Vinegar and water.—7. Dulcified ſpirit of nitre.—8. Mild volatile alkali.—9. Rectified ſpirit of wine.—10. Mild vegetable alkali.—11. Lime-water. The antiſeptic powers of vinegar and bark united are double the ſum of thoſe taken ſeparately. The aſtringent power of the bark is increaſed by acid of vitriol; the bitter taſte is deſtroyed by it.

The officinal preparations of the bark are, 1. The powder: of this, the firſt parcel that paſſes the ſieve, being the moſt reſinous and brittle part, is the ſtrongeſt. 2. The extract: the watery and ſpirituous extract conjoined form the moſt proper preparations of this kind. 3. The reſin: this cannot perhaps be obtained ſeparate from the gummy part, nor would it be deſirable. 4. Spirituous tincture: this is beſt made with proof-ſpirit. 5. The decoction: this preparation, though frequently employed, is yet in many reſpects inferior even to a ſimple watery infuſion.

But the moſt efficacious form in which cinchona can be adminiſtered in diſeaſes, is that of powder; for in this its conſtituent parts are in the moſt effectual proportion. The cold infuſion, which can be made in a few hours, the ſpirituous tincture, and the extract, are likewiſe proper in this view. For covering the taſte, different patients require different vehicles; liquorice, aromatics, acids, port-wine, new milk, &c. are occaſionally employed; and thoſe who diſlike the taſte of the bark itſelf, vary in their accounts to which we ſhould give the preference.

Practitioners have differed much with regard to the mode of operation of the Peruvian bark. Some have aſcribed its virtues entirely to a ſtimulant power. But while the ſtrongeſt and moſt permanent ſtimuli have by no means the ſame effect with bark in the cure of diſeaſes, the bark itſelf ſhows hardly any ſtimulant power, either from its action on the ſtomach, or on other ſenſible parts to which it is applied. From its action on dead animal fibres, there can be no doubt of its being a powerful aſtringent; and from its good effects in certain caſes of diſeaſe, there is reaſon to preſume that it is a ſtill more powerful tonic. To this tonic power ſome think that its action as an antiſeptic is to be entirely attributed: but that, independently of this, it has a very powerful effect in reſiſting the ſeptic proceſs to which animal ſubſtances are naturally ſubjected, appears beyond all diſpute, from its effects in reſiſting putrefaction, not only in dead animal ſolids, but even in animal fluids, when entirely detached from the living ſubject.

But although it be admitted that the Peruvian bark acts powerfully as an aſtringent, as a tonic, and as an antiſeptic; yet theſe principles will by no means explain all the effects derived from it in the cure of diſeaſes. And accordingly, from no artificial compoſition in which theſe powers are combined, or in which they exiſt even to a higher degree, can the good conſequences reſulting from Peruvian bark be obtained. Many practitioners, therefore, are diſpoſed to view it as a ſpecific. If by a ſpecific we mean an infallible remedy, it cannot indeed be conſidered as intitled to that appellation; but in as far as it is a very powerful remedy, of the operation of which no ſatisfactory explanation has yet been given, it may with great propriety be denominated a ſpecific. But whatever its mode of operation may be, there can be no doubt that it is daily employed with ſucceſs in a great variety of different diſeaſes, inſomuch that phyſicians would be greatly at a loſs were they deprived of this remedy.

It was firſt introduced, as has already been ſaid, for the cure of intermittent fevers; and in theſe, when properly exhibited, it rarely fails of ſucceſs. Practitioners, however, have differed with regard to the beſt mode of exhibition; ſome prefer giving it juſt before the fit, ſome during the fit, others immediately after it. Some, again, order it in the quantity of an ounce between the fits, the doſe being the more frequent and larger according to the frequency of the fits; and this mode of exhibition, although it may perhaps ſometimes lead to the employment of more bark than is neceſſary, we conſider as upon the whole preferable, from being well ſuited to moſt ſtomachs. The requiſite quantity is very different in different caſes; and in many vernal intermittents it ſeems even hardly neceſſary to adminiſter it.

It is liable, when given in large doſes, to vomit or purge, and ſometimes it oppreſſes the ſtomach. Theſe, or any other effects that may take place, are to be counteracted by remedies particularly appropriated to them. Thus vomiting is often reſtrained by exhibiting it in wine; looſeneſs, by combining it with opium; and ſickneſs at the ſtomach, by the addition of an aromatic. But unleſs for obviating particular inconveniences, it is more ſucceſsful when exhibited in its ſimple ſtate than with any addition; and there ſeems to be little ground for believing that its powers are increaſed by crude ſal-ammoniac, or any other additions whatever.

In agues it is now given from the very commencement of the diſeaſe, and without previous evacuations, though ſome chooſe to premiſe an emetic. It is to be continued not only till the paroxyſms ceaſe, but till the natural appetite and ſtrength return. Its uſe is then to be gradually left off, and repeated at proper intervals to prevent a relapſe; to which, however unaccountable, independently of the recovery of vigour, there often ſeems to be a peculiar diſpoſition.

Bark is a medicine which ſeems not only ſuited to the cure of intermittents, but to that ſtate of fibre on which all rigidly periodical diſeaſes ſeem to depend. Nor is its uſe of leſs importance in continued fevers; attention being paid to keep the bowels in a proper ſtate, and to promote when neceſſary the evacuation of redundant bile. In the confluent ſmall-pox, it promotes a proper ſuppuration in the puſtules, diminiſhes the fever through its whole courſe, and corrects putreſcence and the diſpoſition to gangrene. In ulcerated ſore throats it is uſed with extraordinary ſucceſs, as it is alſo externally and internally in every ſpecies of gangrene. In all thoſe hemorrhages called *paſſive*, and which it is allowed all hemorrhages are very apt to become, and likewiſe in other increaſed diſcharges which tend to debilitate the patient, it is much employed; and in certain undefined caſes of hæmoptyſis, ſome allege that it is remarkably effectual when joined with ſome of the mineral acids. Laſtly, it is uſed for obviating the diſpoſition to nervous and convulſive diſeaſes, as it greatly leſſens the irritability of the ſyſtem; and ſome have great confidence in it joined with the acid of vitriol, in caſes of phthiſis, ſcrophula, ill-conditioned ulcers, rickets, ſcurvy, and in promoting the recovery of convaleſcents.

Bark, Indian, *Thuris cortex*, a medicinal bark, brought from the Eaſt, rolled up like cinnamon, of a ruſty colour, a

warm, aromatic, bitter taſte, and pleaſant ſmell; ſometimes uſed in fumigation in convulſive diſeaſes.

Bark-*Galling*, is when the trees are galled with thorns, &c. It is cured by binding clay on the galled places.

Bark-*Binding*, a diſtemper incident to trees; cured by ſlitting the bark, or cutting along the grain.

Bark, *grafting* in. See Engrafting.

Bark-*mills*. See Mill.

Bark, in Navigation, denotes a little veſſel for the ſea, uſually with pointed or triangular ſails, in number two, or three at the moſt. The term is uſually appropriated by ſeamen to thoſe ſmall ſhips which carry three maſts without a mizen top-ſail. Our northern mariners in the coal-trade apply the term to a broad-ſterned ſhip, which carries no ornamental figure on the ſtern or prow. The word is derived by ſome from the Latin *barca*; by Fournier, from *Barce*, a city in Africa; and Toletanus, from *Barcelona*. Some authors uſe the word *bark* for any veſſel that has no maſts.—Of barks, there are various kinds, diſtinguiſhed by different names, as, a bilander; a ſaik; a ſette; a ſkuit; a ſnaul; a ſnouke.

Bark, *armed*, a kind of fire-ſhip filled with ſoldiers, uſed both for making ſallies, and to attack galleries, and bar the paſſage over them.

Water-Barks, are little veſſels uſed in Holland for the carriage of freſh water to places where it is wanting, as well as for the fetching ſea-water to make ſalt of. They have a deck, and are filled with water up to the deck.

Bark-*Longue*, or *Barca Longa*, a ſmall low ſharp-built, but very long, veſſel without a deck. It goes with ſails and oars, and is very common in Spain.

BARKHAMSTEAD, or Berkhamstead, a town of Hertfordſhire in England; formerly of more note than at preſent. It had formerly a ſtrong caſtle built by the Normans, but it has been long ſince demoliſhed. W. long. 0. 35. N. lat. 45. 49.

BARKING, a town of Eſſex in England, ſeated on the river Roding, not far from the Thames, in a very unwholeſome air. It has been chiefly noted for a large monaſtery, now in ruins; there being nothing left ſtanding but a ſmall part of the walls, and a gate-houſe. E. long. 0. 13. N. lat. 51. 30.

Barking *of Trees*, the peeling off the rind or bark. This muſt be done, in our climate, in the month of May, becauſe at that time the ſap of the tree ſeparates the bark from the wood. It would be very difficult to perform it at any other time of the year, unleſs the ſeaſon was extremely wet and rainy; for heat and dryneſs are a very great hindrance to it. By the former French laws, all dealers were forbid to bark their wood while growing, on the penalty of 500 livres. This law was the reſult of ignorance; it being now found, that barking of trees, and letting them die, increaſes the ſtrength of the timber.

BARKLEY, a town of Glouceſterſhire in England, ſeated on a branch of the rivern Severn. It was formerly of ſome note for a nunnery, and has ſtill the title of a barony. W. long. 2. 30. N. lat. 51. 40.

BARKWAY, a town of Hertfordſhire in England, on the great road from London to York. W. long. 0. 5. N. lat. 52.

BARLAAMITES, in Church Hiſtory the followers of a Calabrian monk, afterwards biſhop of Emont, the great opponent of Greg. Palama and the Heſychaſtæ. The Barlaamites are the ſame with thoſe otherwiſe denominated Acindynites.

BARLERIA, Snap-Dragon; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quadripartite; two of the ſtamina are much leſs than the reſt; the capſule is quadrangular, bilocular, bivalved, elaſtic, and without claws; and the ſeeds are two. There are ten ſpecies; all natives of the warm parts of America, and therefore require to be kept in a ſtove and treated like other tender exotics. They poſſeſs no great beauty nor any remarkable property; but are kept for the ſake of variety.

BARLETTA, a handſome and ſtrong town of Italy, in the kingdom of Naples, and in the Terra di Bari, with a biſhop's ſee. It is ſituated on the gulph of Venice, in E. long. 16. 32. N. lat. 41. 30.

BARLEY, is a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx is lateral, bivalved, uniflorous, and triple. The involucrum conſiſts of ſix leaves, and contains three flowers. There are eight ſpecies; only one of which, *viz.* the murinum, or wall-barley-graſs, is a native of Britain. The native place of the vulgare, or common barley cultivated in our fields, is not known.

All the ſorts of barley are ſown in the ſpring of the year, in dry weather: in ſome very dry light land, it is ſown early in March, but in ſtrong clay ſoils, it is not ſown till April, and ſometimes not till the beginning of May; but when it is ſown ſo late, if the ſeaſon does not prove favourable, it is very late in autumn before it is fit to mow; unleſs it be the rath ripe ſort, which is often ripe in nine weeks from the time of ſowing. Some have ſteeped the ſeed before ſowing it, and have found the practice very beneficial.

Some people ſow barley upon land where wheat grew the former year; but where this is practiſed, the ground ſhould be plowed the beginning of October in a dry time, laying it in ſmall ridges, that the froſt may mellow it. This will improve the land greatly; and if it be ploughed again in January, or the beginning of February, it will break and prepare the ground better. In March it ſhould be ploughed again deeper, and be laid even where it is not very wet: but in ſtrong wet land the ground ſhould be laid round, and the furrows be made deep to receive the wet. When this is finiſhed, the common method is to ſow the barley-ſeed with a broad caſt at two ſowings, the firſt being harrowed in once, the ſecond is harrowed until the ſeed is buried. The common allowance of ſeed is four buſhels to an acre. After the barley is ſown and harrowed in, the ground ſhould be rolled after the firſt ſhower of rain, to break the clods and lay the earth ſmooth; which will render it eaſier to mow the barley, and alſo cauſe the earth to lie cloſer to the roots of the corn, which will be of great ſervice to it in dry weather. Where barley is ſown upon new broken-up land, the uſual method is to plough up the land in March, and let it lie fallow until June, at which time it is ploughed again, and ſown with turnips, which in winter are eaten by ſheep, by whoſe dung the land is greatly improved; and then in March following the ground is ploughed again, and ſown with barley as in the former caſe.

There are many people who ſow clover with their barley, and ſome have ſown lucern with it; but neither of theſe methods is to be commended; for where there is a good crop of barley, the clover or lucern will be weak. The better way is to ſow the barley alone, and then the land will be at liberty for any other crop when that is taken off the ground. In ſome inſtances the clover has been ſown a month after the barley, and found to anſwer. When the barley has been up three weeks or a month, it will be a very good method to roll it with a heavy roller, which will preſs the earth cloſe to the roots, and keep the ſun from penetrating the ground in dry ſeaſons: and this rolling it before it ſtalks will cauſe it to ſend out a greater number of ſtalks; ſo that if the plants

ſhould be thin, this will cauſe them to ſpread ſo as to fill the ground, and likewiſe ſtrengthen the crop very conſiderably.

The time for cutting barley is when the red colour of the ears changes, when the ſtraw turns yellow, and when the ears begin to hang down. In the north of England they always reap their barley, and make it up into ſheaves, as is practiſed in other places for wheat; by which means they do not loſe near ſo much corn, and it is alſo more convenient for ſtacking. But this method cannot be ſo well practiſed where there are many weeds among the corn, which is too frequently the caſe in the rich lands near London, eſpecially in moiſt ſeaſons. Therefore when this is the caſe, the barley muſt lie on the ſwarth until the weeds are dead; yet as it is apt to ſprout in wet weather, it muſt be ſhook up and turned every fair day after rain to prevent this. When it is carried it ſhould be thoroughly dry, for if it be ſtacked wet, it will turn muſty; and if too green, it is ſubject to heat in the mow.

The common produce of barley is two and a half, or three quarters, on an acre; but a much greater produce is ſometimes found on land that has been judiciouſly managed.

The principal uſe of barley among us is for making beer; in order to which it is firſt malted See the article BEER. The Spaniards, among whom malt liquors are little known, feed their horſes with barley as we do with oats. In Scotland, barley is a common ingredient in broths; and the conſumption of it for that purpoſe is very conſiderable, *barley-broth* being a diſh as frequent there as that of *ſoup* in France.

Pearl BARLEY, and *French* BARLEY; barley freed of the huſk by a mill; the diſtinction between the two being, that the pearl barley is reduced to the ſize of ſmall ſhot, all but the very heart of the grain being ground away.

BARLEY-*Water*, is a decoction of either of theſe, reputed ſoft and diluting, of frequent uſe in phyſic. This well-known decoction is a very uſeful drink in many diſorders; and is recommended, with nitre, by ſome authors of reputation, in acute fevers.

BARLEY-*Corn* is uſed to denote a long meaſure, containing in length the third part of an inch, and in breadth the eighth. The French carpenters alſo uſe barley corn, *grain d'orge*, as equivalent to a line, or the twelfth part of an inch.

BARLEY-*Corn (grain d'orge)*, is alſo uſed in building, for a little cavity between the mouldings of joiners work ſerving to ſeparate or keep them aſunder; thus called becauſe made with a kind of plane of the ſame name.

BARM, otherwiſe called YEAST or YEST, is the foam or froth of beer or other liquors in a ſtate of fermentation. Barm is uſed for a leaven or ferment in the making of bread; as ſerving to ſwell or puff it up very conſiderably in a little time, and to make it much lighter, ſofter, and more delicate: though when there is too much of it, the bread is rendered bitter and nauſeous.

Barm is ſaid to have been firſt uſed by the Celtæ in the compoſition of bread. About the time of Agricola's entrance into Lancaſhire, a new ſort of loaf had been introduced at Rome; which was formed only of water and flour, and much eſteemed for its lightneſs: and it was called the *water cake*, from its ſimple compoſition, and the *Parthian roll* from its original inventors. But even this was not comparable to the French or Spaniſh bread for its lightneſs. The uſe of curmi, and the knowledge of brewing, had acquainted the Celtes with an ingredient for their bread, which was much better calculated to render it light and pleaſant, than the leaven, the eggs, the milk, or the wine and honey, of other nations. This was the ſpume which aroſe on the ſurface of their curw in fermentation, and which the Welch denominate *barm*, and we *barm*. The Celtes of Gaul, of Spain, and moſt probably therefore of South-Britain, had long uſed it; and their bread was, in conſequence of this, ſuperior in lightneſs to that of any other nation in the world. The uſe of yeaſt in bread is but a modern practice among the Engliſh. It is not above a century ſince the avarice of the bakers firſt introduced it; and then it was only done from fraudulent motives. The Faculty of Medicine in Paris, by a decree of the 24th of March 1688, ſolemnly declared it noxious to the health of the people; yet even that cenſure did not prevent its becoming general.

Common ale-yeaſt may be kept freſh and fit for uſe ſeveral months, by putting a quantity of it into a cloſe canvas bag, and gently ſqueezing out the moiſture in a ſcrew-preſs, till the remaining matter be as firm and ſtiff as clay. In this ſtate it ſhould be cloſe packed up in a tight caſk, ſo as to ſecure it from the air; and it will keep freſh, ſound, and fit for uſe for a long time. This practice might be of great uſe to brewers and diſtillers, who, though they employ very large quantities of this ſubſtance, ſeem to know no method of preſerving it, or raiſing an occaſional ſupply of it; for want of which they often ſuſtain a very conſiderable loſs. The brewers in Flanders are ſaid to make a very great advantage of ſupplying the malt-diſtillers of Holland with yeaſt, which is rendered laſting, and fit for carriage, by this eaſy expedient.

Mr. Henry has repeatedly prepared an artificial yeaſt, by impregnating flour and water with fixed air, with which he has made very good bread, without the aſſiſtance of any other ferment: and he propoſes this method of procuring freſh fermented bread at ſea. His proceſs is as follows: boil flour and water together to the conſiſtence of treacle; when the mixture is become cold, fill a ſmall caſk with it. This caſk is to be managed in a way which will be eaſily underſtood by referring to Plate 57, where it will be ſeen that an apparatus is affixed for the purpoſe of impregnating the whole of the fluid with fixed air, a proceſs deſcribed under the article AEROLOGY. The caſk is to be agitated, as often as the mixture riſes to about two-thirds of the capacity of the funnel *a*; and after each agitation, which ſhould continue during ſeveral minutes, the unabſorbed air is to be let out, by withdrawing the plug from the orifice *b*; till that part of the mixture which remained in the funnel has returned into the caſk. When, after repeated agitation, the mixture, which has aſcended into the funnel, does not ſubſide into the caſk, it may be ſuppoſed incapable of abſorbing more air. Pour the mixture, thus ſaturated, into one or more large bottles, or narrow-mouthed jars; cover it over looſely with paper, and upon that lay a ſlate or board with a weight to keep it ſteady. Place the veſſel in a ſituation where the thermometer will ſtand from 70 to 80°, and ſtir up the mixture two or three times in twenty-four hours. In about two days, ſuch a degree of fermentation will have taken place, as to give the mixture the appearance of barm.

With the yeaſt in this ſtate, and before it has acquired a thoroughly vinous ſmell, mix the quantity of flour intended for bread, in the proportion of ſix pounds of flour to a quart of the yeaſt, and a ſufficient portion of warm water. Knead them well together in a proper veſſel, and, covering it with a cloth, let the dough ſtand for twelve hours, or till it appears to be ſufficiently fermented, in the fore-mentioned degree of warmth. It is then to be formed into loaves and baked. When the operation is finiſhed, the caſk, in order to prevent its contracting a diſagreeable taint, ſhould be well waſhed. Mr. Henry adds, that perhaps the yeaſt would be more perfect, if a decoction of malt were uſed inſtead of ſimple water. It appears, however, from a communication made to the ſociety for the encouragement of arts, &c. and publiſhed in their volume for 1790, that yeaſt may be produced from a ſimple infuſion of malt, placed in a proper degree of heat, without having recourſe to the troubleſome proceſs recommended by Mr. Henry. We ſhall accordingly cloſe this article with an account of experi-

ments on the generation of yeaſt, made under the inſpection of the Committee of Chemiſtry, in the month of November 1789.

" Four quarts of ground malt were put into a new ſtone-ware veſſel, and maſhed with about an equal quantity of hot water in the uſual manner for brewing. When the maſh had ſtood about an hour, the wort was drawn off, and three quarts of boiling water poured on the grains: when this had ſtood a due time, the liquor was ſuffered to run off, and the whole liquor boiled half an hour; being then ſet to cool, it was poured clear from the ſediment, and then put in a room where the heat was regularly kept up to ſummer heat, or near 80° of Fahrenheit's thermometer. It ſtood in this degree of heat till ſome ſigns of fermentation appeared on the ſurface; which came on in about three days.

" Another brewing was then made as above deſcribed; and, when of a due heat, ſtirred into the former liquor. In about twenty-four hours ſome yeaſt appeared, and another brewing was then made; and, when of a due heat, mixed with the two former ones, and well beat in, the heat being ſtill kept up to the degree above mentioned: in about two days more, five ounces of excellent yeaſt were collected from the ſurface of the liquor.

" Some of this yeaſt being mixed with a due proportion of flour, water, and ſalt, anſwered all the purpoſes intended for bread; and might certainly have been equally well applied to brewing, in the common method. In fine, being pure and good yeaſt, it will anſwer all the intentions of that uſeful ingredient." See the articles BAKING and BREAD.

BARMAS, an Eaſt-Indian people, who, in 1515, poſſeſſed all the coaſt extending from Bengal to Pegu. It appears alſo, that they were formerly maſters of Ava, the dominions of which extended as far as China; and of conſequence the Barmas were maſters of moſt of the northern part of the peninſula beyond the Ganges. Their dominions, however, were afterwards reduced to very narrow bounds, and their king became tributary to him of Pegu; but by degrees they not only recovered their former empire, but conquered the kingdoms of Pegu, Siam, and ſeveral others. By the lateſt accounts, their kingdom extends from the province of Yun-nan in China, about 800 miles in length from north to ſouth, and 250 in breadth from eaſt to weſt.

BARN, in huſbandry, a covered place or houſe, with air-holes in the ſides, for laying up any ſort of grain, hay, or ſtraw.

St. BARNABAS's DAY, a Chriſtian feſtival, celebrated on the 11th of June. St. Barnabas was born at Cyprus, and deſcended of the tribe of Levi, whoſe Jewiſh anceſtors are thought to have retired thither to ſecure themſelves from violence during the troubleſome times in Judea. His proper name was *Joſes*; to which, after his converſion to Chriſtianity, the apoſtles added that of *Barnabas*, ſignifying either *the ſon of prophecy*, or *the ſon of conſolation*; the firſt reſpecting his eminent *prophetic gifts*, the other his *great charity* in ſelling his eſtate for the comfort and relief of the poor Chriſtians. He was educated at Jeruſalem, under the great Jewiſh doctor Gamaliel; which might probably lay the foundation of that intimate friendſhip which was afterwards contracted between this apoſtle and St. Paul. The time of his converſion is uncertain; but he is generally eſteemed one of the ſeventy diſciples choſen by our Saviour himſelf. At Antioch, St. Paul and St. Barnabas had a conteſt, which ended in their ſeparation: but what followed it with reſpect to St. Barnabas, is not related in the *Acts of the Apoſtles*. Some ſay, he went into Italy, and founded a church at Milan. At Salamis, we are told, he ſuffered martyrdom; whither ſome Jews, being come out of Syria, ſet upon him, as he was diſputing in the ſynagogue, and ſtoned him to death. He was buried, by his kinſman Mark, whom he had taken with him, in a cave near that city. The remains of his body are ſaid to have been diſcovered in the reign of the emperor Zeno, together with a copy of St. Matthew's goſpel, in his own hand-writing.

St. BARNABAS's *Epiſtle*, an apocryphal work aſcribed to St. Barnabas, and frequently cited by St. Clement of Alexandria and Origen. It was firſt publiſhed in Greek, from a copy of Father Hugh Menard a Benedictine monk. An ancient verſion of it was found in a manuſcript of the abbey of Coebey, near a thouſand years old. Voſſius publiſhed it, in the year 1656, together with the epiſtles of St. Ignatius.

St. BARNABAS's *Goſpel*, another apocryphal work, aſcribed to St. Barnabas the apoſtle, wherein the hiſtory of Jeſus Chriſt is related in a manner very different from the account given us by the four Evangeliſts. The Mahometans have this goſpel in Arabic, and it correſponds very well with thoſe traditions which Mahomet followed in his Koran. It was, probably, a forgery of ſome nominal Chriſtians; and afterwards altered and interpolated by the Mahometans, the better to accord with their deſigns.

BARNABITES, a religious order, founded in the 16th century by three Italian gentlemen, who had been adviſed by a famous preacher of thoſe days to read carefully the epiſtles of St. Paul. Hence they were called *clerks of St. Paul*; and *Barnabites*, becauſe they performed their firſt exerciſe in a church of St. Barnabas at Milan. Their habit is black; and their office is to inſtruct, catechiſe, and ſerve in miſſion to diſtant countries.

BARNACLE, in ornithology, a ſpecies of gooſe. See the article ANAS.

BARNACLES, in farriery, an inſtrument compoſed of two branches joined at one end with a hinge, to put upon horſes' noſes when they will not ſtand quietly to be ſhod, blooded, or dreſſed with any painful applications.

BARNADESIA, in botany; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; the characters of which are: the corolla is radiated; the calyx is naked, imbricated, and pungent; the pappus of the rays feathery, of the diſk briſtly and retrofracted. There is but one ſpecies, the ſpinoſa, a native of America.

BARNARD-*Caſtle*, ſeated on the river Tees in the county of Durham, is a town and barony belonging to Vane earl of Darlington. It is indifferently large, and has a manufacture of ſtockings. W. long. 1. 45. N. lat. 54. 35.

BARNEVELDT (John d'Olden), the celebrated Dutch ſtateſman, and one of the founders of the civil liberty of Holland. His patriotic zeal inducing him to limit the authority of Maurice prince of Orange the ſecond ſtadtholder of Holland, the partiſans of that prince falſely accuſed him of a deſign to deliver his country into the hands of the Spaniſh monarch. On this abſurd charge he was tried by 26 commiſſaries deputed from the ſeven provinces, condemned, and beheaded in 1619. His ſons William and Réné, with a view of revenging their father's death, formed a conſpiracy againſt the ſtadtholder, which was diſcovered. William fled; but Réné was taken and condemned to die; which fatal circumſtance has immortalized the memory of his mother, of whom the following anecdote is recorded. She ſolicited a pardon for Réné; upon which Maurice expreſſed his ſurpriſe that ſhe ſhould do that for her ſon which ſhe had refuſed for her huſband. To this remark, ſhe replied with indignation, " I would not aſk a pardon for my huſband, becauſe he was innocent. I ſolicit it for my ſon, becauſe he is guilty."

BARNET, a town partly in Middleſex, and partly in Hertfordſhire. It is a great thorough-fare, and the market is very remarkable for hogs. W. long. 0. 5. N. lat. 51. 42.

BARNFIARD, in ornithology, the name of a bird uſually ſeen at ſea, and looked on as a foreteller of bad weather. It is about the ſize of a ſparrow; its neck and back are black, and its

breaſt and belly grey; its feet are red, and its bill black and ſomewhat broad. It ſkims very nimbly along the ſurface of the water.

BARNSLEY, or Black Barnsley, a town of the weſt riding of Yorkſhire, ſeated on the ſide of a hill, and five furlongs in length. W. long. 1. 20. N. lat. 53. 35.

BARNSTABLE, a ſea-port town of Devonſhire, ſeated on the river Tau, over which there is a good bridge. It is a corporation town, and ſends two members to parliament. W. long. 4. 5. N. lat. 51. 15.

BAROCCI (Frederic), a celebrated painter, was born at Urbin, where the genius of Raphael inſpired him. In his early youth he travelled to Rome; where he painted ſeveral things in freſco. He then returned to Urbino; and giving himſelf up to intenſe ſtudy, acquired a great name in painting. His genius particularly led him to religious ſubjects. At his leiſure hours, he etched a few prints from his own deſigns; which are highly finiſhed, and executed with great ſoftneſs and delicacy. The *Salutation* is his capital performance in that way; of which we ſeldom meet with any impreſſions, but thoſe taken from the retouched plate, which are very harſh. He died at Urbino in 1612, at the age of 84.

BAROCHE, a town of Cambaya, in the dominions of the Great Mogul. It is walled round, and was formerly a place of great trade. It is now inhabited by weavers and ſuch mechanics as manufacture cotton cloth. Here they have the beſt cotton in the world, and of conſequence the beſt baſtas are manufactured in this place. The Engliſh and Dutch had formerly factories here, which are now abandoned. E. long. 72. 5. N. lat. 22. 15.

BAROCO, in logic, a term given to the fourth mode of the ſecond figure of ſyllogiſms. A ſyllogiſm in baroco has the firſt propoſition univerſal and affirmative, but the ſecond and third particular and negative, and the middle term is the predicate in the two firſt propoſitions. For example,

BA *Every virtue is attended with diſcretion:*
RO *Some kinds of zeal are not attended with diſcretion:*
CO *Therefore ſome kinds of zeal are not virtues.*

BAR *Nullus homo non eſt bipes:*
CC *Non omne animal eſt bipes:*
O *Non omne animal eſt homo.*

BAROMETER, an inſtrument for meaſuring the weight or preſſure of the atmoſphere; and by that means the variations in the ſtate of the air, foretelling the changes in the weather, and meaſuring heights or depths, &c.

This inſtrument is founded on what is called the Torricellian experiment, related below. It commonly conſiſts of a glaſs tube, open at one end; which being firſt filled with quickſilver, and then inverted with the open end downwards into a baſon of the ſame, the mercury deſcends in the tube till it remains at about the height of 29 or 30 inches, according to the weight or preſſure of the atmoſphere at the time, which is juſt equal to the weight of that column of the quickſilver. Hence it follows that, if by any means the preſſure of the air be altered, it will be indicated by the riſing or falling of the mercury in the tube; or if the barometer be carried to a higher ſtation, the quickſilver will deſcend lower in the tube, but when carried to a lower place, it will riſe higher in the tube, according to the difference in elevation between the two places.

Hiſtory of the Barometer.—About the beginning of the laſt century, when the doctrine of a plenum was in vogue, it was a common opinion among philoſophers, that the aſcent of water in pumps was owing to what they called nature's abhorrence of a vacuum; and that thus fluids might be raiſed by ſuction to any height whatever. But an accident having juſt diſcovered, that water could not be raiſed in a pump unleſs the ſucker reached to within 33 feet of the water in the well, it was conjectured by Galileo, who flouriſhed about that time, that there might be ſome other cauſe of the aſcent of water in pumps, or at leaſt that this abhorrence was limited to the finite height of 33 feet. Being unable to ſatisfy himſelf on this head, he recommended the conſideration of the difficulty to Torricelli, who had been his diſciple. After ſome time Torricelli fell upon the ſuſpicion that the preſſure of the atmoſphere was the cauſe of the aſcent of water in pumps; that a column of water 33 feet high was a juſt counterpoiſe to a column of air of the ſame baſe, and which extended up to the top of the atmoſphere; and that this was the true reaſon why the water did not follow the ſucker any farther. And this ſuſpicion was ſoon after confirmed by various experiments. Torricelli conſidered, that if a column of water 33 feet high were a counterpoiſe to a whole column of the atmoſphere, then a column of mercury of about 2 feet and a half high would alſo be a counterpoiſe to it, ſince quickſilver is near 14 times heavier than water, and ſo the 14th part of the height, or near 2 feet and a half, would be as heavy as the column of water. This reaſoning was ſoon verified; for having filled a glaſs tube with quickſilver, and inverted it into a baſon of the ſame, the mercury preſently deſcended till its height, above that in the baſon, was about two feet and a half, juſt as he expected. And this is what has, from him, been called the Torricellian experiment.

The new opinion, with this confirmation of it, was readily acquieſced in by moſt of the philoſophers, who repeated the experiment in various ways. Others however ſtill adhered to the old doctrine, and raiſed ſeveral pretended objections againſt the new one; ſuch as that there was a film or imperceptible *rope of mercury*, extended through the upper part of the tube, which ſuſpended the column of mercury, and kept it from falling into that in the baſon. This and other objections were however ſoon overcome by additional confirmations of the true doctrine, particularly by varying the elevation of the place. It was hinted by Deſcartes and Paſcal, that if the mercury be ſuſtained in the tube by the preſſure of the atmoſphere, by carrying it to a higher ſituation, it would deſcend lower in the tube, having a ſhorter column of the atmoſphere to ſuſtain it, and vice verſa. And Paſcal engaged his brother-in-law, M. Perier, to try that experiment for him, being more conveniently ſituated for that purpoſe than he was at Paris. This he accordingly executed, by obſerving the height of the quickſilver in the tube, firſt at the bottom of a mountain in Auvergne, and then at ſeveral ſtations, or different altitudes, in aſcending, by which it was found that the mercury fell lower and lower all the way to the top of the mountain; and ſo confirming the truth of the doctrine relating to the univerſal preſſure of the atmoſphere, and the conſequent ſuſpenſion of the mercury in the tube of the barometer. Thus, by the united endeavours of Torricelli, Deſcartes, Paſcal, Merſenne, Huygens, and others, the cauſe of the ſuſpenſion of the quickſilver in the tube of the barometer became pretty generally eſtabliſhed.

It was ſome time however after this general conſent before it was known that the preſſure of the air was various at different times, in the ſame place. This could not however remain long unknown, as the frequent meaſuring of the column of mercury muſt ſoon ſhew its variations in altitude; and experience and obſervation would preſently ſhew that thoſe variations in the mercurial column were always ſucceeded by certain changes in the weather, as to rain, wind, froſts, &c. Hence this inſtrument ſoon came into uſe as the means of foretelling the changes of the weather; and on this account it obtained the name of the *weather-glaſs*, as it did that of *barometer* from its being the meaſure of the weight or preſſure of the air. We now proceed to take a view of its various forms and uſes.

The Common Barometer. This is repreſented at fig. 1, plate 46, ſuch as was invented by Torricelli. AB is a glaſs tube, of $\frac{1}{4}$, or $\frac{1}{3}$, or $\frac{1}{2}$ inch wide, the more the better, and about 34 inches long, being cloſe at the top A, and the open end B immerſed in a baſon of quickſilver CD, which is the better the wider it is. To fill this, or any other barometer; take a clean new glaſs tube, of the dimenſions as above, and pour into it well purified quickſilver, with a ſmall funnel either of glaſs or paper, in a fine continued ſtream, till it wants about half an inch or an inch of being full; then ſtopping it cloſe with the finger, invert it ſlowly, and the air in the empty part will aſcend gradually to the other end, collecting into itſelf ſuch other ſmall air bubbles as unavoidably get into the tube among the mercury, in filling it with the funnel: and thus continue to invert it ſeveral times, turning the two ends alternately upwards, till all the air bubbles are collected, and brought up to the open end of the tube, and till the part filled ſhall appear, without ſpeck, like a fine poliſhed ſteel rod. This done, pour in a little more quickſilver, to fill the empty part quite full, and ſo exclude all air from the tube: then ſtopping the orifice again with the finger, invert the tube, and immerſe the finger and end, thus ſtopped, into a baſon of like purified quickſilver. In this poſition withdraw the finger, ſo ſhall the mercury deſcend in the tube to ſome place as E, between 28 and 31 inches above that in the baſon at F, as theſe are the limits between which it always ſtands in this country on the common ſurface of the earth. Then meaſure, from the ſurface of the quickſilver in the baſon at F, 28 inches to G, and 31 inches to H, dividing the ſpace between them into inches and tenths, which are marked on a ſcale placed againſt the ſide of the tube; and the tenths are ſubdivided into hundredth parts of an inch by a ſliding index carrying a vernier or nonius. Theſe 3 inches, between 28 and 31, ſo divided, will anſwer for all the ordinary purpoſes of a ſtationary or chamber barometer; but for experiments on altitudes and depths, it is proper to have the diviſions carried on a little higher up, and a great deal lower down. In the proper filling and otherwiſe fitting up of the barometer, ſeveral circumſtances are to be carefully noted; as, that the bore of the tube be pretty wide, to allow the freer motion of the quickſilver, without being impeded by an adheſion to the ſides; that the baſon below it be alſo pretty large, in order that the ſurface of the mercury at F may not ſenſibly riſe or fall with that in the tube; that the bottom of the tube be cut off rather obliquely, that when it reſts on the bottom of the baſon there may be a free paſſage for the quickſilver; and that, to have the quickſilver very pure, it is beſt to boil it in the tube, which will expel all the air from it. This barometer is commonly fitted up in a neat mahogany caſe, together with a thermometer and hygrometer, as repreſented in plate 46, fig. 10.

As the ſcale of variation is but ſmall, being included within three inches in the common barometer, ſeveral contrivances have been deviſed to enlarge the ſcale, or to render the motion of the quickſilver more ſenſible.

Deſcartes firſt ſuggeſted a method of increaſing the ſenſibility, which was executed by Huygens. This was effected by making the barometrical tube end in a pretty large cylindrical veſſel at top, into which was inſerted alſo the lower or open end of a much finer tube than the former, which was partly filled with water, to give little obſtruction by its weight to the motion of the mercury, while it moved through a pretty long ſpace of the very fine tube by a ſmall variation of the mercury below it, and ſo rendered the ſmall changes in the ſtate of the air very ſenſible. But the inconvenience was this, that the air contained in the water gradually diſengaged itſelf, and eſcaped through into the vacuum in the top of the ſmall tube, till it was collected in a body there, and by its elaſticity preventing the free riſe of the fluids in the tubes, ſpoiled the inſtrument as a barometer. And this, it may be obſerved by-the-bye, is the reaſon why a water barometer cannot ſucceed. This barometer is here repreſented in fig. 7, where CD is the veſſel, in which is united the upper or ſmall water tube AC, with the lower or mercurial one CB

To remedy this inconvenience, Huygens thought of placing the mercury at top, and the water at bottom, which he thus contrived. ADG (fig. 11) is a bent tube hermetically ſealed at A, but open at G, of about one line in diameter, and paſſing through the two equal cylindrical veſſels BC, EF, which are about 26 inches apart, and of 15 lines diameter, their length being 10. The mercury being put into the tube, will ſtand between the middle of the veſſels EF and BC, the remaining ſpace to A being void both of air and mercury. Laſtly, common water, tinged with a 6th part of aqua regis, to prevent its freezing, is poured into the tube FG, till it riſes a foot above the mercury in DF. To prevent the water from evaporating, a drop of oil of ſweet almonds floats on the top of it. But the column of water will be ſenſibly affected by heat and cold, which ſpoils the accuracy of the inſtrument. For which reaſon other contrivances have been made, as below.

The Horizontal or Rectangular Barometer, fig. 3, was invented by J. Bernoulli and Caſſini; where AB is a pretty wide cylindrical part at the top of the tube, which tube is bent at right angles at C, the lower part of it CD being turned into the horizontal direction, and cloſe above at A, but open at the lower end D, where however the mercury cannot run out, being there oppoſed by the preſſure of the atmoſphere. This and the foregoing contrivance of Huygens are founded on the theorem of hydroſtatics, that fluids of the ſame baſe preſs according to their perpendicular altitude, not according to the quantity of their matter; ſo that the ſame preſſure of the atmoſphere ſuſtains the quickſilver that fills the tube ACD, and the ciſtern B, as would ſupport the mercury in the tube alone. Hence, having fixed upon the ſize of the ſcale, as ſuppoſe the extent of 12 inches, inſtead of the 3, in the common barometer from 28 to 31, that is four times as long; then the area of a ſection of the cylinder AB muſt be 4 times that of the tube, and conſequently its diameter double, ſince the areas of circles are as the ſquares of their diameters: then for every natural variation of an inch in the cylinder AB, there will be a variation of four inches in the tube CD.—But on account of the attrition of the mercury againſt the ſides of the glaſs, and the great momentum from the quick motion in CD, the quickſilver is apt to break, and the riſe and fall is no longer equable; and beſides, the mercury is apt to be thrown out of the orifice at D by ſudden motions of the machine.

The Diagonal Barometer of Sir Samuel Moreland, fig. 2, is another method of enlarging the natural ſcale of three inches perpendicular, or CD, by extending it to any length BC in an oblique direction. This is liable in ſome degree to the ſame inconvenience, from friction and breaking, as the horizontal one; and hence it is found that the diagonal part BC cannot properly be bent from the perpendicular more than in an angle of 45°, which only increaſes the ſcale nearly in the proportion of 7 to 5.

Doctor Hook's Wheel Barometer, fig. 6. This was invented about 1668, and is meant to render the alterations in the air more ſenſible. Here the barometer tube has a large ball AB at top, and is bent up at the lower or open end, where an iron ball G floats on the top of the mercury in the tube, to which is connected another ball H by a cord, hanging freely over a pulley, turning an index KL about its centre. When the mercury riſes in the part FG, it raiſes the ball, and the other ball deſcends and turns the pulley with the index round a graduated circle from N towards M and P; and the contrary

way when the quickſilver and the ball ſink in the bent part of the tube. Hence the ſcale is eaſily enlarged 10 or 12 fold, being increaſed in proportion of the axis of the pulley to the length of the index KL. But then the friction of the pulley and axis is ſome obſtruction to the free motion of the quickſilver. Contrivances to leſſen the friction, &c. may alſo be ſeen in the Philoſ. Tranſ. vol. 52, art. 29, and vol. 60, art 10.

The Steelyard Barometer, for ſo that may be called which is repreſented by fig. 8, which enlarges the ſcale in the proportion of the ſhorter to the longer arm of a ſteelyard. AB is the barometer tube, cloſe at A and open at B, immerſed in a cylindrical glaſs ciſtern CD, which is but very little wider than the tube AB is. The barometer tube is ſuſpended to the ſhorter arm of an index like a ſteelyard, moving on the fulcrum E, and the extremity of its longer arm pointing to the diviſions of a graduated arch, with which index the tube is nearly in equilibrio. When the preſſure of the atmoſphere is leſſened, the mercury deſcends out of the tube into the ciſtern, which raiſes the tube and the ſhorter arm of the index, and conſequently the extremity of the longer moves downwards, and paſſes over a part of the graduated arch. And on the contrary this moves upwards when the preſſure of the atmoſphere increaſes.

The Pendant Barometer, fig. 4, was invented by M. Amontons, in 1695. It conſiſts of a ſingle conical tube AB, hung up by a thread, the larger or open end downwards, and having no veſſel or ciſtern, becauſe the conical figure ſupplies that, and the column of mercury ſuſtained is always equal to that in the common barometer tube; which is effected thus: when the preſſure of the air is leſs, the mercury ſinks down to a lower and wider part of the tube, and conſequently the altitude of its column will be leſs; and on the contrary, by a greater preſſure of the atmoſphere the mercury is forced up to a higher and narrower part, till the length of the column CD be equal to that in the tube of the common barometer.—The inconvenience of this barometer is, that as the bore muſt be made very ſmall, to prevent the mercury from falling out by an accidental ſhake, the friction and adheſion to the ſides of the tube prevent the free motion of the mercury.

Mr. Rowning's Compound Barometer. This gentleman has ſeveral contrivances for enlarging the ſcale, and that in any proportion whatever. One of theſe is deſcribed in the Philoſ. Tranſ. N° 427, and alſo in his Nat. Philoſ. part 2; and another in the ſame part, which is here repreſented at fig. 5. ABC is a compound tube, hermetically ſealed at A, and open at C; empty from A to D, filled with mercury from thence to B, and from hence to E with water. Hence by varying the proportions of the two tubes AF and FC, the ſcale of variation may be changed in any degree.

The Marine Barometer. This was firſt invented by Dr. Hook, to be uſed on board of ſhip, being contrived ſo as not to be affected or injured by the motion of the ſhip. His contrivance conſiſted of a double thermometer, or a couple of tubes half filled with ſpirit of wine; the one ſealed at both ends, with a quantity of air included; the other ſealed at one end only. The former of theſe is affected only by the warmth of the air; but the other is affected both by the external warmth and by the variable preſſure of the atmoſphere. Hence, conſidering the ſpirit thermometer as a ſtandard, the exceſs of the riſe or fall of the other above it will ſhew the increaſe or decreaſe of the preſſure of the atmoſphere. This inſtrument is deſcribed by Dr. Halley, in the Philoſ. Tranſ. N° 269, where he ſays of it, "I had one of theſe barometers with me in my late ſouthern voyage, and it never failed to prognoſticate and give early notice of all the bad weather we had, ſo that I depended thereon, and made proviſion accordingly; and from my own experience I conclude, that a more uſeful contrivance hath not for this long time been offered for the benefit of navigation."

Mr. Nairne, an ingenious artiſt in London, has lately invented a new kind of Marine Barometer: which differs from the common barometer by having the lower part of the tube, for about two feet long, made very ſmall, to check the vibrations of the mercury, which would otherwiſe ariſe from the motions of the ſhip. This is alſo aſſiſted by being hung in gimbals, by a part which ſubjects it to be the leaſt affected by ſuch motions.

Another ſort of Marine Barometer has alſo been invented by M. Paſſemente, an ingenious artiſt at Paris. This contrivance conſiſts only in twiſting the middle of the tube into a ſpiral of two revolutions; by which contrivance the impulſes which the mercury receives from the motions of the ſhip are deſtroyed, by being tranſmitted in contrary directions.

The Statical Baroſcope, or *Barometer*, of Mr. Boyle, &c. This conſiſts of a large glaſs bubble, blown very thin, and then balanced by a ſmall braſs weight. Hence theſe two bodies being of unequal bulk, the larger will be very much affected by a change of the denſity of the medium, but the leſs not at all as to ſenſe: ſo that, when the atmoſphere becomes denſer, the ball loſes more of its weight, and the braſs weight preponderates; and contrariwiſe when the air grows lighter.

Mr. Caſwell's Baroſcope, or *Barometer*. This is deſcribed in the Philoſ. Tranſ. vol. 24, and ſeems to be the moſt ſenſible and exact of any. It is thus deſcribed: Suppoſe ABCD (fig. 9) is a bucket of water, in which is the baroſcope *xrezyofm*, which conſiſts of a body *xrfm*, and a tube *ezyo*, which are both concave cylinders, made of tin, or rather glaſs, and communicating with each other. The bottom of the tube *zy* has a leaden weight to ſink it, ſo that the top of the body may juſt ſwim even with the ſurface of the water by the addition of ſome grain weights on the top. When the inſtrument is forced with its mouth downwards, the water aſcends into the tube to the height *yu*. To the top is added a ſmall concave cylinder, or pipe, to keep the inſtrument from ſinking down to the bottom: *md* is a wire: and *mS*, *de* are two threads oblique to the ſurface of the water, which perform the office of diagonals: for while the inſtrument ſinks more or leſs by an alteration in the gravity of the air, where the ſurface of the water cuts the thread is formed a ſmall bubble, which aſcends up the thread while the mercury of the common baroſcope aſcends, and vice verſa.

It appears from a calculation which the author makes, that this inſtrument ſhews the alterations in the air 1200 times more accurately than the common barometer. He obſerves, that the bubble is ſeldom known to ſtand ſtill even for a minute; that a ſmall blaſt of wind, which cannot be heard in a chamber, will ſenſibly make it ſink; and that a cloud paſſing over it always makes it deſcend, &c.

While ſome have been increaſing the ſenſibility of the barometer by enlarging the variations, others have endeavoured to make it more convenient by reducing the length of the tube. M. Amontons, in 1688, firſt propoſed this alteration in the ſtructure of barometers, by joining ſeveral tubes to one another, alternately filled with mercury and with air, or ſome other fluid; and the number of theſe tubes may be increaſed at pleaſure: but the contrivance is perhaps more ingenious than uſeful.

Mr. Mairan's reduced Barometer, which is only 3 inches long, ſerves the purpoſe of a manometer, in ſhewing the dilatations of the air in the receiver of an air pump; and inſtruments of this kind are now commonly applied to this uſe.

The Portable Barometer is ſo contrived that it may be carried from one place to another without being diſordered. The end of the tube is tied up in a leathern bag not quite full of mercury; which being preſſed by the air, forces the mercury

into the tube, and keeps it ſuſpended at its proper height. This bag is uſually incloſed in a box, through the bottom of which paſſes a ſcrew, by means of which the mercury may be forced up to the top of the tube, and prevented from breaking it by daſhing againſt the top when the inſtrument is removed from one ſtation to another. It ſeems Mr. Patrick firſt made a contrivance of this kind: but the portable barometer has received various improvements ſince; and the moſt complete of this kind has been deſcribed by M. De Luc, in his Recherches, vol. 2, pa. 5 &c, together with the apparatus belonging to it, the method of conſtruction and uſe, and the advantages attending it. Improvements have alſo been ſuggeſted by Sir George Shuckburgh, and Col. Roy, which have been carried into execution, with farther improvements alſo, by Mr. Ramſden, and other ingenious artiſts in London.

Fig. 12 repreſents this inſtrument, as incloſed in its mahogany caſe by means of three metallic rings *a a a*. This caſe is a hollow cone, ſo ſhaped within as to contain ſteadily the body of the barometer, and is divided into three branches from *b* to *c*, forming three legs or ſupports for the inſtrument when obſervations are making, and ſuſtaining it at the part *d* of the caſe, as it appears in Fig. 13, by an improved kind of gimbals, in which its own weight renders it ſufficiently ſteady at any time. In the part of the frame *f g* where the barometer tube appears, is made a long ſlit or opening, that the column of mercury may be ſeen againſt the light, and the vernier piece *f* brought down to coincide very nicely with the edge of the mercury. When the inſtrument is fixed in its ſtand, the ſcrew *l* is to be turned to let the mercury down to its proper ſtation, and a peg at *i* muſt be looſened, to admit the external air to act upon the mercury contained in the box *k*. The proper adjuſtment, or mode of obſerving what is called the *zero* or 0 diviſion of the column of mercury, is by obſerving it in the tranſparent part of the box *k*, which has a glaſs tube or reſervoir for the quickſilver, and an edged piece of metal attached to the external part of it; with the edge of which the mercury is to be brought into contact by turning the ſcrew *l* to the right or left as occaſion requires. The vernier piece at *f*, which determines the altitude of the mercurial column, is firſt brought down by the hand to a near contact, and then accurately adjuſted by turning the ſcrew *e* at the top. The diviſions annexed to the tube of this inſtrument may be of any ſort, or of any degree of ſmallneſs, according to the purpoſes it is intended to ſerve. To accommodate it to the uſe of foreigners as well as natives, there are commonly added ſcales of both French and Engliſh inches, with their ſubdiviſions to any extent required. It is uſual to place the French ſcale of inches on the right ſide, at *f g*, from 19 to 31 inches, meaſured from the zero or ſurface of the mercury in the box *k* below; each inch being divided into lines or 12th parts, and each line ſubdivided by the vernier into 10th parts, or 120th parts of inches; by means of which, therefore, the length of the mercurial column may be determined to the 120th part of a French inch. The other ſcale, which is placed on the left ſide of the inſtrument, is divided into Engliſh inches, and each inch into 20th parts, which by a vernier are ſubdivided into 25th parts, or 500th parts of inches; by this means ſhewing the height of the mercury to the 500th part of an Engliſh inch. But this vernier is figured double, or each diviſion is accounted 2, which reduces the meaſures to 1000ths of an inch for the conveniency of calculation, in meaſuring altitudes of hills, &c.

A thermometer is always attached to the inſtrument, as a neceſſary appendage to it, being faſtened to the body at *h*, and ſunk into the ſurface of the frame, to preſerve it from injury: the degrees of this thermometer are marked on two ſcales, one on each ſide of it, viz, the ſcale of Fahrenheit, and that of Reaumur; the freezing point of the former being at 32 and of the latter at 0. Alſo on the right hand ſide of theſe two ſcales there is a third, called a ſcale of *correction*, placed oppoſitely to that of Fahrenheit, with the word *add* and *ſubtract* marked; which ſhews the neceſſary correction of the obſerved altitude of the mercury at any given temperature of the air indicated by the thermometer.

There are ſeveral other pieces of mechaniſm about the inſtrument, which will be evident by inſpection; and the manner of making the obſervations, with the neceſſary calculations, are fully explained in M. de Luc's *Recherches ſur les Modifications de l'Atmoſphere*, and the *Philoſ. Tranſ.* vol. 67 and 68, before cited.

The Common Chamber Weatherglaſs is alſo uſually fitted up in a neat mahogany frame, and other embelliſhments, to make it an ornamental piece of furniture. It conſiſts of the common tube barometer, with a thermometer by the ſide of it, and an hygrometer at the top, as exhibited in fig. 10.

To the foregoing may be added a new ſort of *Barometer*, or *Weather Inſtrument by the Sound of a Wire*. This is mentioned by M. Lazowſki in his Tour through Switzerland: it is as yet but in an imperfect ſtate, and was lately diſcovered there by accident. It ſeems that a clergyman, though near-ſighted, often amuſed himſelf with firing at a mark, and contrived to ſtretch a wire ſo as to draw the mark to him to ſee how he had aimed. He obſerved that the wire ſometimes ſounded as if it vibrated like a muſical cord; and that after ſuch ſoundings, a change always enſued in the ſtate of the atmoſphere; from whence he came to predict rain or fine weather. On making farther experiments, it was found that the ſounds were moſt diſtinct when extended in the plane of the meridian. And according to the weather which was to follow, it was found that the ſounds were more or leſs ſoft, or more or leſs continued; alſo fine weather, it is ſaid, was announced by the tones of counter-tenor, and rain by thoſe of baſs. It has been ſaid that M. Volta mounted 15 chords in this way at Pavia, to bring this method to ſome preciſion, but no accounts have yet appeared of the ſucceſs of his obſervations.

The Phænomena and Obſervations of the Barometer *. The phænomena of the barometer are various; but authors are not yet agreed upon the cauſes of them; nor is the uſe of it, as a weather-glaſs, yet perfectly aſcertained, though daily obſervations and experience lead us ſtill nearer to preciſion. Mr. Boyle obſerves that the phænomena of the barometer are ſo precarious, that it is exceedingly difficult to form any certain general rules concerning the riſe and fall of the mercury. Even that rule fails which ſeems to hold the moſt generally, viz, that the mercury is low in high winds. The beſt rules however that have been deduced by ſeveral authors are as follow.

Dr. Halley's Rules for judging of the Weather.

1. In calm weather, when the air is inclined to rain, the mercury is commonly low.

2. In ſerene, good, and ſettled weather, the mercury is generally high.

3. Upon very great winds, though they be not accompanied with rain, the mercury ſinks loweſt of all, according to the point of the compaſs the wind blows from.

4. The greateſt heights of the mercury are found upon eaſterly or north-eaſterly winds, other circumſtances alike.

* An eccentric writer obſerves that, by means of barometers, we may regain the knowledge that ſtill reſides in brutes, and which we forfeited by not continuing in the open air, as they moſtly do; and, by our intemperance, corrupting the *craſis* of our organs of ſenſe.

OBSERVATIONS ON THE *BAROMETER*, SHEWING *The Change of the* WEATHER.

THERE are several curious observations to be made by the rising and falling of the Mercury in the Tube, or Pipe, which must be allowed to be occasioned by the Pressure of the Air upon the Quicksilver; and most of the ingenious who have studied the nature of it, agree the influence to be upon the pool or fountain; others think it to be upon the seeming Vacuum on the top of the tube; and most certain it is very hard to penetrate into the true nature and cause of it.

I. OBSERVATION.

IF in a fair season the Mercury falls two or three days together, though there be no other signs of rain, yet be assured it will rain in a short time.

II.

If the Mercury is very active, and rises and falls often in a short time, it shews fair gleams and showers, and very unsettled weather.

III.

When the weather is frosty, and the Mercury is as low as changeable, or falls from where it was, be assured that it betokens cold, rain, or snow, or bad weather for man or beast.

IV.

When the weather is about to change to the East or North East, then the quicksilver rises very high.

V.

If it is going to be tempestuous weather, the quicksilver will sink very low; but as soon as the storm is over, it rises a-pace.

VI.

When it has rained for some time, and the quicksilver rises above the height of the place which denotes fair weather, during twenty-four hours or more, it is a sure sign that the weather will continue fair during some days.

VII.

When the weather has been fair several days, and the quicksilver comes down to the point of changeable and rain, though it should not rain presently, it is a sign that it shall stay at the degree of changeable weather, and there shall be small and changeable winds. If the Mercury falls lower, stopping at the place marked snow or wind, it will rain certainly. And if it goes down as low as the point of great snow, there will be great rain, which will continue several days. The degree marked storms, denotes hurricanes or storms, when the quicksilver is come there, but if at that time the storm is not felt at that place, it is certain that it will in others not far off.

VIII.

About the time of the Equinox, when nights and days are equal, if the quicksilver marks rain, that foreshews that the weather will be very rainy until the other Equinox; so on the contrary, if at the same time the quicksilver marks fair weather, that is a sign the weather will be dry to the next Equinox.

IX.

Note, If the Mercury falls it is good to take physic, but contrary when it rises.

X.

Further, the Barometer is of very great service to all country people in harvest time, for the certain notice it gives of the change of weather before it comes, whereby they may with greater ease and safety get in their corn and grass, and is likewise very serviceable to all travellers, whereby they may avoid the inconveniences of bad weather.

N. B.—As the Barometer never fails to shew the true cause of the alterations of the weather, we are thereby prepared to expect the same; but it may sometimes happen, that the column of Mercury will not alter its altitude agreeably to the foregoing rules; for when the atmosphere is charged with more watry matter than it can dissolve, (the atmosphere being known to be a dissolvent medium) the surplus will form clouds, & those produce showers of rain, when the Mercury stands very high; & for the contrary reason there may be sometimes no rain when the Mercury is very low. Hence it follows, if observed, the wind is North or North East, when the Mercury stands high and there is rain; and when low without rain, the wind is Southerly.——To conclude, the mariner might as well go to sea without a compass, as the farmer to be without a weather-glass.

CHARLES ZAPPA, *fecit.*

5. In calm frosty weather, the mercury commonly stands high.

6. After very great storms of wind, when the mercury has been very low, it generally rises again very fast.

7. The more northerly places have greater alterations of the barometer than the more southerly, near the equator.

8. Within the tropics, and near them, there is little or no variation of the barometer, in all weathers. For instance, at St. Helena it is little or nothing, at Jamaica 3-10ths of an inch, and at Naples the variation hardly ever exceeds an inch; whereas in England it amounts to 2 inches and a half, and at Petersburgh to $3\frac{1}{3}$ nearly.

Dr. Beal, who followed the opinion of M. Pascal, observes that, *cæteris paribus*, the mercury is higher in cold weather than in warm; and in the morning and evening usually higher than at mid-day: that in settled and fair weather, the mercury is higher than either a little before or after, or in the rain; and that it commonly descends lower after rain than it was before it. And he ascribes these effects to the vapours with which the air is charged in the former case, and which are dispersed by the falling rain in the latter. If it chance to rise higher after rain, it is usually followed by a settled serenity. And that there are often great changes in the air, without any perceptible alteration in the barometer.

Mr. Patrick's Rules for judging of the Weather.

These are esteemed the best of any general rules hitherto made:

1. The rising of the mercury presages, in general, fair weather; and its falling, foul weather, as rain, snow, high winds, and storms.

2. In very hot weather, the falling of the mercury indicates thunder.

3. In winter, the rising presages frost: and in frosty weather, if the mercury falls 3 or 4 divisions, there will certainly follow a thaw. But in a continued frost, if the mercury rises, it will certainly snow.

4. When foul weather happens soon after the falling of the mercury, expect but little of it; and on the contrary, expect but little fair weather when it proves fair shortly after the mercury has risen.

5. In foul weather, when the mercury rises much and high, and so continues for 2 or 3 days before the foul weather is quite over, then expect a continuance of fair weather to follow.

6. In fair weather, when the mercury falls much and low, and thus continues for 2 or 3 days before the rain comes; then expect a great deal of wet, and probably high winds.

7. The unsettled motion of the mercury denotes uncertain and changeable weather.

8. You are not so strictly to observe the words engraved on the plates, as the mercury's rising and falling; though in general it will agree with them. For if it stands at *much rain*, and then rises up to *changeable*, it presages fair weather; though not to continue so long as if the mercury had risen higher. And so, on the contrary, if the mercury stood at *fair*, and falls to *changeable*, it presages foul weather; though not so much of it as if it had sunk lower.

Upon these rules of Mr. Patrick, the following *Remarks* are made by *Mr. Rowning*. That it is not so much the absolute height of the mercury in the tube that indicates the weather, as its motion up and down: wherefore, to pass a right judgment of what weather is to be expected, we ought to know whether the mercury is actually rising or falling; to which end the following rules are of use.

1. If the surface of the mercury is convex, standing higher in the middle of the tube than at the sides, it is a sign that the mercury is then rising.

2. But if the surface be concave, or hollow in the middle, it is then sinking. And,

3. If it be plain, or rather a very little convex, the mercury is stationary: for mercury being put into a glass tube, especially a small one, naturally has its surface a little convex, because the particles of mercury attract one another more forcibly than they are attracted by glass. Farther,

4. If the glass be small, shake the tube; then if the air be grown heavier, the mercury will rise about half a 10th of an inch higher than it stood before; but if it be grown lighter, it will sink as much. And, it may be added, in the wheel or circular barometer, tap the instrument gently with the finger, and the index will visibly start forwards or backwards according to the tendency to rise or fall at that time. This proceeds from the mercury's sticking to the sides of the tube, which prevents the free motion of it till it be disengaged by the shock: and therefore, when an observation is to be made with such a tube, it ought to be first shaken; for sometimes the mercury will not vary of its own accord, till the weather is present which it ought to have indicated.

And to the foregoing may be added the following rules, more accurately drawn from later and more close observation of the motions of the barometer, and the consequent changes in the air in this country.

1. In winter, spring, and autumn, the sudden falling of the mercury, and that for a large space, denotes high winds and storms; but in summer it denotes heavy showers, and often thunder: and it always sinks lowest of all for great winds, though not accompanied with rain; though it falls more for wind and rain together than for either of them alone. Also, if, after rain, the wind change into any part of the north, with a clear and dry sky, and the mercury rise, it is a certain sign of fair weather.

2. After very great storms of wind, when the mercury has been low, it commonly rises again very fast. In settled fair and dry weather except the barometer sink much, expect but little rain; for its small sinking then is only for a little wind, or a few drops of rain; and the mercury soon rises again to its former station. In a wet season, suppose in hay-time and harvest, the smallest sinking of the mercury must be minded; for when the constitution of the air is much inclined to showers, a little sinking in the barometer then denotes more rain, as it never then stands very high. And if, in such a season, it rise suddenly, very fast, and high, expect not fair weather more than a day or two, but rather that the mercury will fall again very soon, and rain immediately to follow: the slow gradual rising, and keeping on for 2 or 3 days, being most to be depended on for a week's fair weather. And the unsettled state of the quicksilver always denoting uncertain and changeable weather, especially when the mercury stands any where about the word *changeable* on the scale.

3. The greatest heights of the mercury, in this country, are found upon easterly and north-easterly winds; and it may often rain or snow, the wind being in these points, and the barometer sink little or none, or it may even be in a rising state, the effect of those winds counteracting. But the mercury sinks for wind, as well as rain, in all the other points of the compass; but rises as the wind shifts about to the north or east, or between those points: but if the barometer should sink with the wind in that quarter, expect it soon to change from thence; or else, should the fall of the mercury be much, a heavy rain is then likely to ensue, as it sometimes happens.

Cause of the Phænomena of the Barometer.

To account for the foregoing phænomena of the barometer, many hypotheses have been framed, which may be reduced to two general heads, viz. *mechanical* and *chemical*. The chief writers upon these causes, are Pascal, Beal, Wallis, Garcin, Garden, Lister, Halley, Garsten, De la Hire, Mariotte, Le Cat, Woodward, Leibnitz, De Mairan, Hamberger, D. Ber-

noulli, Muſchenbroek, Chambers, De Luc, Black, &c. and an account of moſt of their hypotheſes may be ſeen at large in M. De Luc's *Recherches ſur les Modifications de l'Atmoſphere*, vol. 1, chap. 3; ſee alſo the *Philoſ. Tranſ.* and various other works on this ſubject. It may ſuffice to notice here ſlightly a few of the principal of them.

Dr. Liſter accounts for the changes of the barometer from the alterations by heat and cold in the mercury itſelf; contracting by cold, and expanding by heat. But this, it is now well known, is quite inſufficient to account for the whole of the effect.

The changes in the weight or preſſure of the atmoſphere muſt therefore be regarded as the principal cauſe of thoſe in the barometer. But then, the difficulty will be to aſſign the cauſe of that cauſe, or whence ariſe thoſe alterations that take place in the atmoſphere, which are ſometimes ſo great as to alter its preſſure by the 10th part of the whole quantity. It is probable that the winds, as driven about in different directions, have a great ſhare in them; vapours and exhalations, riſing from the earth, may alſo have ſome ſhare; and ſome perhaps the flux and reflux occaſioned in the air by the moon; as well as ſome chemical cauſes operating between the different particles of matter.

Dr. Halley thinks the winds and exhalations ſufficient; and on this principle gives a theory, the ſubſtance of which may be compriſed in what follows:

1ſt, That the winds muſt alter the weight of the air in any particular country; and this, either by bringing together a greater quantity of air, and ſo loading the atmoſphere of any place; which will be the caſe as often as two winds blow from oppoſite parts, at the ſame time, towards the ſame point: or by ſweeping away ſome part of the air, and giving room for the atmoſphere to expand itſelf; which will happen when two winds blow oppoſite ways from the ſame point at the ſame time: or laſtly, by cutting off the perpendicular preſſure of the air; which is the caſe when a ſingle wind blows briſkly any way; it being found by experience, that a ſtrong blaſt of wind, even made by art, will render the atmoſphere lighter; and hence the mercury in a tube below it, as well as in others more diſtant, will conſiderably ſubſide. See Philoſ. Tranſ. N°. 292.

2dly, That the cold nitrous particles, and even the air itſelf condenſed in the northern regions, and driven elſewhere, muſt load the atmoſphere, and increaſe its preſſure.

3dly, That heavy dry exhalations from the earth muſt increaſe the weight of the atmoſphere, as well as its elaſtic force; as we find the ſpecific gravity of menſtruums increaſed by ſalts and metals being diſſolved in them.

4thly, That the air being rendered heavier by theſe and the like cauſes, is thence better able to ſupport the vapours; which being likewiſe intimately mixed with it, make the weather ſerene and fair. Again, the air being made lighter from the contrary cauſes, it becomes unable to ſupport the vapours with which it is replete; theſe therefore precipitating, are collected into clouds, the particles of which in their progreſs unite into drops of rain.

Hence he infers, it is evident that the ſame cauſes which increaſe the weight of the air, and render it more able to ſupport the mercury in the barometer, do likewiſe produce a ſerene ſky, and a dry ſeaſon; and that the ſame cauſes which render the air lighter, and leſs able to ſupport the mercury, do likewiſe generate clouds and rain.

But theſe principles, though well adapted to many of the particular caſes of the barometer, ſeem however to fall ſhort of ſome of the principal and moſt obvious ones, beſides being liable to ſeveral objections.

Leibnitz accounted for the fall of the mercury before rain by another principle, viz. That as a body ſpecifically lighter than a fluid, while it is ſuſtained by it, adds more weight to that fluid than when, by being reduced in bulk, it becomes ſpecifically heavier, and deſcends; ſo the vapour, after it is reduced into the form of clouds, and deſcends, adds leſs weight to the air than it did before; and hence the mercury ſinks in the tube.—But here, granting that the drops of rain formed from the vapours always increaſing in ſize as they fall lower, were continually accelerated alſo in their motion, and ſo the air ſuffer a continued loſs of their weight as they deſcend; it may however be objected, that by the deſcent of the mercury the rain is foretold a much longer time before it comes, than the vapour can be ſuppoſed to take up in falling: that many times, and in different places, there falls a great deal of rain, without any ſinking of the mercury at all; as alſo that there often happens a fall of the mercury without any rain enſuing: and that ſometimes the mercury will ſuddenly ſink, in a ſhort ſpace of time, half an inch or more, which anſwers to 7 inches of rain, or about one third of the whole quantity falling in the whole year.

Mr. De Luc ſuppoſes that the changes obſerved in the preſſure of the atmoſphere, are chiefly produced by the greater or leſs quantity of vapours floating in it: as others have attributed them to the ſame cauſe, but have given a different explanation of it. His opinion is, that vapours diminiſh the ſpecific gravity, and conſequently the abſolute weight, of thoſe columns of the atmoſphere into which they are received, and which, notwithſtanding this admixture, ſtill remain of the ſame height with adjoining columns that conſiſt of pure or dry air. He afterwards vindicates and more fully explains this theory, and applies it to the ſolution of the principal phænomena of the barometer, as depending on the varying denſity and weight of the atmoſphere.

Dr. James Hutton, in his Theory of Rain, printed in the Tranſactions of the Royal Society of Edinburgh, vol. 1, gives ingenious and plauſible reaſons for thinking that the leſſening the weight of the atmoſphere by the fall of rain, is not the cauſe of the fall of the barometer; but that the principal, if not the only cauſe, ariſes from the commotions in the atmoſphere, which are chiefly produced by ſudden changes of heat and cold in the air. "The barometer, ſays he, is an inſtrument neceſſarily connected with motions in the atmoſphere; but it is not equally affected with every motion in that fluid body. The barometer is chiefly affected by thoſe motions by which there are produced accumulations and abſtractions of this fluid, in places or regions of ſufficient extent to affect the preſſure of the atmoſphere upon the ſurface of the earth. But as every commotion in the atmoſphere may, under proper conditions, be a cauſe for rain, and as the want of commotion in the atmoſphere is naturally a cauſe of fair weather, this inſtrument may be made of great importance for the purpoſe of meteorologieal obſervations, although not in the certain and more ſimple manner in which it has been, with the increaſe of ſcience, ſo ſucceſsfully applied to the meaſuring of heights."

Another theory of the changes in the barometer, as depending on the *heat* in the atmoſphere, not as producing commotions there, but as altering the ſpecific gravity of the air by the changes of heat and cold.—The principles of this theory are, 1ſt, That vapour is formed by an intimate union between the elements of fire and water, by which the fire or heat is ſo totally enveloped, and its action ſo perfectly ſuſpended by the aqueous particles, that it not only loſes its properties of burning and of giving light, but becomes incapable of affecting the moſt ſenſible thermometer, in which caſe it is ſaid to be in a latent ſtate: and 2d, That if the atmoſphere be affected by any unuſual degree of heat, it thence becomes incapable of

ſupporting ſo long a column of mercury as before; for which reaſon it is that the barometer ſinks.

From theſe axioms it would follow, that as vapour is formed by an union of fire with water, whether by attraction or a ſolution of the water in the fire, the vapour cannot be condenſed till this union, attraction, or ſolution, is at an end. Hence the beginning of the condenſation of the vapour, or the firſt ſigns of approaching rain, muſt be the ſeparation of the fire which is latent in the vapour. In the beginning, this may be either ſlow and partial, or it may be ſudden and violent: in the firſt caſe, the rain will come on ſlowly, and after a conſiderable time; but in the other, it will come very quickly, and in a great quantity. Yet Dr. Black has proved, that when fire quits its latent ſtate, however long it may have lain dormant and inſenſible, it always reaſſumes its proper qualities, and affects the thermometer juſt the ſame as if it had never been abſorbed. The conſequence of this is, that in proportion as the latent heat is diſcharged from the vapour, thoſe parts of the atmoſphere into which it is diſcharged muſt be ſenſibly affected by it; and in proportion to the heat communicated to thoſe parts, they will become ſpecifically lighter, and the mercury will ſink of courſe.

In the Memoirs of the Literary Society of Mancheſter, vol. 4. is alſo a curious paper on this ſubject, viz. *Meteorological Obſervations made on different Parts of the Weſtern Coaſt of Great Britain; arranged by T. Garnett, M. D.* This paper is compoſed of materials furniſhed by ſeveral obſervers; thoſe of Mr. Copland, ſurgeon at Dumfries, are of ſpecial importance. This gentleman is of opinion that the changes of the barometer indicate approaching hot and cold weather, with much more certainty than dry and wet. "Every remarkable elevation of the barometer, ſays he, where it is of any duration, is followed by very warm or dry weather, and moderate as to wind, or by all of them; but heat ſeems to have moſt influence and connexion; and when it is deficient, the continuance of the other two will be longer and more remarkable; therefore the calculation muſt be in a compound ratio of the exceſs and deficiency of the heat, and of the dryneſs of the weather in compariſon of the medium of the ſeaſon; and with regard to the want of ſtrong wind, it appears to be intimately connected with the laſt, as they ſhew that no precipitation is going on in any of the neighbouring regions."

In his 14th and 15th remarks, he had ſaid,

'14th, That the barometer being lower, and continuing ſo longer than what can be accounted for by immediate falls, or ſtormy weather, indicates the approach of very cold weather for the ſeaſon; and alſo, cold weather, though dry, is always accompanied by a low barometer, till near its termination.

'15th, That warm weather is always preceded and moſtly accompanied by a high barometer; and the riſing of the barometer in the time of broken or cold weather, is a ſign of the approach of warmer weather: and alſo if the wind is in any of the cold points, a ſudden riſe of the barometer indicates the approach of a ſoutherly wind, which in winter generally brings rain with it.'

In the two following remarks, Mr. Copland had explained certain phænomena from a principle ſimilar to that on which Dr. Darwin has ſo much inſiſted in his Botanic Garden, I. notes p. 79, &c.

'That the falling of the barometer may proceed from a decompoſition of the atmoſphere occurring around or near that part of the globe where we are placed, which will occaſion the electricity of the atmoſphere to be repelled upwards in fine lambent portions; or driven downwards or upwards in more compacted balls of fire; or laſtly, to be carried along with the rain, &c. in an imperceptible manner to the ſurface of the earth; the precipitation of the watery parts generally very ſoon takes place, which diminiſhes the real gravity of the atmoſphere, and alſo by the decompoſition of ſome of the more active parts, the air loſes part of that elaſtic and repulſive power which it ſo eminently poſſeſſed, and will therefore preſs with leſs force on the mercury of the barometer than before, by which means a fall enſues.

'That the cauſe of the currents of air, or winds, may alſo be this way accounted for: and in very ſevere ſtorms, where great decompoſitions of the atmoſphere take place, this is particularly evident, ſuch as generally occur in one or more of the Weſt India iſlands at one time, a great loſs of real gravity, together with a conſiderable diminution of the ſpring of the air immediately enſues; hence a current commences, firſt in that direction whence the air has moſt gravity, or is moſt diſpoſed to undergo ſuch a change; but it being ſoon relieved of its ſuperior weight or ſpring on that ſide, by the decompoſition going on as faſt as the wind arrives on the iſland, it immediately veers to another point, which then ruſhes in moſtly with an increaſe of force; thus it goes on till it has blown more than half way round the points of the compaſs during the continuation of the hurricane. For in this manner the Weſt India phænomena, as well as the alteration of the wind during heavy rains in this country, can only be properly accounted for.'

Mr. Copland's 4th aphoriſm is, 'That the heavieſt rains, when of long continuance, generally begin with the wind blowing eaſterly, when it gradually veers round to the ſouth; and that the rain does not then begin to ceaſe till the wind has got to the weſt, or rather a little to the northward of it, when, it may be added, it commonly blows with ſome violence.'

Many other obſervations on the barometer, the weather, &c. may be ſeen in various parts of the Philoſ. Tranſ. And for other curious papers on the ſame, and other ſubjects connected with the barometer, ſee the Gentleman's Magazine for 1789, p. 317; alſo Greu's Journal of Nat. Philoſ. printed at Leipzig, 1792, for the influence of the ſun and moon upon the barometer.

The Barometer applied to the Meaſuring of Altitudes.

The ſecondary character of the barometer, namely as an inſtrument for meaſuring acceſſible heights or depths, was firſt propoſed by Paſcal, and Deſcartes, as has been before obſerved; and ſucceeding philoſophers have been at great pains to aſcertain the proportion between the fall of the barometer and the height to which it is carried; as Halley, Mariotte, Maraldi, Scheuchzer, J. Caſſini, D. Bernoulli, Horrebow, Bouguer, Shuckburgh, Roy, and more eſpecially De Luc, who has given a critical and hiſtorical detail of moſt of the attempts that have at different times been made for applying the motion of the mercury in the barometer to the meaſurement of acceſſible heights. To this purpoſe is applied the portable barometer, before deſcribed, (fig. 12 and 13, plate 46,) which ſhould be made with all the accuracy poſſible. Various rules have been given by the writers on this ſubject, for computing the height aſcended from the given fall of the mercury in the tube of the barometer, the moſt accurate of which was that of Dr. Halley, till it was rendered much more accurate by the indefatigable reſearches of De Luc, who introduced into it the corrections of the columns of mercury and air, on account of heat. And other corrections and modifications of the ſame may be ſeen inſerted under the article ATMOSPHERE, where the moſt correct rule is deduced from one ſingle experiment only. This rule is as follows:

The Rule for Computing Altitudes is this,

Viz. 10000 × log. of $\frac{M}{m}$ is the altitude in fathoms, in the mean temperature of 31°; and for every degree of the thermo-

meter above that, the result must be increased by so many times its 435th part, and diminished when below it: in which theorem M denotes the length of the column of mercury in the barometer tube at the bottom, and *m* that at the top of the hill, or other eminence; which lengths may be expressed in any one and the same sort of measures, whether feet, or inches, or tenths, &c. and either English, or French, or of any other nation; but the result is always in fathoms, of 6 English feet each.

The *Precepts*, in words, for the practice of measurements by the barometer, are these following:

1st, Observe the height of the barometer at the bottom of any height or depth, proposed to be measured; together with the temperature of the mercury by means of the thermometer attached to the barometer, and also the temperature of the air in the shade by another thermometer which is detached from the barometer.

2dly, Let the same thing be done also at the top of the said height or depth, and as near to the same time with the former as may be. And let those altitudes of mercury be reduced to the same temperature, if it be thought necessary, by correcting either the one or the other, viz. augmenting the height of the mercury in the colder temperature, or diminishing that in the warmer, by its 9600th part for every degree of difference between the two; and the altitudes of mercury so corrected, are what are denoted by M and *m*, in the algebraic formula above stated.

3dly, Take out the common logarithms of the two heights of mercury, so corrected, and subtract the less from the greater, cutting off from the right hand side of the remainder three places for decimals; so shall those on the left be fathoms in whole numbers, the tables of logarithms being understood to be such as have seven places of decimals.

4thly. Correct the number last found, for the difference of the temperature of the air, as follows: viz. Take half the sum of the two temperatures of the air, shewn by the detached thermometers, for the mean one; and for every degree which this differs from the standard temperature of 31°, take so many times the 435th part of the fathoms above found, and add them if the mean temperature be more than 31°, but subtract them if it be below 31°; so shall the sum or difference be the true altitude in fathoms, or being multiplied by 6, it will give the true altitude in English feet.

Example 1. Let the state of the barometers and thermometers be as follows, to find the altitude: viz.

Thermometers. detached.	Thermometers. attached.	Barometers.
57	57	29·68 lower
42	43	25·28 upper
mean 49½	dif. 14	

As 9600 : 14 :: 29·68 : 04
cor. ·04 logs.

mean 49½	M = 29·64 -	4718782
stand. 31	*m* = 25·28 -	4027771
dif. 18½	As 435 - 18½ :: 691·011 : 29·388	
	29·388	

the altitude sought is { 720·399 fath. or 4322·394 feet.

Example 2. To find the altitude of a hill, when the state of the barometer and thermometer, as observed at the bottom and top of it, is as follows; viz.

Thermometers. detached.	Thermometers. attached.	Barometers.
35	41	29·45
31	38	26·82
mean 33	dif. 3	

As 9600 : 3 :: 29·45 : ·01
·01 logs.

mean 33	M = 29·44 -	4689378
stand. 31	*m* = 26·82 -	4284588
dif. 2	As 435 : 2 :: 404·790 : 1·86	
	1·86	

the altitude sought is { 406·65 fathoms. or 2439·90 feet.

See this rule investigated under the article PNEUMATICS, at the end, in HUTTON's *Mathematical and Philosophical Dictionary*.

N. B. The mean height of the barometer in London, upon an average of two observations in every day of the year, kept at the house of the Royal Society, for many years past, is 29·88; the medium temperature, or height of the thermometer, according to the same, being 58°. But the medium height at the surface of the sea, according to Sir Geo. Shuckburgh (Philos. Trans. 1777, p. 586) is 30·04 inches, the heat of the barometer being 55°, and of the air 62°.

BARON, a person who holds a barony. The origin and primary import of this term is much contested.

Menage derives it from the Latin *baro*, which we find used in the pure age of that language for *vir*, a *stout* or *valiant man*; whence, according to this author, it was, that those placed next the king in battle were called *barones*, as being the bravest men in the army; and as princes frequently rewarded the bravery and fidelity of those about them with fees, the word came to be used for any noble person who holds a fee immediately of the king. Isidore, and after him Camden, take the word, in its original sense, to signify a *mercenary soldier*. Messieurs of the Port Royal derive it from βαρος, *weight* or *authority*. Cicero uses the word *baro* for a stupid brutal man; and the old Germans make mention of *buffeting a baron*, i. e. a *villain*; as the Italians still use the word *barone* to signify a *beggar*. M. de Marca derives baron from the German *bar*, *man*, or *freeman*; others derive it from the old Gaulish, Celtic, and Hebrew languages; but the most probable opinion is, that it comes from the Spanish *varo*, a *stout*, *noble person*; whence wives used to call their husbands, and princes their tenants, *barons*. In the Salic law, as well as the laws of the Lombards, the word *baron* signifies a *man* in the general; and the old glossary of Philomenes translates baron by the word ανηρ, *man*.

BARON is more particularly used, among us, for a lord or peer of the lowest class; or a degree of nobility next below that of a viscount, and above that of a knight or a baronet. In ancient records the word *baron* included all the nobility of England, because regularly all noblemen were barons, though they had also a higher dignity. But it has sometimes happened, that, when an ancient baron hath been raised to a new degree of peerage, in the course of a few generations the two titles have descended differently; one perhaps to the male descendants, the other to the heirs general; whereby the earl-

dom or other ſuperior title hath ſubſiſted without a barony: and there are alſo modern inſtances, where earls and viſcounts have been created without annexing a barony to their other honours: ſo that now the rule doth not hold univerſally that all peers are barons.

The original and antiquity of barons have occaſioned great inquiries among our Engliſh antiquarians. The moſt probable opinion is ſuppoſed to be, that they were the ſame with our preſent lords of manors; to which the name of *court baron* (which is the lord's court, and incident to every manor) gives ſome countenance. It is ſaid the original name of this dignity in England was *vavaſſour*, which by the Saxons was changed into *thane*, and by the Normans into *baron*. It may be collected from King John's *magna charta*, that originally all lords of manors, or barons, had ſeats in the great council or parliament: but ſuch is the deficiency of public records, that the firſt precept to be found is of no higher date than the 49th year of King Henry III. which, although it was iſſued out in the king's name, was neither by his authority nor by his direction: for, not only the king himſelf, but his ſon Prince Edward, and moſt of the nobility who ſtood loyal to him, were then priſoners in the hands of the rebellious barons; having been ſo made in the month of May preceding, at the battle of Lewes, and ſo continued until the memorable battle of Eveſham, which happened in Auguſt the year following; when, by the happy eſcape of Prince Edward, he reſcued the king and his adherents out of the hands of Simon Mountfort Earl of Leiceſter. It cannot be doubted but that ſeveral parliaments were held by King Henry III. and King Edward I. yet no record is to be found giving any account thereof (except the 5th of King Edward I.), until the 22d year of the reign of the laſt mentioned king.

Before the 49th of Hen. III. the ancient parliaments conſiſted of the archbiſhops, biſhops, abbots, earls, and barons. Of theſe barons there were two ſorts: the *greater barons*, or the king's chief tenants, who held of him *in capite* by barony; and the *leſſer barons*, who held of the firſt by military ſervice *in capite*. The former had ſummons to parliament by ſeveral writs; and the latter (*i. e.* all thoſe who were poſſeſſed of thirteen knights fees and a quarter) had a general ſummons from the ſheriff in each county. Thus things continued till the 49th of Henry III. But then, inſtead of keeping to the old form, the prevailing powers thought fit to ſummon, not all, but only thoſe of the greater barons who were of their party; and, inſtead of the leſſer barons who came with large retinues, to ſend their precepts to the ſheriff of each county, to cauſe two knights in every ſhire to be choſen, and one or two burgeſſes for each borough, to repreſent the body of the people reſiding in thoſe counties and boroughs; which gave riſe to the ſeparation into two houſes of parliament. By degrees the title came to be confined to the greater barons, or lords of parliament only; and there were no other barons among the peerage but ſuch as were ſummoned by writ, in reſpect of the tenure of their lands or baronies, till Richard II. firſt made it a mere title of honour, by conferring it on divers perſons by his letters patent.

When a baron is called up to the houſe of peers by writ of ſummons, the writ is in the king's name, and he is directed to come to the parliament appointed to be held at a certain time and place, and there to treat and adviſe with his majeſty, the prelates, and nobility, about the weighty affairs of the nation. The ceremony of the admiſſion of a baron into the houſe of peers is thus: He is brought into the houſe between two barons, who conduct him up to the Lord Chancellor, his patent or writ of ſummons being carried by a king at arms, who preſents it kneeling to the Lord Chancellor, who reads it, and then congratulates him on his becoming a member of the houſe of peers, and inveſts him with his parliamentary robe. The patent is then delivered to the clerk of the parliament, and the oaths are adminiſtered to the new peer, who is then conducted to his ſeat on the barons' bench. Some barons hold their ſeats by tenure. The firſt who was raiſed to this dignity by patent was John de Beauchamp of Holt Caſtle, created Baron of Kidderminſter in Worceſterſhire, to him and his heirs-male, by King Richard II. in the 11th year of his reign. He inveſted him with a mantle and cap. The coronation-robes of a baron are the ſame as an earl's, except that he has only two rows of ſpots on each ſhoulder. In like manner, his parliamentary robes have but two guards of white fur, with rows of gold lace. In other reſpects they are the ſame as other peers. King Charles II. granted a coronet to the barons. It has ſix pearls, ſet at equal diſtances on the chaplet. His cap is the ſame as a viſcount's. His ſtyle is *Right Honourable*; and he is ſtyled by the king or queen, *Right Truſty and Well Beloved*.

Barons *by ancient Tenure* were thoſe who held by certain territories of the king, who ſtill reſerved the tenure in chief to himſelf. We alſo read of *barons by temporal tenure*; who are ſuch as hold honours, caſtles, manors, as heads of their barony, that is by grand ſergeanty; by which tenure they were anciently ſummoned to parliament. But at preſent a baron by tenure is no lord of parliament, till he be called thither by writ.

The barons by tenure after the Conqueſt were divided into *majores* and *minores*, and were ſummoned accordingly to parliament; the *majores* or greater barons, by immediate writ from the king; the *minores*, or leſſer barons, by general writ from the high ſheriff, at the king's command.

Anciently they diſtinguiſhed the greater barons from the leſs, by attributing high and even ſovereign juriſdiction to the former, and only inferior juriſdiction over ſmaller matters to the latter.

Barons *of the Exchequer*, the four judges to whom the adminiſtration of juſtice is committed, in cauſes between the king and his ſubjects relating to matters concerning the revenue. They were formerly barons of the realm, but of late are generally perſons learned in the laws. Their office is alſo to look into the accounts of the king, for which reaſon they have auditors under them.

The *Exchequer* is an ancient court of record, in which all cauſes concerning the revenues and rights of the crown are heard and determined, and where the crown revenues are received. It took this name from the cloth that covered the table of the court, which was party-coloured, or chequered.

This court is ſaid to have been erected by William the Conqueror, its model being taken from a like court eſtabliſhed in Normandy long before that time. Anciently its authority was ſo great, that it was held in the king's palace, and the acts thereof were not to be examined or controlled in any other of the king's courts; but, at preſent, it is the laſt of the four courts at Weſtminſter.

In the exchequer, ſome reckon ſeven courts, viz. thoſe of pleas, accounts, receipts, exchequer-chamber (which is an aſſembly of all the judges on difficult matters in law), errors in the exchequer, errors in the king's bench, and, laſtly, the court of equity in the exchequer.

But the exchequer, for the diſpatch of buſineſs, is generally divided into two parts; one of which is chiefly converſant in the judicial hearing and deciding of all cauſes relating to the king's coffers, formerly termed the *exchequer of accounts*: the other is called the *receipt of the exchequer*, as being principally employed in receiving and paying of money.

Officers of the receipt may take one penny in the pound, as their fee for ſums iſſued out; and they are obliged, without delay, to receive the money brought thither; and the money received is to be put into cheſts under three different locks and

keys, kept by three ſeveral officers. All ſheriffs, bailiffs, &c. are to account in the exchequer; and in the lower part, termed the receipt, the debtors of the king, and perſons in debt to them, the king's tenants, and the officers and miniſters of the court, are privileged to ſue one another, or any ſtranger, and to be ſued in the like actions as are brought in the courts of king's bench and common-pleas.

The judicial part of the exchequer is a court both of law and equity. The court of law is held in the office of pleas, according to the courſe of common law, before the barons: in this court, the plaintiff ought to be a debtor or accountant to the king; and the leading proceſs is either a writ of ſubpœna, or quo minus, which laſt goes into Wales, where no proceſs out of courts of law ought to run, except a capias utlagatum.

The court of equity is held in the exchequer chamber before the treaſurer, chancellor, and barons; but, generally, before the barons only: the lord chief baron being the chief judge to hear and determine all cauſes. The proceedings in this part of the exchequer are by Engliſh bill and anſwer, according to the practice of the court of chancery; with this difference, that the plaintiff here muſt ſet forth, that he is a debtor to the king, whether he be ſo or not. It is in this court of equity that the clergy exhibit bills for the recovery of their tythes, &c. Here too the attorney-general exhibits bills for any matters concerning the crown; and a bill may be exhibited againſt the king's attorney by any perſon aggrieved in any cauſe proſecuted againſt him on behalf of the king, to be relieved therein: in which caſe, the plaintiff is to attend on the attorney-general, with a copy of the bill, and procure him to give in an anſwer thereto; in the making of which he may call in any perſon intereſted in the cauſe, or any officer, or others, to inſtruct him, that the king be not prejudiced thereby, and his anſwer is to be put in without oath.

But, beſides the buſineſs relating to debtors, farmers, receivers, accountants, &c. all penal puniſhments, intruſion, and forfeitures upon popular actions, are matters likewiſe cognizable by this court; where there alſo ſits a puiſne-baron, who adminiſters the oaths to high ſheriffs, bailiffs, auditors, receivers, collectors, comptrollers, ſurveyors, and ſearchers of all the cuſtoms, &c. The exchequer in Scotland has the ſame privileges and juriſdiction as that of England; and all matters competent to the one are competent to the other alſo.

BARONS *of the Cinque-ports* are members of the houſe of commons, elected by the five ports, two for each port. The Cinque-ports are five havens that lie on the eaſt part of England, towards France; thus called by way of eminence on account of their ſuperior importance, as having been thought by our kings to merit a particular regard for their preſervation againſt invaſion. Hence they have a particular policy, and are governed by a keeper with the title of *Lord-warden of the Cinque-ports*.

Camden tells us, that William the Conqueror firſt appointed a warden of the Cinque-ports: but King John firſt granted them their privileges; and that upon condition they ſhould provide 80 ſhips at their own charge for 40 days, as often as the king ſhould have occaſion in the wars; he being then ſtraitened for a navy to recover Normandy.

The five ports are, Haſtings, Romney, Hythe, Dover, and Sandwich. Thorn tells us, that Haſtings provided 21 veſſels, and in each veſſel 21 ſeamen. To this port belong Seaford, Pevenſey, Hedney, Winchelſea, Rye, Hamine, Wakeſbourn, Creneth, and Forthclipe. Romney provided five ſhips, and in each 24 men. To this belong Bromhal, Lyde, Oſwarſtone, Dangemares, and Romenhal. Hythe furniſhed five ſhips, and in each 21 ſeamen. To this belongs Weſtmeath. Dover the ſame number as Haſtings. To this belong Folkſtone, Feverſham, and Marge. Laſtly, Sandwich furniſhed the ſame with Hythe. To this belong Fordiwic, Reculver, Serre, and Deal.

The privileges granted to them in conſequence of theſe ſervices were very great. Amongſt others, they were each of them to ſend two barons to repreſent them in parliament; their deputies were to bear the canopy over the king's head at the time of his coronation, and to dine at the uppermoſt table in the great hall on his right hand; to be exempted from ſubſidies and other aids; their heirs to be free from perſonal wardſhip, notwithſtanding any tenure; to be impleaded in their own towns, and not elſewhere; not to be liable to tolls, &c.

The Cinque-ports give the following titles: Haſtings, a barony to the ancient family of Huntington: Romney, to the Marſhams: Dover, new barony, to a branch of the York family; formerly a dukedom (now extinct) to the Queenſberry family: Sandwich, an earldom to a branch of the Montagues.

BARON *and Feme*, in the Engliſh law, a term uſed for huſband and wife, in relation to each other: and they are deemed but one perſon; ſo that a wife cannot be witneſs for or againſt her huſband, nor he for or againſt his wife, except in caſes of high treaſon.

BARON *and Feme*, in heraldry, is when the coats of arms of a man and his wife are borne par pale in the ſame eſcutcheon, the man's being always on the dexter ſide, and the woman's on the ſiniſter; but here the woman is ſuppoſed not an heireſs, for then her coat muſt be borne by the huſband on an eſcutcheon of pretence.

BARONET, a dignity or degree of honour next beneath a baron, and above a knight; having precedency of all knights excepting thoſe of the garter, and being the only knighthood that is hereditary.

The dignity of baronet is given by patent, and is the loweſt degree of honour that is hereditary. The order was founded by King James I. at the ſuggeſtion of Sir Robert Cotton, in 1611, when 200 baronets were created at once; to which number it was intended they ſhould always be reſtrained: but it is now enlarged at the king's pleaſure, without limitation.

They had ſeveral conſiderable privileges given them, with an *habendam* to them and their heirs male. They were allowed to charge their coat with the arms of Ulſter, which are, in a field argent, a ſiniſter hand, gules; and that upon condition of their defending the province of Ulſter in Ireland againſt the rebels, who then haraſſed it extremely: to which end they were each to raiſe and keep up 30 ſoldiers at their own expence for three years together, or to pay into the exchequer a ſum ſufficient to do it; which, at 8d. per day per head, was 109l. So that, including fees, the expence of this dignity may be about 1200l. ſterling. To be qualified for it, one muſt be a gentleman born, and have a clear eſtate of 1000l. *per annum*.

Baronets take place according to the dates of their patents; by the terms of which no honour is to be exacted between barons and baronets. The title *Sir* is granted them by a peculiar clauſe in their patents, though they be not dubbed knights: but both a baronet, and his eldeſt ſon, being of full age, may claim knighthood. The firſt baronet who was created was Sir Nicholas Bacon of Redgrave in Suffolk, whoſe ſucceſſor is therefore ſtyled *Primus Baronetorum Angliæ*.

BARONETS *of Scotland*, called alſo *Baronets of Nova Scotia*. The order of knights-baronets was alſo deſigned to be eſtabliſhed in Scotland in the year 1621, by King James I. for the plantation and cultivation of the province of Nova Scotia in America; but it was not actually inſtituted till the year 1625 by his ſon Charles I. when the firſt perſon dignified with this title was Sir Robert Gordon of Gordonſtone, a younger ſon of the Earl of Sutherland. The king granted a certain portion of land in Acadia or New Scotland, to each of them, which they were to hold of Sir William Alexander (afterwards

Earl of Stirling), for their encouragement who ſhould hazard their lives for the good and increaſe of that plantation, with precedency to them, and their heirs-male for ever, before all knights called *equites aurati*, and all leſſer barons called *lairds*, and all other gentlemen, except Sir William Alexander his majeſty's lieutenant in Nova Scotia, his heirs, their wives and children; that the title of *Sir* ſhould be prefixed to their Chriſtian name, and *Baronet* added to their ſurname; and that their own and their eldeſt ſons' wives ſhould enjoy the title of *Lady*, *Madam*, or *Dame*. His majeſty was ſo deſirous of adding every mark of dignity to this his favourite order, that, four years after its inſtitution, he iſſued a royal warrant, granting them the privilege of wearing an orange ribbon and a medal; which laſt was preſented to each of them by the king himſelf, according to the words of the warrant. All the privileges of the order, particularly this of wearing the medal, were confirmed at the king's requeſt by the convention of eſtates in the year 1630; and in order to eſtabliſh them on the moſt ſolid foundation, they were again confirmed by an act of the parliament of Scotland in the year 1633. This mark of diſtinction fell to the ground with all the other honours of Scotland during the uſurpation of the Long Parliament and of Oliver Cromwell. It continued in general, though not total, diſuſe, after the Reſtoration. There have been former meetings of the order to revive the uſe of it, one in the year 1721, and another in 1734. Theſe meetings proved ineffectual, becauſe the proper ſteps towards its revival were not taken; but, under the auſpices of our preſent monarch George III. ſuch meaſures were concerted in the year 1775 as have effectually reeſtabliſhed this honourable order.

Baronets *of Ireland*. This order was likewiſe inſtituted by King James I. in the 18th year of his reign, for the ſame purpoſe, and with the ſame privileges within the kingdom of Ireland as he had conferred on the like order in England; for which the Iriſh baronets paid the ſame fees into the treaſury of Ireland. The firſt of that kingdom who was advanced to this hereditary dignity was Sir Francis Blundell, then ſecretary for the affairs of Ireland. Since his time, ſeveral have been created, no number being limited.

BARONY, Baronia, or *Baronagium*, the lordſhip or fee of a baron, either temporal or ſpiritual: in which ſenſe *barony* amounts to the ſame with what is otherwiſe called *honour*.

A barony may be conſidered as a lordſhip held by ſome ſervice in chief of the king, coinciding with what is otherwiſe called *grand ſergeanty*. Baronies, in their firſt creation, moved from the king himſelf, the chief lord of the whole realm, and could be holden immediately of no other lord. For example, the king enfeoffed a man of a great ſeigneurie in land, to hold to the perſon enfeoffed and his heirs, of the king and his heirs, by baronial ſervice; to wit, by the ſervice of 20, 40, 60 knights, or of ſuch other number of knights, either more or fewer, as the king by his enfeoffment limited or appointed. In the ages next after the Conqueſt, when a great lord was enfeoffed by the king of a large ſeigneurie, ſuch ſeigneurie was called a *barony*, but more commonly an *honour*; as, the honour of Glouceſterſhire, the honour of Wallingford, the honour of Lancaſter, the honour of Richmond, and the like. There were in England certain honours, which were often called by Norman or other foreign names; that is to ſay, ſometimes by the Engliſh and ſometimes by the foreign name. This happened when the ſame perſon was lord of an honour in Normandy, or ſome other foreign country, and alſo of an honour in England. For example, William de Forz, de Force, or de Fortibus, was lord of the honour of Albemarle in Normandy: he was alſo lord of two honours in England; to wit, the honour of Holderneſs, and the honour of Skipton in Cravene. Theſe honours in England were ſometimes called by the Norman name, the honour of Albemarle, or the honour of the Earl of Albemarle. In like manner, the Earl of Britannie was lord of the honour of Britannie in France, and alſo of the honour of Richmond in England: the honour of Richmond was ſometimes called by the foreign name, the honour of Britannie, or the honour of the Earl of Britannie. This ſerveth to explain the terms "honour of Albemarle in England," *honor Albemarliæ*, or *comitis Albemarliæ in Anglia*; *honor Britanniæ*, or *comitis Britanniæ in Anglia*, "the honour of Britannie," or "the Earl of Britannie in England." Not that Albemarle or Britannie were in England, but that the ſame perſon reſpectively was lord of each of the ſaid honours abroad and of each of the ſaid honours in England. The baronies belonging to biſhops are by ſome called *regalia*, as being held ſolely on the king's liberality. Theſe do not conſiſt in one barony alone, but in many; for *tot erant baroniæ, quot majora prædia*.

A barony, according to Bracton, is a right indiviſible. Wherefore, if an inheritance be to be divided among coparceners, though ſome capital meſſuages may be divided, yet if the capital meſſuage be the head of a county or barony, it may not be parcelled: and the reaſon is, leſt by this diviſion many of the rights of counties and baronies by degrees come to nothing, to the prejudice of the realm, which is ſaid to be compoſed of counties and baronies.

BARRA, or Bara, iſland of. See Bara.

Barra, in commerce, a long-meaſure uſed in Portugal and ſome parts of Spain, to meaſure woollen cloths, linen cloths, and ſerges. There are three ſorts; the barra of Valencia, 13 of which make $12\frac{6}{7}$ yards Engliſh meaſure; the barra of Caſtile, 7 of which make $6\frac{4}{7}$ yards; and the barra of Arragon, 3 of which make $2\frac{4}{7}$ yards Engliſh.

BARRABA (deſert of); a tract of land in Siberia, lying between the rivers Irtis and Oby, in the province of Tobolſk. It is uninhabited, but not through any deficiency of the ſoil; for that is excellent for tillage, and part of it might alſo be laid out in meadows and paſtures. It is interſperſed with a great number of lakes, which abound with a ſpecies of carp called by the neighbouring people *karawſchen*; and the country produces great numbers of elks, deer, foxes, ermine and ſquirrels. Between the Irtis and Oby are ſome rich copper mines; particularly on a mountain called *Pißowa*, from the *pißa* or white firs that grow upon it. Every hundred weight of the ore found here yields 12 pounds of pure copper; and there is no occaſion for digging deep in order to come at it. Moſt of theſe ores, beſides being very rich in copper, yield a great deal of ſilver, which affords ſo much gold as makes rich returns for the trouble and expence of extracting it.

BARRACAN, or Barracan, in commerce, a kind of ſtuff belonging to the claſs of camblets, only of a grain much coarſer than the reſt, manufactured in various parts of France and Flanders, chiefly at Abbeville, Amiens, Rouen, and Liſle, and now in England.—The word is barbarous Latin, formed, as ſome ſuppoſe, from *barra*, q. d. *barrarum formam referens*. Du-Cange. The chief uſe of barragans, called alſo by the French *bouracans*, is for ſurtouts, or upper garments againſt the rain, being, when good, of ſo cloſe a grain, that the water will not ſoak through, but only run over them.—For the woof, its thread is ſingle, twiſted, and fine ſpun; that of the warp is double or triple, i. e. compoſed of two or three threads well twiſted together. The uſual matter it is made of is wool; though there are ſome made at Rouen, where the warp is hemp, and the woof wool. Some barragans, again, are made of wool, dyed before it comes to the loom; others are woven white, and dyed afterwards, red, black, blue, brown, &c. They

are not fulled, but only boiled two or three times in fair water, when they come from the loom; then calendered to make them ſmooth and even; and laſtly, made into rolls called pieces of *barragan*.

BARRACIDA, or Barraeuda of Cateſby, a ſpecies of *eſox*. Esox, in ichthyology, is a genus of fiſhes belonging to the order of abdominales. The body is elongated; the head is plainiſh above; the upper jaw is plain, and ſhorter than the under one, which is dotted; and the branchioſtege membrane has from ſeven to twelve rays. Of the ſpecies,

1. The Lucius, or Pike, has a flat head: the upper jaw is broad, and ſhorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very ſharp, diſpoſed only in the front of the upper jaw, but in both ſides of the lower; in the roof of the mouth, and often in the tongue. The ſlit of the mouth, or the gape, is very wide; the eyes ſmall. The pike is common in moſt of the lakes of Europe; but the largeſt are thoſe taken at Lapland, which, according to Scheffer, are ſometimes eight feet long. They are taken there in great abundance, dried, and exported for ſale. The largeſt fiſh of this kind ſaid to be caught in England, weighed 35 pounds. All writers who treat of this ſpecies bring inſtances of its voracioufneſs. It hath been known to choke itſelf by attempting to ſwallow one of its own ſpecies, which proved too large a morſel. Yet its jaws are very looſely connected, and have on each ſide an additional bone like the jaw of a viper, which renders them capable of greater diſtenſion when it ſwallows its prey. It does not confine itſelf to feed on fiſh and frogs; it will devour the water-rat, and draw down the young ducks as they are ſwimming about. But there are inſtances of its fierceneſs ſtill more ſurpriſing, and which indeed border a little on the marvellous. Geſner relates, that a famiſhed pike in the Rhone ſeized on the lips of a mule that was brought to water, and that the beaſt drew the fiſh out before it could diſengage itſelf; that people have been bit by theſe voracious creatures while they were waſhing their legs; and that the pike will even contend with the otter for its prey, and endeavour to force it out of its mouth. Small fiſhes ſhow the ſame uneaſineſs and deteſtation at the preſence of this tyrant, that the little birds do at the ſight of the hawk or owl. When the pike lies dormant near the ſurface, as is frequently the caſe, the leſſer fiſhes are often obſerved to ſwim around it in vaſt numbers and in great anxiety. Pikes are often haltered in a nooſe, and taken while they thus lie aſleep, as they are often found in the ditches near the Thames, in the month of May. In the ſhallow water of the Lincolnſhire fens they are often taken in a manner, we believe, peculiar to that country and to the iſland of Ceylon. The fiſherman makes uſe of what is called a *crown net*; which is no more than a hemiſpherical baſket, open at top and bottom. He ſtands at the end of one of the little fen-boats, and frequently puts his baſket down to the bottom of the water; then poking a ſtick into it, diſcovers whether he has any booty by the ſtriking of the fiſh; and vaſt numbers of pike are taken in this manner. The longevity of this fiſh is very remarkable, if we may credit the accounts given of it. Rzaczynſki tells us of one that was 90 years old; but Gefner relates, that, in the year 1497, a pike was taken near Hailbrun in Suabia, with a brazen ring affixed to it, on which were theſe words in Greek characters: "I am the fiſh which was firſt put into this lake by the governor of the univerſe, Frederick the Second, the 5th of October 1230:" So that the former muſt have been an infant to this Methuſalem of a fiſh. Pikes ſpawn in March or April, according to the coldneſs or warmneſs of the weather. When they are in high ſeaſon, their colours are very fine, being green, ſpotted with bright yellow; and the gills are of a moſt vivid and full red. When out of ſeaſon, the green changes to a grey, and the yellow ſpots become of a pale hue.

2. The Belone, or Gar, ſometimes grows to the length of three feet or more. The jaws are very long, ſlender, and ſharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of ſhort and ſlender teeth: the tongue is ſmall; the eyes are large; the irides ſilvery; the noſtrils wide and round. The body is ſlender, the belly quite flat, bounded on both ſides by a rough line. The tail is much forked. The colours are extremely beautiful when the fiſh is in the water: the back is of a fine green, beneath which appears a rich changeable blue and purple: the ſides and belly are of a fine ſilvery hue. This fiſh, which is found in many places, is known by the name of the *ſea needle*. It comes in ſhoals on our coaſts in the beginning of ſummer, and precedes the mackarel: it has a reſemblance to it in taſte; but the light green which ſtains the back-bone of this fiſh prevents many people from employing it as food.

3. The Saurus, or Saury, is 11 inches in length: the noſe ſlender; the jaws produced like thoſe of the ſea-needle, but of equal length: the eyes large: the body is anguilliform; but towards the tail grows ſuddenly ſmaller, and tapers to a very inconſiderable girth. The tail is much forked: the back duſky: the belly bright and ſilvery. Great numbers of theſe fiſh were thrown aſhore on the ſands of Leith near Edinburgh, after a great ſtorm in November 1768. Rondeletius deſcribes this ſpecies among the fiſh of the Mediterranean; but ſpeaks of it as rarely met with.

4. The Barracuda of Cateſby, is found in great numbers about the ſeas of the Bahamas, and as far as Jamaica. Its body and head very much reſemble the European pike: the eyes are large: the mouth is very wide; the under jaw longer than the upper: there are four very large and ſharp teeth in the front of the upper jaw; in that of the lower, a ſingle great and ſharp tooth; there are two dorſal fins: the tail is large and forked: colour a deep brown, whitiſh on the belly. It grows to the length of 10 feet. It ſwims exceedingly ſwift, and, dreadfully voracious, will attack and devour men when they are bathing. The fleſh has a diſagreeable ſmell and taſte, and is frequently poiſonous; cauſing great ſickneſs, vomiting, intolerable pains in the head, and loſs of hair and nails: yet the hungry Bahamans formerly were under the neceſſity, at times, of eating it.

BARRACKS, or Baracks, places for ſoldiers to lodge in, eſpecially in garriſons.—Barracks, when damp, are greatly prejudicial to the health of the ſoldiers lodged in them; occaſioning dyſenteries, intermitting fevers, coughs, rheumatic pains, &c. For which reaſon, quarter-maſters ought to be careful in examining every barrack offered by the magiſtrates of a place; rejecting all ground-floors in houſes that have either been uninhabited, or have any ſigns of moiſture.

BARRATI, barred, an appellation given to the Carmelites after they were obliged to lay aſide the white cap, and wear cowls ſtriped black and white.

BARRATOR, or Barretor, in law, a perſon guilty of barretry. See Barretry.

Lambert derives the word *barretor* from the Latin *balatro*, "a vile knave;" but the proper derivation is from the French *barrateur*, *i. e.* "a deceiver;" and this agrees with the deſcription of a common barretor in Lord Coke's Report, *viz.* that he is a common mover and maintainer of ſuits in diſturbance of the peace, and in taking and detaining the poſſeſſion of houſes and lands, or goods, by falſe inventions, &c. And therefore it was adjudged that the indictment againſt him ought to be in theſe words, *viz.* That he is *communis malefactor*,

calumniator et seminator litium et discordiarum inter vicinos suos, et pacis regis perturbator, &c. And there it is said that a common barretor is the most dangerous oppressor in the law, for he oppresseth the innocent by colour of law, which was made to protect them from oppression.

BARRATRY, in law. See BARRETRY.

BARRATRY, in a shipmaster, is his cheating the owners. If goods delivered on ship-board are embezzled, all the mariners ought to contribute to the satisfaction of the party that lost his goods by the maritime law; and the cause is to be tried in the admiralty. In a case where a ship was insured against the barratry of the master, &c. and the jury found that the ship was lost by the fraud and negligence of the master, the court agreed, that the fraud was barratry, though not named in the covenant; but that negligence was not.

BARRAUX, a fortress of Dauphiny belonging to France. It stands in the valley of Grésivaudan, and was built by a Duke of Savoy in 1597. The French took it in 1598, and have kept it ever since. It is seated on the river Iser, in E. long. 4. 35. N. lat. 45. 0.

BARRAY, one of the Hebrides, or Western isles of Scotland, situated in W. long. 6. 30. N. lat. 56. 55.

BARREL, in commerce, a round vessel, extending more in length than in breadth, made of wood, in form of a little tun. It serves for holding several sorts of merchandize.

BARREL is also a measure of liquids. The English barrel, wine-measure, contains the eighth part of a tun, the fourth part of a pipe, and one half of a hogshead; that is to say, it contains 31½ gallons. A barrel, beer-measure, contains 36 gallons; and, ale-measure, 32 gallons. The barrel of beer, vinegar, or liquor preparing for vinegar, ought to contain 34 gallons, according to the standard of the ale-quart.

BARREL also denotes a certain weight of several merchandizes, which differs according to the several commodities. A barrel of Essex butter weighs 106 pounds; and of Suffolk butter, 256 pounds. The barrel of herrings ought to contain 32 gallons wine-measure, which amount to about 28 gallons old standard, containing about 1000 herrings. The barrel of salmon must contain 42 gallons; the barrel of eels the same. The barrel of soap must weigh 256 lbs.

BARREL, in mechanics, a term given by watch-makers to the cylinder about which the spring is wrapped; and by gunsmiths to the cylindrical tube of a gun, pistol, &c. through which the ball is discharged.

BARREL, in anatomy, a pretty large cavity behind the tympanum of the ear, about four or five lines deep, and five or six wide.

Fire BARRELS, are barrels containing combustible materials arranged in a particular manner in a fire-ship. To make the subject better understood, we shall here give an account of the construction of the latter.

A Fire Ship is an old vessel filled with combustible materials, fitted with grappling irons to hook, and equipped for the purpose of setting fire to the enemies' ships in battle, or in harbour, &c. As there is nothing particular in the construction of this ship, except the apparatus by which the fire is instantly conveyed from one part to another, and from thence to the enemy, it will be sufficient to describe the fire-room, where these combustibles are enclosed, together with the instruments necessary to grapple the ship intended to be destroyed.

The fire-room is built between decks, and limited on the after part by a *bulk-head*, *l*, behind the main-mast, from which it extends quite forward, as represented in Plate 48. The train enclosed in this apartment is contained in a variety of wooden troughs, *d*, *g*, which intersect each other in different parts of the ship's length; being supported at proper distances by cross-pieces and stanchions. On each side of the ship are six or seven ports, *h*, about 18 inches broad and 15 inches high; and having their lids to open downward, contrary to the usual method.

Against every port is placed an iron chamber *, which, at the time of firing the ship, blows out the port-lid, and opens a passage for the flame. Immediately under the main and fore-shrouds is fixed a wooden funnel *m*; whose lower end communicates with a fire-barrel, of which we shall here stop to give some account.

Fire-Barrels ought to be of a cylindrical form, as most suitable to contain the reeds with which they are filled, and more convenient for stowing them between the troughs in the fire-room. Their inside chambers should not be less than 21 inches, and 30 inches is sufficient for their length. The bottom parts are first well stored with short double-dipped reeds placed upright; and the remaining vacancy is filled with fire-barrel composition well mixed and melted, and then poured over them. The composition used for this purpose is a mass of sulphur, pitch, tar, and tallow.

There are five holes, of three-fourths of an inch in diameter and three inches deep, formed in the top of the composition while it is yet warm; one being in the centre, and the other four at equal distances round the sides of the barrel. When the composition is cold and hard, the barrel is primed by filling those holes with fuse-composition, which is firmly driven into them, so as to leave a little vacancy at the top to admit a strand of quick-match twice doubled. The centre-hole contains two strands at their whole length, and every strand must be driven home with mealed powder. The loose ends of the quick-match being then laid within the barrel, the whole is covered with a curtain of canvas dipped in a composition of brimstone and saw-dust, &c. fastened on with a hoop that slips over the head of the barrel.

The barrels should be made very strong, not only to support the weight of the composition before firing, when they are moved or carried from place to place, but to keep them together whilst burning: for if the staves are too light and thin, so as to burn very soon, the remaining composition will tumble out and be dissipated, and the intention of the barrels, to carry the flame aloft, will accordingly be frustrated.

By means of the fire-barrel the flame passing through the funnel is conducted to the shrouds. Between the funnels, which are likewise called *fire-trunks*, are two scuttles, or small holes in the upper deck, serving also to let out the flames. Both funnels must be stopped with plugs, and have sail-cloth or canvas nailed close over them, to prevent any accident happening from above to the combustibles laid below.

The ports, funnels, and scuttles, not only communicate the flames to the outside and upper-works of the ship and her rigging; but likewise open a passage for the inward air, confined

* The iron chambers are 10 inches long and 3.5 in diameter. They are breeched against a piece of wood fixed across the ports, and let into another a little higher. When loaded, they are almost filled with corn powder, and have a wooden tompion well driven into their muzzles. They are primed with a small piece of quick-match thrust through their vents into the powder, with a part of it hanging out. When the ports are blown open by means of the iron chambers, the port-lids either fall downward, or are carried away by the explosion.

in the fire-room, which is thereby expanded ſo as to force impetuouſly through thoſe out-lets, and prevent the blowing up of the decks, which muſt of neceſſity happen from ſuch a ſudden and violent rarefaction of the air as will then be produced.

On each ſide of the bulk head behind is cut a hole *l*, of ſufficient ſize to admit a trough of the ſame dimenſions as the others. A leading trough, *l i*, whoſe foremoſt end communicates with another trough within the fire-room, is laid cloſe to this opening, from whence it extends obliquely to a ſally-port *i*, cut through the ſhip's ſide. The decks and troughs are well covered with melted roſin. At the time of the firing either of the leading troughs, the flame is immediately conveyed to the oppoſite ſide of the ſhip, whereby both ſides burn together. The ſpaces *n*, *o*, behind the fire-room, repreſent the cabins of the lieutenant and maſter, one of which is on the ſtarboard, and the other on the larboard ſide. The captain's cabin, which is ſeparated from theſe by a bulk-head, is exhibited alſo by *p*.

Four of the eight fire-barrels are placed under the four fire-trunks; and the other four between them, two on each ſide the fire-ſcuttles, where they are ſecurely cleated to the deck. The longeſt reeds * are put into the fore and aft troughs, and tied down: the ſhorteſt reeds are laid in the troughs athwart, and tied down alſo. The bavins †, dipped at one end, are tied faſt to the troughs over the reeds, and the curtains are nailed up to the beams, in equal quantities, on each ſide of the fire-room. The remainder of the reeds are placed in a poſition nearly upright, at all the angles of every ſquare in the fire-room, and there tied down. If any reeds are left, they are to be put round the fire-barrels, and other vacant places, and there tied faſt.

Inſtructions to prime. Take up all the reeds, one after another, and ſtrow a little compoſition at the bottom of all the troughs under the reeds, and then tie them gently down again: next ſtrow compoſition upon the upper part of the reeds throughout the fire-room; and upon the ſaid compoſition lay double quick-match upon all the reeds, in all the troughs: the remainder of the compoſition ſtrow over all the fire-room, and then lay the bavins looſe.

Caſt off all the covers of the fire-barrels, and hang the quick-match looſe over their ſides, and place leaders of quick-match from the reeds into the barrels, and from thence into the vent of the chambers, in ſuch a manner as to be certain of their blowing open the ports, and ſetting fire to the barrels. Two troughs of communication from each door of the fire-room to the ſally-ports, muſt be laid with a ſtrong leader of quick-match four or five times double: alſo a croſs-piece to go from the ſally-port, when the ſhip is fired, to the communication trough, laid with leaders of quick-match, that the fire may be communicated on both ſides at once. What quick-match is left, place ſo that the fire may be communicated to all parts of the room at once, eſpecially about the ports and fire-barrels, and ſee that the chambers are well and freſh primed.

The ſheer-hooks (repreſented at *a*) are fitted ſo as to faſten on the yard-arms of the fire-ſhip, where they hook the enemy's rigging. The fire-grapplings, *b*, are either fixed on the yard-arms, or thrown by hand, having a chain to confine the ſhips together, or faſten thoſe inſtruments wherever neceſſary.

When the commanding officer of a fleet diſplays the ſignal to prepare for action, the fire-ſhips fix their ſheer-hooks, and diſpoſe their grapplings in readineſs. The battle being begun, they proceed immediately to prime, and prepare their fire-works. When they are ready for grappling, they inform the admiral thereof by a particular ſignal.

To avoid being diſabled by the enemy's cannon during a general engagement, the fire-ſhips continue ſufficiently diſtant from their line of battle, either to windward or leeward. They cautiouſly ſhun the openings or intervals of the line, where they would be directly expoſed to the enemy's fire, from which they are covered by lying on the oppoſite ſide of their own ſhips. They are attentively to obſerve the ſignals of the admiral or his ſeconds, in order to put their deſigns immediately in execution.

Although no ſhip of the line ſhould be previouſly appointed to protect any fire-ſhip, except a few of the ſmalleſt particularly deſtined to this ſervice, yet the ſhip before whom ſhe paſſes in order to approach the enemy, ſhould eſcort her thither, and aſſiſt her with an armed boat, or whatever ſuccour may be neceſſary in her ſituation. The captain of the fire-ſhip ſhould himſelf be particularly attentive that the above inſtructions are punctually executed, and that the yards may be ſo braced when he falls along-ſide of the ſhip intended to be deſtroyed, that the ſheer-hooks and grapplings faſtened to the yard-arms, &c. may effectually hook the enemy. He is expected to be the laſt perſon who quits the veſſel; and being furniſhed with every neceſſary aſſiſtance and ſupport, his reputation will greatly depend on the ſucceſs of his undertaking.

Thundering BARRELS, in the military art, are filled with bombs, grenades, and other fire-works to be rolled down a breach.

BARREN *ground*, is that which being ſowed produces no crop, or, at moſt, ſo ſlender a crop, that it will not defray the charge of its tillage.

BARREN *money* is uſed, in the Civil Law, for that which is not put out to intereſt.

BARREN *corn*, the name given to a diſtemper in corn by M. Aimen, who firſt obſerved it. It is moſt common in wheat and rye; the ears of which are long, lean, and white; in ſome the ſtamina are dry, tranſparent, and horned: the female organs are ſmall, whiter, and leſs velvety than in healthy ears; in others the filaments are ſmaller, the apices are void of farina, and the ſtigmata badly unfolded. It is owing either to the too ſudden growth of the corn; to froſt, or to hot gleams of ſun-ſhine after hard ſhowers; and ſometimes, though very rarely, to inſects. Count Ginnani imputes this diſeaſe of corn to the faultineſs of the ſoil; and he recommends particular attention to the amendment of it by ſuch means as are beſt ſuit-

* The reeds are made up in ſmall bundles of about a foot in circumference, cut even at both ends, and tied together in two places. They are diſtinguiſhed into two kinds, viz. the long and ſhort; the former of which are four feet, and the latter two feet five inches in length. Some part of them are ſingly dipped, *i. e.* at one end: the reſt are dipped at both ends in a kettle of melted compoſition. After being immerſed about ſeven or eight inches in this preparation, and then drained, they are ſprinkled over with pulveriſed ſulphur.

† The bavins are made of birch, heath, or other bruſh-wood, which is tough and readily kindled. They are uſually two or three feet in length, and have all their buſh-ends lying one way, the other ends being tied together with ſmall cords. They are dipped in compoſition at the buſh-ends, whoſe branches are afterwards confined by the hand, to prevent them from breaking off by moving about; and alſo to make them burn more fiercely. After being dipped in the ſame manner as the reeds, they alſo are ſprinkled with ſulphur.

able to its nature; and he alſo directs to change the ſeed every year.

BARREN *ſprings*, a name given by huſbandmen to thoſe whoſe waters are injurious to land. Such are moſt of thoſe that flow from coal-mines, or through beds of ſulphureous minerals.

BARRENNESS, the ſame with STERILITY, a term formed from *ſterilitas*, of *ſterilis*, *barren*, the quality of a thing that is barren; in oppoſition to FECUNDITY.—Barrenneſs was held a grievous affliction by the wives of the ancient patriarchs. Nature has wiſely decreed barrenneſs to all monſtrous productions, that the creation might not degenerate. Hence the ſterility of mules, &c.

Women frequently become ſterile after a miſcarriage, or a difficult labour, by reaſon of injuries done to the uterus, or ſome other of the genital parts. It is alſo certain, that ſterility in either ſex may ariſe from a ſchirroſity or induration in the organs deſtined to generation, whence their functions are either depraved or aboliſhed; as for inſtance, the teſticles may become ſchirrous in men, as we are ſhewn by innumerable inſtances. But ſince there are ſeveral neceſſary circumſtances required in women, that they may be capable not only of receiving the firſt rudiments of the incipient animal, but alſo that they may be able to retain and nouriſh the ſame to its proper time of perfect maturity; it is from thence evident, that the cauſes of ſterility are much more frequent in the female ſex. In fat women, Hippocrates aſſerts, that the large omentum compreſſes the uterus in ſuch a manner, that they are not capable of receiving the ſemen maſculinum; but this is unlikely. If the os uteri ſhould be ſchirrous, as alſo its neck, as may be known by paſſing up the finger, the woman will be barren unleſs cured of that diſorder. But alſo the opening of dead bodies demonſtrates that ſchirroſities concealed in theſe parts have occaſioned barrenneſs. A woman of ſixty years old, who had been married twice but never conceived, was opened by Hildanus, that he might diſcover the cauſe of her ſterility: and he found a ſchirrous round the os uteri, which inveſted the neck of the womb like a ring, and by that means ſo ſtrictly cloſed its opening, that it was difficult even to introduce a probe. In another woman, that was taken with an inflammation of the uterus, in her firſt lying-in, and remained ever afterwards barren, he found after death, that a ſchirrus, equal to the ſize of a gooſe-egg, was placed in ſuch a manner before the os uteri, as totally to exclude the paſſage of any thing to that organ, and ſo firmly adhered to the circumjacent parts, that it could not by any means be pulled off. Van Swieten aſſerts that he has ſeen the vagina uteri ſchirrous throughout, and ſo much ſwelled in every point as to be ſcarce able to admit a probe. It is alſo frequently obſerved in women who have lived ſterile, that the uterus begins to turn cancerous about the time when their menſes leave them; in which terrible diſorder they are afflicted with ſevere pains, and a profuſe diſcharge of a foul putrid matter, the veſſels being rendered varicoſe, and afterwards eroded. From all which it is ſufficiently evident, that a ſchirrus is deſervedly reckoned among other organical defects which cauſe ſterility.

BARRETRY, in law, is the offence of frequently exciting and ſtirring up ſuits and quarrels between his Majeſty's ſubjects either at law or otherwiſe. The puniſhment for this offence, in a common perſon, is by fine and impriſonment: but if the offender (as is too frequently the caſe) belongs to the profeſſion of the law, a barretor who is thus able as well as willing to do miſchief ought alſo to be diſabled from practiſing for the future. And indeed it is enacted by ſtatute 12 Geo. I. c. 29. that if any one, who hath been convicted of forgery, perjury, ſubornation of perjury, or common barretry, ſhall practiſe as an attorney, ſolicitor, or agent, in any ſuit; the court, upon complaint, ſhall examine it in a ſummary way; and, if proved, ſhall direct the offender to be tranſported for ſeven years. Hereunto alſo may be referred another offence, of equal malignity and audaciouſneſs; that of ſueing another in the name of a fictitious plaintiff, either one not in being at all, or one who is ignorant of the ſuit. This offence, if committed in any of the king's ſuperior courts, is left, as a high contempt, to be puniſhed at their diſcretion: but in courts of a lower degree, where the crime is equally pernicious, but the authority of the judges not equally extenſive, it is directed by ſtatute 8 Eliz. c. 2. to be puniſhed by ſix months impriſonment, and treble damages to the injured party.

BARRICADE, or BARRICADO, a military term for a fence formed in haſte with veſſels, baſkets of earth, trees, palliſades, or the like, to preſerve an army from the ſhot or aſſault of the enemy.—The moſt uſual materials for barricades conſiſt of paſes or ſtakes croſſed with batoons, and ſhod with iron at the feet, uſually ſet up in paſſages or breaches.

BARRICADE, in naval architecture, a ſtrong wooden rail, ſupported by ſtanchions, extending acroſs the foremoſt part of the quarter deck. In a veſſel of war, the vacant ſpaces between the ſtanchions are commonly filled with rope matts, cork, or pieces of old cable; and the upper part, which contains a double rope-netting above the rail, is ſtuffed with full hammocks to intercept the motion, and prevent the execution of ſmall-ſhot in time of battle.

BARRIER, in fortification, a kind of fence made at a paſſage, retrenchment, &c. to ſtop up the entry thereof. It is compoſed of great ſtakes, about four or five feet high, placed at the diſtance of eight or ten feet from one another, with tranſums, or overthwart rafters, to ſtop either horſe or foot, that would enter orruſh in with violence: in the middle is a moveable bar of wood, that opens or ſhuts at pleaſure. A barrier is commonly ſet up in a void ſpace, between the citadel and the town, in half moons, &c.

BARRIERS, ſignifies that which the French call *jeu de barres*, i. e. *palæſtra*; a martial exerciſe of men armed and fighting together with ſhort ſwords, within certain bars or rails which ſeparated them from the ſpectators: it is now diſuſed in this country.

BARRINGTONIA, in botany; a genus of the polyandria order, belonging to the monadelphia claſs of plants, the characters of which are: one female, the calyx dyphyllous above; with a drupa, which it crowns; and the ſeed is a quadrilocular nut. There is but one ſpecies known, the ſpecioſa, a native of China and Otaheite.

BARRISTER, is a counſellor learned in the law, admitted to plead at the bar, and there to take upon him the protection and defence of clients. They are termed *in utroque conſulti*; and in other countries called *licentiati in jure*: and anciently barriſters at law were called *apprentices* of the law, in Latin *apprenticii juris nobiliores*. The time before they ought to be called to the bar, by the ancient orders, was eight years, now reduced to five; and the exerciſes done by them (if they were not called *ex gratia*) were twelve grand moots performed in the inns of Chancery in the time of the grand readings, and 24 petty moots in the term times, before the readers of the reſpective inns: and a barriſter newly called is to attend the ſix (or four) next long vacations the exerciſe of the houſe, viz. in Lent and Summer, and is thereupon for thoſe three (or two) years ſtyled a *vacation barriſter*. Alſo they are called *outer barriſters*, i. e. pleaders without the bar, to diſtinguiſh them from benchers, or thoſe that have been readers, who are ſometimes admitted to plead within the bar, as the king, queen, or prince's counſel are allowed to do.

BARROS (John), a celebrated Portugueſe hiſtorian, born

at Viſco, in 1496. He was educated at the court of king Emanuel, among the princes of the blood, and made a great progreſs in Greek and Latin. The Infant John, to whom he attached himſelf, and became preceptor, having ſucceeded the king his father in 1521, Barros obtained a place in this prince's houſehold; and in 1522, was made governor of St. George del Mina, on the coaſt of Guinea. Three years after, the king having recalled him to court, made him treaſurer of the Indies, and this poſt inſpired him with the thought of writing this hiſtory; for which purpoſe he retired to Pompas, where he died, in 1570. His hiſtory of Aſia and the Indies is divided into decades; the firſt of which he publiſhed in 1552, the ſecond in 1553, and the third in 1563; but the fourth decade was not publiſhed till the year 1615, when it appeared by order of King Philip III. who had the manuſcript purchaſed of the heirs of John Barros. Several authors have continued it, ſo that we have at preſent 12 decades. He left many other works; ſome of which have been printed, and others remain in manuſcript to this day.

BARROW (Iſaac), an eminent mathematician and divine, of the laſt century, was the ſon of Mr. Thomas Barrow a linen-draper in London, where he was born in 1630. He was at firſt placed at the Charter-houſe ſchool, for two or three years; where his behaviour afforded but little hopes of ſucceſs in the profeſſion of a ſcholar, he being fond of fighting, and promoting it among his ſchool-fellows. But being removed from thence, his diſpoſition took a happier turn; and having ſoon made a great progreſs in learning, he was admitted a penſioner of Peter Houſe in Cambridge. He now applied himſelf with great diligence to the ſtudy of all parts of literature, eſpecially to that of natural philoſophy. He afterwards turned his thoughts to the profeſſion of phyſic, and made a conſiderable progreſs in anatomy, botany, and chemiſtry; after which he ſtudied chronology, aſtronomy, and geometry. After having travelled into France and Italy, and Conſtantinople, where he remained ſomewhat more than a year, he returned to Venice. From thence he came home in 1659, through Germany and Holland; and was epiſcopally ordained by biſhop Brownrig. In 1660, he was choſen to the Greek profeſſorſhip at Cambridge. When he entered upon this province, he intended to have read upon the tragedies of Sophocles; but he altered his intention, and made choice of Ariſtotle's rhetoric. Theſe lectures, having been lent to a friend who never returned them, are irrecoverably loſt. July 16th 1662, he was elected profeſſor of geometry in Greſham college, by the recommendation of Dr. Wilkins, maſter of Trinity college, and afterwards biſhop of Cheſter. Upon the 20th of May 1663 he was elected a fellow of the Royal Society, in the firſt choice made by the council after their charter. The ſame year the executors of Mr. Lucas having, according to his appointment, founded a mathematical lecture at Cambridge, they fixed upon Mr. Barrow for the firſt profeſſor; and though his two profeſſorſhips were not inconſiſtent with each other, he choſe to reſign that of Greſham college, which he did May the 20th 1664. In 1669 he reſigned his mathematical chair to his learned friend Mr. Iſaac Newton, being now determined to give up the ſtudy of mathematics for that of divinity. Upon quitting his profeſſorſhip, he was only a fellow of Trinity college, till his uncle gave him a ſmall ſinecure in Wales, and Dr. Seth Ward biſhop of Saliſbury conferred upon him a prebend in his church. In the year 1670 he was created doctor in divinity by mandate; and, upon the promotion of Dr. Pearſon maſter of Trinity college to the ſee of Cheſter, he was appointed to ſucceed him by the king's patent bearing date the 13th of February 1672. When the king advanced him to this dignity, he was pleaſed to ſay, "he had given it to the beſt ſcholar in England." His majeſty did not ſpeak from report, but from his own knowledge: the doctor being then his chaplain, he uſed often to converſe with him, and in his humorous way, to call him an "unfair preacher," becauſe he exhauſted every ſubject, and left no room for others to come after him. In 1675 he was choſen vice-chancellor of the univerſity.—The doctor's works are very numerous, and ſuch as do honour to the Engliſh nation. They are, 1. Euclid's Elements. 2. Euclid's Data. 3. Optical Letters, read in the public ſchool of Cambridge. 4. Thirteen Geometrical Letters. 5. The Works of Archimedes, the four Books of Apollonius's Conic Sections, and Theodoſius's Spherics explained in a new Method. 6. A Lecture, in which Archimedes's Theorems of the Sphere and Cylinder are inveſtigated and briefly demonſtrated. 7. Mathematical Lectures, read in the public ſchools of the univerſity of Cambridge. The above were all printed in Latin; and as to his Engliſh works, they are printed together in four volumes folio. "The name of Dr. Barrow (ſays the reverend and learned Mr. Granger) will ever be illuſtrious for a ſtrength of mind and a compaſs of knowledge that did honour to his country. He was unrivalled in mathematical learning, and eſpecially in the ſublime geometry; in which he has been excelled only by one man, and that was his pupil the great Sir Iſaac Newton. The ſame genius that ſeemed to be born only to bring hidden truths to light, to riſe to the heights or deſcend to the depths of ſcience, would ſometimes amuſe itſelf in the flowery paths of poetry, and he compoſed verſes both in Greek and Latin. He at length gave himſelf up entirely to divinity; and particularly to the moſt uſeful part of it, that which has a tendency to make men wiſer and better. He has, in his excellent ſermons on the Creed, ſolved every difficulty and removed every obſtacle that oppoſed itſelf to our faith, and made divine revelation as clear as the demonſtrations in his own Euclid. In his ſermons he knew not how to leave off writing till he had exhauſted his ſubject; and his admirable Diſcourſe on the Duty and Reward of Bounty to the Poor took him up three hours and an half in preaching. This excellent perſon, who was a bright example of Chriſtian virtue, as well as a prodigy of learning, died on the 4th of May 1677, in the 47th year of his age;" and was interred in Weſtminſter abbey, where a monument, adorned with his buſt, was ſoon after erected at the expence of his friends and relations.

BARROWS, in ancient topography, artificial hillocks or mounts, met with in many parts of the world, intended as repoſitories for the dead, and formed either of ſtones heaped up, or elſe of earth. For the former, more generally known by the name of *cairns*, ſee CAIRNS, and the plate there referred to. Dr. Plott takes notice of two ſorts in Oxfordſhire: one placed on the military ways; the other in the fields, meadows, or woods; the firſt ſort doubtleſs of Roman erection, the other more probably erected by the Britons or Danes. We have an examination of the barrows in Cornwall by Dr. Williams, in the Phil. Tranſ. N° 458, from whoſe obſervations we find that they are compoſed of foreign or adventitious earth; that is, ſuch as does not riſe on the place, but is fetched from ſome diſtance.—Monuments of this kind are alſo very frequent in Scotland. On digging into the barrows, urns have been found in ſome of them, made of calcined earth, and containing burnt bones and aſhes; in others, ſtone cheſts containing bones entire; in others, bones neither lodged in cheſts nor depoſited in urns. Theſe tumuli are round, not greatly elevated, and generally at their baſis ſurrounded with a foſs. They are of different ſizes; in proportion, it is ſuppoſed, to the greatneſs, rank, and power, of the deceaſed perſon. The links or ſands of Skail, in Sandwich, one of the Orkneys, abound in round barrows. Some are formed of earth alone, others of ſtone

covered with earth. In the former was found a coffin, made of ſix flat ſtones. They are too ſhort to receive a body at full length: the ſkeletons found in them lie with the knees preſſed to the breaſt, and the legs doubled along the thighs. A bag, made of ruſhes, has been found at the feet of ſome of theſe ſkeletons, containing the bones, moſt probably, of another of the family. In one were to be ſeen multitudes of ſmall beetles; and as ſimilar inſects have been diſcovered in the bag which incloſed the ſacred *Ibis*, we may ſuppoſe that the Egyptians, and the nation to whom theſe *tumuli* did belong, might have had the ſame ſuperſtition reſpecting them. On ſome of the corpſes interred in this iſland, the mode of burning was obſerved. The aſhes, depoſited in an urn which was covered on the top with a flat ſtone, have been found in the cell of one of the barrows. This coffin or cell was placed on the ground, then covered with a heap of ſtones, and that again caſed with earthen ſods. Both barrow and contents evince them to be of a different age from the former. Theſe tumuli were in the nature of family vaults: in them have been found two tiers of coffins. It is probable, that on the death of any one of the family, the tumulus was opened, and the body interred near its kindred bones.

Ancient Greece and Latium concurred in the ſame practice with the natives of this iſland. Patroclus among the Greeks, and Hector among the Trojans, received but the ſame funeral honours with our Caledonian heroes; and the aſhes of Dercennus the Laurentine monarch had the ſame ſimple protection. The urn and pall of the Trojan warrior might perhaps be more ſuperb than thoſe of a Britiſh leader: the riſing monument of each had the common materials from our mother earth.

The ſnowy bones his friends and brothers place,
With tears collected, in a golden vaſe.
The golden vaſe in purple palls they roll'd
Of ſofteſt texture and inwrought with gold.
Laſt o'er the urn the ſacred earth they ſpread,
And rais'd a tomb, memorial of the dead.
Pope's Homer's Iliad, xxiv. 1003.

Or, as it is more ſtrongly expreſſed by the ſame elegant tranſlator, in the account of the funeral of Patroclus;

High in the midſt they heap the ſwelling bed
Of riſing earth, memorial of the dead. *Ib.* xxiii. 319.

The Grecian barrows, however, do not ſeem to have been all equally ſimple. The barrow of Alyattes, father of Crœſus king of Lydia, is deſcribed by Herodotus as a moſt ſuperb monument inferior only to the works of the Egyptians and Babylonians. It was a vaſt mound of earth heaped on a baſement of large ſtones by three claſſes of the people; one of which was compoſed of girls, who were proſtitutes. Alyattes died, after a long reign, in the year 562 before the Chriſtian æra. Above a century intervened, but the hiſtorian relates, that to his time five ſtones (ὅροι *termini* or *ſtelæ*) on which letters were engraved, had remained on the top, recording what each claſs had performed; and from the meaſurement it had appeared, that the greater portion was done by the girls. Strabo likewiſe has mentioned it as a huge mound raiſed on a lofty baſement by the multitude of the city. The circumference was ſix ſtadia or three quarters of a mile; the height two plethra or two hundred feet; and the width thirteen plethra. It was cuſtomary among the Greeks to place on barrows either the image of ſome animal or *ſtelæ*, commonly round pillars with inſcriptions. The famous barrow of the Athenians in the plain of Marathon, deſcribed by Pauſanias, is an inſtance of the latter uſage. An ancient monument in Italy by the Appian way, called without reaſon the ſepulchre of the Curiatii, has the ſame number of *termini* as remained on the barrow of Alyattes; the baſement, which is ſquare, ſupporting five round pyramids.—Of the barrow of Alyattes the apparent magnitude is deſcribed by travellers as now much diminiſhed, and the bottom rendered wider and leſs diſtinct than before, by the gradual increaſe of the ſoil below. It ſtands in the midſt of others by the lake Gygæus; where the burying-place of the Lydian princes was ſituated. The barrows are of various ſizes, the ſmaller made perhaps for children of the younger branches of the royal family. Four or five are diſtinguiſhed by their ſuperior magnitude, and are viſible as hills at a great diſtance. That of Alyattes is greatly ſupereminent. The lake it is likely furniſhed the ſoil. All of them are covered with green turf; and all retain their conical form without any ſinking in of the upper part.

Barrows, or ſimilar tumuli, are alſo found in great numbers in America. Theſe are of different ſizes, according to the account given by Mr. Jefferſon in his notes on the State of Virginia, p. 156: ſome of them being conſtructed of earth, and ſome of looſe ſtones. That they were repoſitories of the dead has been obvious to all; but on what particular occaſion conſtructed, was matter of doubt. Some have thought they covered the bones of thoſe who have fallen in battles fought on the ſpot of interment. Some aſcribed them to the cuſtom ſaid to prevail among the Indians, of collecting at certain periods the bones of all their dead, whereſoever depoſited at the time of death. Others again ſuppoſed them the general ſepulchres for towns, conjectured to have been on or near theſe grounds; and this opinion was ſupported by the quality of the lands in which they are found (thoſe conſtructed of earth being generally in the ſofteſt and moſt fertile meadow-grounds on river ſides), and by a tradition ſaid to be handed down from the aboriginal Indians, that when they ſettled in a town, the firſt perſon who died was placed erect, and earth put about him, ſo as to cover and ſupport him; that when another died, a narrow paſſage was dug to the firſt, the ſecond reclined againſt him, and the cover of earth replaced, and ſo on. "There being one of theſe barrows in my neighbourhood (ſays Mr. Jefferſon), I wiſhed to ſatisfy myſelf whether any, and which of theſe opinions were juſt. For this purpoſe I determined to open and examine it thoroughly. It was ſituated on the low grounds of the Rivanna, about two miles above its principal fork, and oppoſite to ſome hills, on which had been an Indian town. It was of a ſpheroidical form, of about 40 feet diameter at the baſe, and had been of about 12 feet altitude, though now reduced by the plough to ſeven and a half, having been under cultivation about a dozen years. Before this it was covered with trees of twelve inches diameter, and round the baſe was an excavation of five feet depth and width, from whence the earth had been taken of which the hillock was formed. I firſt dug ſuperficially in ſeveral parts of it, and came to collections of human bones, at different depths, from ſix inches to three feet below the ſurface. Theſe were lying in the utmoſt confuſion, ſome vertical, ſome oblique, ſome horizontal, and directed to every point of the compaſs, entangled, and held together in cluſters by the earth. Bones of the moſt diſtant parts were found together; as, for inſtance, the ſmall bones of the foot in the hollow of the ſkull, many ſkulls would ſometimes be in contact, lying on the face, on the ſide, on the back, top or bottom, ſo as on the whole to give the idea of bones emptied promiſcuouſly from a bag or baſket, and covered over with earth, without any attention to their order. The bones of which the greateſt numbers remained, were ſkulls, jaw-bones, teeth, the bones of the arms, thighs, legs, feet, and hands. A few ribs remained, ſome vertebræ of the neck and ſpine, without their proceſſes, and one inſtance only of the bone which ſerves as a baſe to the vertebral column. The

ſkulls were ſo tender, that they generally fell to pieces on being touched. The other bones were ſtronger. There were ſome teeth which were judged to be ſmaller than thoſe of an adult; a ſkull which, on a ſlight view, appeared to be that of an infant, but it fell to pieces on being taken out, ſo as to prevent ſatisfactory examination; a rib, and a fragment of the under-jaw of a perſon about half-grown; another rib of an infant; and part of the jaw of a child, which had not yet cut its teeth. This laſt furniſhing the moſt deciſive proof of the burial of children here, I was particular in my attention to it. It was part of the right half of the under jaw. The proceſſes by which it was articulated to the temporal bones were entire; and the bone itſelf firm to where it had been broken off, which, as nearly as I could judge, was about the place of the eye-tooth. Its upper edge, wherein would have been the ſockets of the teeth, was perfectly ſmooth. Meaſuring it with that of an adult, by placing their hinder proceſſes together, its broken end extended to the penultimate grinder of the adult. This bone was white, all the others of a ſand colour. The bones of infants being ſoft, they probably decay ſooner, which might be the cauſe ſo few were found here. I proceeded then to make a perpendicular cut through the body of the barrow, that I might examine its internal ſtructure. This paſſed about three feet from its centre, was opened to the former ſurface of the earth, and was wide enough for a man to walk through and examine its ſides. At the bottom, that is, on the level of the circumjacent plain, I found bones; above theſe a few ſtones, brought from a cliff a quarter of a mile off, and from the river one-eighth of a mile off; then a large interval of earth, then a ſtratum of bones, and ſo on. At one end of the ſection were four ſtrata of bones plainly diſtinguiſhable; at the other, three; the ſtrata in one part not ranging with thoſe in another. The bones neareſt the ſurface were leaſt decayed. No holes were diſcovered in any of them, as if made with bullets, arrows, or other weapons. I conjectured that in this barrow might have been a thouſand ſkeletons. Every one will readily ſeize the circumſtances above related, which militate againſt the opinion that it covered the bones only of perſons fallen in battle; and againſt the tradition alſo which would make it the common ſepulchre of a town, in which the bodies were placed upright, and touching each other. Appearances certainly indicate that it has derived both origin and growth from the accuſtomary collection of bones, and depoſition of them together; that the firſt collection had been depoſited on the common ſurface of the earth, a few ſtones put over it, and then a covering of earth; that the ſecond had been laid on this, had covered more or leſs of it in proportion to the number of bones, and was then alſo covered with earth, and ſo on. The following are the particular circumſtances which give it this aſpect. 1. The number of bones. 2. Their confuſed poſition. 3. Their being different in ſtrata. 4. The ſtrata in one part having no correſpondence with thoſe in another. 5. The different ſtates of decay in theſe ſtrata, which ſeem to indicate a difference in the time of inhumation. 6. The exiſtence of infant bones among them. But on whatever occaſion they may have been made, they are of conſiderable notoriety among the Indians: for a party paſſing, about thirty years ago, through the part of the country where this barrow is, went through the woods directly to it, without any inſtructions or enquiry; and having ſtaid about it ſome time, with expreſſions which were conſtrued to be thoſe of ſorrow, they returned to the high road, which they had left about half a dozen miles to pay this viſit, and purſued their journey. There is another barrow, much reſembling this in the low grounds of the ſouth branch of Shenandoah, where it is croſſed by the road leading from the Rock-fiſh gap to Staunton. Both of theſe have, within theſe dozen years, been cleared of their trees and put under cultivation, are much reduced in their height, and ſpread in width, by the plough, and will probably diſappear in time. There is another on a hill in the blue ridge of mountains, a few miles north of Wood's gap, which is made up of ſmall ſtones thrown together. This has been opened and found to contain human bones as the others do. There are alſo many others in other parts of the country."

Barrow, in the ſalt works, is a wicker-caſe, almoſt in the ſhape of a ſugar-loaf, wherein the ſalt is put to drain.

BARROWISTS, more uſually termed Brownists, a religious ſect, which ſprung out of the Puritans, toward the cloſe of the 16th century: their leader, Robert Brown, who wrote ſeveral books in their behalf, was a man of good parts, and ſome learning. He was born of a good family in Rutlandſhire, and related to the lord-treaſurer Burleigh. He had been educated at Cambridge; but firſt publiſhed his notions, and began to inveigh openly againſt the diſcipline and ceremonies of the church, at Norwich, in the year 1580, from which time he underwent divers perſecutions from the biſhops; inſomuch that he boaſted he had been committed to no leſs than 32 priſons, in ſome of which he could not ſee his hand at noon-day. At length, with his congregation, he left the kingdom, and ſettled at Middleburgh in Zealand; where they obtained leave of the ſtates to worſhip God in their own way, and form a church according to their own model; which they had not long done before this handful of men, juſt delivered from the ſeverities of the biſhops, began to differ among themſelves, and crumble into ſo many parties, that Brown their paſtor grew weary of his office; and, returning to England in 1589, renounced his principles of ſeparation, and was preferred to the rectory of a church in Northamptonſhire, and died in 1630, after leading a very idle and diſſolute life.

The revolt of Brown was attended with the diſſolution of the church at Middleburgh; but the ſeeds of Browniſm, which he had ſown in England, were ſo far from being deſtroyed, that Sir Walter Raleigh, in a ſpeech in 1592, computes no leſs than 20,000 followers of it. The occaſion of their ſeparation was not any fault they found with the faith, but only with the diſcipline and form of government of the other churches in England. They equally charged corruption on the epiſcopal form, and on that of the preſbyterians, by conſiſtories, claſſes, and ſynods: nor would they join with any other reformed church, becauſe they were not aſſured of the ſanctity and regeneration of the members that compoſed it: on account of the toleration of ſinners, with whom they maintained it an impiety to communicate. They condemned the ſolemn celebration of marriages in the church; maintaining, that matrimony being a political contract, the confirmation thereof ought to come from the civil magiſtrate. They would not allow any children to be baptized of ſuch as were not members of the church, or of ſuch as did not take ſufficient care of thoſe baptized before. They rejected all forms of prayer: and held that the Lord's prayer was not to be recited as a prayer, being only given for a rule or model whereon all our prayers are to be formed. The form of church-government which they eſtabliſhed was democratical. When a church was to be gathered, ſuch as deſired to be members of it made a confeſſion of it, and ſigned a covenant, by which they obliged themſelves to walk together in the order of the goſpel. The whole power of admitting and excluding members, with the deciſion of all controverſies, was lodged in the brotherhood. Their church-officers were choſen from among themſelves, for preaching the word, and taking care of the poor, and ſeparated to their ſeveral offices by faſting, prayer, and impoſition of hands of ſome of the brethren. But they did not allow the prieſthood to be any diſtinct order, or to give any indelible character. As the

vote of the brotherhood made a man a minister, and gave him authority to preach the word and administer the sacraments among them, so the same power could discharge him from his office, and reduce him to a mere layman again. And as they maintained the bounds of a church to be no greater than what could meet together in one place and join in one communion, so the power of these officers was prescribed within the same limits. The minister or pastor of one church could not administer the Lord's supper to another, nor baptize the children of any but those of his own society. Any lay-brother was allowed the liberty of prophesying, or of giving a word of exhortation to the people; and it was usual for some of them, after sermon, to ask questions, and reason upon the doctrines that had been preached. In a word, every church on the Brownists model is a body-corporate, having full power to do every thing which the good of the society requires, without being accountable to any classis, synod, convocation, or other jurisdiction whatever. Most of their discipline has been adopted by the Independents, a party which afterwards arose from among the Brownists. The laws were executed with great severity on the Brownists; their books were prohibited by queen Elizabeth, and their persons imprisoned, and many of them were hanged. The ecclesiastical commission and the star-chamber, in fine, distressed them to such a degree, that they resolved to quit their country. Accordingly, many families retired and settled at Amsterdam, where they formed a church, and chose Mr. Johnson their pastor; and after him Mr. Ainsworth, author of the learned commentary on the Pentateuch. Their church flourished near 100 years. See INDEPENDENTS.

BARRULET, in heraldry, the fourth part of the bar, or the one half of the closset: an usual bearing in coat-armour.

BARRULY, in heraldry, is when the field is divided bar-ways, that is, across from side to side, into several parts.

BARRY, in heraldry, is when an escutcheon is divided bar-ways, that is, across from side to side, into an even number of partitions, consisting of two or more tinctures, interchangeably disposed: it is to be expressed in the blazon by the word *barry*, and the number of pieces must be specified; but if the divisions be odd, the field must be first named, and the number of bars expressed.

BARRY-*Bendy* is when an escutcheon is divided evenly, bar and bend-ways, by lines drawn transverse and diagonal, interchangeably varying the tinctures of which it consists.

BARRY-*Pily* is when a coat is divided by several lines drawn obliquely from side to side, where they form acute angles.

BARSALLI, a kingdom of Africa, bordering on the river Gambia, inhabited by a tribe of negroes called *Jaloffs*. The government of this kingdom is a most despotic monarchy; all people being obliged to prostrate themselves on the earth when any of the royal family make their appearance. In time of war, every soldier has his share of the booty, and the king put a certain proportion, which is moderate, considering that if he pleased he might keep the whole. The kingdom is divided into a number of provinces, over which governors called *bumeys* are appointed by the king. These bumeys are absolute within their jurisdictions; but they seldom carry their prerogative so far as to incur the dislike of the people, which would quickly prove fatal to them. The Mahometan religion is professed by the king and his court; though little regard is paid to that part of the impostor's creed which forbids the use of wine; for the king cannot live without brandy, nor is he ever more devout than when he is drunk. When his majesty is in want of brandy or other necessaries, he sends to beg of the governor of James-fort that he will dispatch a boat with the merchandize he has occasion for; and to purchase this he plunders the neighbouring towns, and seizes a certain number of his subjects, whom he sells for slaves to the Europeans in exchange for their commodities. This is his method of supplying himself if he happens to be at peace with his neighbours; for which reason the people are never so happy as when at war; and hence they pursue war with great vigour, and continue it with obstinacy.—The general dress of the people is a kind of loose callicoe surplice, that hangs down below the knee; which they sometimes plait about the waist in a very agreeable manner. They wear a great number of gold trinkets in their hair, ears, noses, and round their necks, arms, and legs; but the women especially are fond of these ornaments. The king of Barsalli, whom More saw in 1732, had a prodigious number of women: but when he went abroad he was seldom attended by more than two, who seemed to be dressed out in the whole finery and jewels of the seraglio. He had likewise a number of brethren; but it was seldom that he deigned to speak to them: if ever he did them that honour, they were forced to treat him with the same respect as other subjects, and fall prostrate on the earth the moment they came into his presence, notwithstanding they were the presumptive heirs of the crown. It is indeed usual for the king's children to dispute the right of succession with his brethren, and the longest sword generally triumphs.

BARTER, or TRUCK, is the exchanging of one commodity for another, and forms a rule in the commercial part of arithmetic, by which the commodities are properly calculated and equalled, by computing first the value of the commodity which is given, and then the quantity of the other which will amount to the same sum. The word comes from the Spanish *barator*, to deceive or circumvent in bargaining, perhaps because those who deal this way usually endeavour to over-reach one another.

To transact properly, the price of one of the commodities, and an equivalent quantity of the other, must be found either by practice, or by the rule of three.

Quest. 1. How many pounds of cotton, at 9d. *per* lb. must be given in barter for 13 C. 3 Q. 14 lb. of pepper, at 2l. 16s. *per* C.?

First. Find the price or value of the commodity whose quantity is given as follows:

	C. Q. lb. L. s.
	13 3 14 at 2 16.
	26
2l.	10 8
16s.	1 8
2Q.	14
1Q.	7
14lb.	
	L. 38 17

Secondly. Find how much cotton, at 9d. *per* lb. 38l. 17s. will purchase as under:

d.	lb.	L.	s.
If 9	: 1 ::	38	17
		20	
		777	
		12	
9)9324(			
		C.	Q.
Ans. 1036 *lb.* =		9	1

If the above queſtion be wrought decimally, the operation may ſtand as follows:

C. L. C.
If 1 : 2.8 :: 13.875
2.8

111000
27750

lb. C. Q.
.0375) 38.8500 (1036=9 1 *Anſ.*
37.5...

1350
1125

2250
2250

The value or price of the goods received and delivered in barter being always equal, it is obvious that the product of the quantities received and delivered, multiplied in their reſpective rates, will be equal: and hence ariſes a rule which may be uſed with advantage in working ſeveral queſtions; namely, Multiply the given quantity and rate of the one commodity, and the product divided by the rate of the other commodity quotes the quantity ſought; or divided by the quantity quotes the rate.

Queſt. 2. How many yards of linen, at 4s. per yard, ſhould I have in barter for 120 yards of velvet, at 15s. 6d.?

Yds. *Sixp.* *Sixp.* *Yds.*
120 × 31 = 3720, and 8)3720(459 *Anſ.*

St. BARTHOLOMEW'S DAY, a feſtival of the Chriſtian church, celebrated on the 24th of Auguſt. St. Bartholomew was one of the twelve apoſtles; and is eſteemed to be the ſame as Nathanael, one of the firſt diſciples that came to Chriſt.

It is thought this apoſtle travelled as far as India, to propagate the goſpel; for Euſebius relates, that a famous philoſopher and chriſtian, named *Pantænus*, deſiring to imitate the apoſtolical zeal in propagating the faith, and travelling for that purpoſe as far as India, found there, among thoſe who yet retained the knowledge of Chriſt, the goſpel of St. Matthew, written, as the tradition aſſerts, by St. Bartholomew, one of the twelve apoſtles, when he preached the goſpel in that country. From thence he returned to the more northern and weſtern parts of Aſia, and preached to the people of Hierapolis; then in Lycaonia; and laſtly at Albania, a city upon the Caſpian Sea; where his endeavours to reclaim the people from idolatry were crowned with martyrdom, he being (according to ſome writers) flayed alive, and crucified with his head downwards.—There is mention made of a Goſpel of St. Bartholomew, in the preface to Origen's Homilies on St. Luke, and in the preface to St. Jerome's commentary on St. Matthew: but it is generally looked upon as ſpurious, and is placed by pope Gelaſius among the apocryphal books.

BARTHOLOMEW (St.), one of the Caribbee iſlands belonging to the French, who ſent a colony thither in 1648. It is about 24 miles in compaſs, and has a good haven. W. long. 62. 15. N. lat. 18. 6.

BARTHOLOMEW'S HOSPITAL (St.); a hoſpital for the reception of ſick and wounded poor perſons. It is ſituated on the ſouth-eaſt ſide of Smithfield, and incorporated by the name of the *hoſpital* of the mayor, commonalty, and citizens of London, governors for the poor, called Little St. Bartholomew's, near Weſt Smithfield. This *hoſpital* formerly belonged to the priory of St. Bartholomew, in Smithfield, founded by one Rahere, about the year 1102.

At the diſſolution of the monaſteries, Henry VIII. left five hundred marks a year to it, on condition that the city ſhould add five hundred marks per annum for the relief of ſick and poor people; but it was more largely endowed for the uſe of ſick and lame perſons only, by Edward VI. by the munificence of the city and private benefactors. This *hoſpital*, having eſcaped the dreadful fire in 1666, was repaired and beautified by the governors in the year 1691. But the buildings became by length of time ſo ruinous and dangerous, that a ſubſcription was entered into in 1729, for defraying the expence of rebuilding it, on a plan comprehending four detached piles of building to be joined by ſtone gate-ways, about a court or area. Four piles have been erected and finiſhed; one of theſe piles contains a large hall for the reſort of the governors at general courts, a compting-houſe for the committees, and other neceſſary offices: the other three piles contain wards for the reception of the patients, &c.

It is governed by a preſident, treaſurer, &c. It is attended by three phyſicians, and three ſurgeons, beſides as many aſſiſtant ſurgeons, and has an apothecary and chaplain. The officers of this hoſpital, are a cook, ſteward, renter, matron, and porter. This hoſpital, ſince its enlargement, is capable of accommodating four hundred and twenty patients: it extends relief alſo to a great number of out patients. By the report of 1780, it appears that this hoſpital adminiſtered relief to 10846 patients in the courſe of the preceding year.

BARTHOLOMITES, a religious order founded at Genoa in the year 1307; but the monks leading very irregular lives, the order was ſuppreſſed by pope Innocent X. in 1650, and their effects were confiſcated. In the church of the monaſtery of this order at Genoa is preſerved the image which it is pretended Chriſt ſent to king Abgarus.

BARTOLOMEO (Franciſco), a celebrated painter, born at Savignano, a village 10 miles from Florence, in the year 1469, was the diſciple of Coſimo Roſelli, but was much more beholden to the works of Leonarda da Vinci for his extraordinary ſkill in painting. He was well verſed in the fundamentals of deſign. Raphael, after quitting the ſchool of Perugino, applied to this maſter; and under him ſtudied the rules of perſpective, with the art of managing and uniting his colours. In the year 1500, he turned Dominican friar; and ſome time after was ſent by his ſuperiors to the convent of St. Martin, in Florence. He painted both portraits and hiſtory; but his ſcrupulous conſcience would hardly ever ſuffer him to draw naked figures, though nobody underſtood them better. He died in 1517, aged 48.

BARTON, a town of Lincolnſhire, ſeated on the river Humber, where there is a conſiderable ferry to paſs over into Yorkſhire. W. long. 0. 10. N. lat. 53. 40.

BARTSIA, PAINTED CUP; a genus of the angioſperm order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is bulbous, emarginated and coloured; the corolla lies coloured than the calyx, with its upper lip longer than the under one. The viſcoſa or marſhy, called alſo *yellow marſh eye-bright*, was found by Mr. Lightfoot in bogs and marſhy places about Loch-Goyl, near Loch-Long in the diſtrict of Cowal in Argyleſhire. The plant is about ten or twelve inches high, with an erect ſtalk, downy and unbranched: the leaves are ſeſſile, ſpear-ſhaped, and a little viſcous; the flowers are yellow, and the plant dries black. It is likewiſe found in marſhy places in Cornwall in England. The alpina, or mountain eye-bright cow-wheat, hath heart-ſhaped leaves placed oppoſite, and bluntly ſerrated, with purple bloſſoms in leafy ſpikes. It is likewiſe a native of Britain, and is found near rivulets in hilly countries. Sheep and goats eat it. There are two other ſpecies.

BARUCH (the prophecy of), one of the apocryphal books, ſubjoined to the canon of the Old Teſtament. Baruch was the ſon of Neriah, who was the diſciple and amanuenſis of the prophet Jeremiah. It has been reckoned part of Jeremiah's prophecy, and is often cited by the ancient fathers as ſuch. Joſephus tells us, Baruch was deſcended of a noble family; and it is ſaid in the book itſelf, that he wrote this prophecy at Babylon; but at what time is uncertain. It is difficult to determine in what language this prophecy was originally written. There are extant three copies of it; one in Greek, the other two in Syriac; but which of theſe, or whether any one of them, be the original, is uncertain.

BARULES, in church-hiſtory, certain heretics, who held, that the Son of God had only a phantom of a body; that ſouls were created before the world, and that they lived all at one time.

BARUTH, an ancient town of Turkey in Syria, with a Chriſtian church of the Neſtorian perſuaſion. It is ſituated in a fine fertile ſoil, but is inconſiderable now to what it was formerly. E. long. 34. 20. N. lat. 33. 30.

BARUTH, an Indian meaſure, containing 17 gantans: it ought to weigh about three pounds and an half Engliſh avoirdupois.

BARYPYCNI, *βαρυπυκνοι*, in the ancient muſic, was a name given to ſuch chords as formed the graveſt notes of the ſeveral *ſpiſſa*. There were five barypycni in the ſcale.

BARYTONUM, from *βαρυς grave*, and *τονος accent*, in the Greek grammar, denotes a verb, which having no accent marked on the laſt ſyllable, a grave accent is to be underſtood. In Italian muſic, *barytono* anſwers to our common pitch of baſs.

BAS CHEVALIER. See BACHELOR.

BAS-*Relief*. See BASSO-*Relievo*.

BAS (James Philip le), a modern French engraver, by whom we have ſome excellent prints. His great ability ſeems to lie in landſcapes and ſmall figures, which he executed in a ſuperior manner. His ſtyle of engraving is extremely neat; but yet he proves the freedom of the etching, and harmonizes the whole with the graver and dry point. We have alſo a variety of pretty vignettes by this artiſt. He flouriſhed about the middle of the preſent century; but we have no account either of the time of his birth or of his death.

BASALTES, (from *baſal* "iron," or *βασαλιζω diligenter examino*), in natural hiſtory, an heavy, hard ſtone, chiefly black or green, conſiſting of priſmatic cryſtals, the number of whoſe ſides is uncertain. The Engliſh miners call it *cockle*; the German *ſchoerl*. Its ſpecific gravity is to that of water as 3000 or upwards to 1000. It frequently contains iron; and conſiſts either of particles of an indeterminate figure, or of a ſparry, ſtriated, or fibrous texture. It has a flinty hardneſs, is inſoluble by acids, and is fuſible by fire. The following is an analyſis of ſome baſaltes by Mr. Bergman; and as the reſemblance of it to lava will be frequently mentioned in the ſucceeding part of this article, we ſhall here contraſt this analyſis with that of lava by the ſame author.

Baſaltes, 100 parts, contains		Lava, 100 parts, contains	
Siliceous earth	50	Siliceous earth	49
Argillaceous	15	Argillaceous	35
Calcareous	8	Calcareous	4
Magneſia	2	Iron	12
Iron	25		

The moſt remarkable property of this ſubſtance is its figure, being never found in ſtrata, like other marbles, but always ſtanding up in the form of regular angular columns, compoſed of a number of joints, one placed upon, and nicely fitted to another, as if formed by the hands of a ſkilful architect. See Plate 45.

This ſubſtance was originally found in columns in Ethiopia, and fragments of it in the river Tmolus, and ſome other places. We now have it frequently, both in columns and ſmall pieces, in Spain, Ruſſia, Poland, near Dreſden, and in Sileſia; but the nobleſt ſtore in the world ſeems to be that called the Giant's Cauſeway in Ireland, and Staffa one of the weſtern iſles of Scotland. Great quantities of baſaltes are likewiſe found in the neighbourhood of Mount Ætna in Sicily, of Hecla in Iceland, and of the volcano in the iſland of Bourbon. Theſe are the only three active volcanoes in whoſe neighbourhood it is to be met with; but it is alſo found in the extinguiſhed volcanoes in Italy, though not in the neighbourhood of Mount Veſuvius.

In Ireland the baſaltes riſes far up the country, runs into the ſea, croſſes at the bottom, and riſes again on the oppoſite land. In Staffa the whole end of the iſland is ſupported by natural ranges of pillars, moſtly above 50 feet high, ſtanding in natural colonnades, according as the bays and points of land have formed themſelves, upon a firm baſis of ſolid uniform rock. Above theſe, the ſtratum, which reaches to the ſoil or ſurface of the iſland, varies in thickneſs, as the iſland itſelf is formed into hills or valleys; each hill, which hangs over the valleys below, forming an ample pediment. Some of theſe, above 60 feet in thickneſs from the baſe to the point, are formed by the ſloping of the hill on each ſide, almoſt into the ſhape of thoſe uſed in the conſtruction of edifices.

The columns which form the Giant's Cauſeway have been very particularly examined and deſcribed. The moſt accurate account of them is to be met with in a work intitled, "Letters concerning the northern coaſt of the county of Antrim;" from which the following particulars relative to the preſent ſubject are taken.

"1. The pillars of the Cauſeway are ſmall, not very much exceeding 1 foot in breadth and 30 in length; ſharply defined, neat in their articulation, with concave or convex terminations to each point. In many of the capes and hills they are of a larger ſize; more imperfect and irregular in their figure and articulation, having often flat terminations to their joints. At Fairhead they are of a gigantic magnitude, ſometimes exceeding 5 feet in breadth and 100 in length; oftentimes apparently deſtitute of joints altogether. Through many parts of the country, this ſpecies of ſtone is entirely rude and unformed, ſeparating in looſe blocks; in which ſtate it reſembles the ſtone known in Sweden by the name of *trappe*.

"2. The pillars of the Giant's Cauſeway ſtand on the level of the beach; from whence they may be traced through all degrees of elevation to the ſummit of the higheſt grounds in the neighbourhood.

"3. At the Cauſeway, and in moſt other places, they ſtand perpendicular to the horizon. In ſome of the capes, and particularly near Uſhet harbour, in the Iſle of Baghery, they lie in an oblique poſition. At Doon point in the ſame iſland, and along the Ballintoy ſhore, they form variety of regular curves.

"4. The ſtone is black, cloſe, and uniform; the varieties of colour are blue, reddiſh, and grey; and of all kinds of grain, from extreme fineneſs to the coarſe granulated appearance of a ſtone which reſembles imperfect granite, abounding in cryſtals of ſchoerl chiefly black, though ſometimes of various colours.

"5. Though the ſtone of the Giant's Cauſeway be in general compact and homogeneous; yet it is remarkable, that the upper joint of each pillar, where it can be aſcertained with any certainty, is always rudely formed and cellular. The groſs pillars alſo in the capes and mountains frequently abound in theſe air-holes through all their parts, which ſometimes contain fine clay, and other apparently foreign bodies: and the irregular baſaltes beginning where the pillars ceaſe, or lying

over them, is in general extremely honey-combed; containing in its cells cryſtals of zeolite, little morſels of fine brown clay, ſometimes very pure ſteatite, and in a few inſtances bits of agate."

According to the account given by Sir Joſeph Banks, the bending pillars of Staffa differ conſiderably from thoſe of the Giant's Cauſeway. In Staffa, they lie down on their ſides, each forming the ſegment of a circle; and in one place, a ſmall maſs of them very much reſembles the ribs of a ſhip. Thoſe of the Giant's Cauſeway, which he ſaw, ran along the face of a high cliff, bent ſtrangely in the middle, as if unable, at their firſt formation, while in a ſoft ſtate, to ſupport the maſs of earth which lay over them.

The rocks of the Cyclops, in the neighbourhood of Ætna, exhibit very magnificent baſaltic pillars. A diſtant view of ſome of them is given in Plate 45. The principal of theſe rocks has the ſtraighteſt and moſt regular columns of any: they ſeem, at firſt view, to reſemble thoſe of the Giant's Cauſeway, and others commonly met with, but on a nearer inſpection, we find a remarkable difference; being aſſembled in groups of five or ſix about one, which ſerves as their common centre. They are of various ſizes and forms; ſome ſquare, others hexagonal, heptagonal, or octagonal. One half of this rock is compoſed of perpendicular columns; the other of another ſpecies of baſaltes diſpoſed in inclined, and almoſt rectilinear, layers. Theſe are in contact with the columns, and are as cloſely connected with them as they are with one another. The layers are longer at the baſe than towards the top of the rock. It is further to be remarked, that moſt of theſe layers are ſubdivided as they riſe upwards, ſo that towards theſe upper extremities, one layer preſents to the eye ſometimes one, ſometimes two, and ſometimes three, diviſions. The fragments of baſaltes taken off from theſe layers are of a rhomboidal figure, becauſe the layers break in an oblique direction.

Theſe layers, though inclined towards the baſe, become almoſt perpendicular towards the upper part of the rock, where they appear united in a point, and overtop moſt of the viſible and elevated parts of the priſmatic columns. Theſe columns terminate in ſuch a manner as to form a kind of ſtair-caſe. They appear even to riſe under a ſpecies of clay with which they are covered at one extremity, till they reunite themſelves with the point which is formed by the moſt elevated parts of the layers of baſaltes beſide them.

The promontory of Caſtel d'Iaci, which terminates the baſis of Ætna, is almoſt entirely compoſed of baſaltes, but of a kind very different from the former. It conſiſts of a great number of cylinders from the diameter of ſix inches to that of twenty feet. Some of theſe are ſolid, others hollow like cannon; ſome extended in layers, others ſimilar to carrots of tobacco conſiſting of a number of pieces ſqueezed together. Some of theſe cylinders are ſtraight, others curved into a variety of forms. Some look like globes incloſed in the rocks; and in the fractures of theſe globes we perceive the ſtrata of which they are compoſed.

The little heaps delineated in the plate, repreſent the baſaltes at the foot of this promontory on the ſouth ſide. Theſe little mounts into which it appears to be collected, are ſometimes only one French foot in diameter, ſometimes ſix. They are compoſed of ſmall priſms or needles, or of cubic trapezoids, and conſiſt of a matter diſtinguiſhed by the name of *dirty lava*. It is made up of pozzolana, conſolidated by a certain liquid, which while it has communicated ſolidity to the pozzolana, has at the ſame time ſuffered that ſubſtance to ſhrink conſiderably, in ſuch a manner as to leave large chinks between the pieces of baſaltes, which are thus formed by the operation of the liquid on the pozzolana. It appears alſo to have inſinuated itſelf into the clay with which the promontory is covered; which has become hard in its turn, and which has alſo ſplit into chinks that appear to contain a kind of hard matter between.

Theſe deſcriptions and figures will ſerve to give an idea of the appearance of the baſaltes, which is now generally accounted a kind of marble. Wallerius conſiders it as a ſpecies of the corneous or horn rock; and Cronſtedt enumerates it among thoſe ſubſtances which he calls *garnet earths*. The largeſt block of this ſtone that ever was ſeen, was placed, according to Pliny, by Veſpaſian in the temple of peace. It repreſented the figure of Nilus, with 16 children playing about it, denoting as many cubits of the riſe of the river. The ſtatue of Memnon, in the temple of Serapis at Thebes, which ſounded at the riſing of the ſun, was alſo made of the ſame material, if we may believe this author. Moſt of the Egyptian figures are likewiſe made of baſaltes. Some of the ancients call it *Lapis Lydius*, from Lydia, where it ſeems it was formerly found in greateſt abundance. The moderns denominate it the *touch-ſtone*, as the trial of gold and ſilver is ſometimes made with it.

A variety of ſubſtances are found intermixed with baſaltes; of which Mr. Hamilton enumerates the following. 1. Extenſive layers of red ochre, varying in all degrees from a dull ferruginous colour to a bright red, anſwering very well for coarſe painting. 2. Veins of iron ore, ſometimes very rich, commonly of a very brown or reddiſh caſt, at other times of a blue colour. 3. Steatites, generally of a greeniſh ſoapy appearance, more rarely of a pure white, and raiſing an imperfect ſaponaceous froth when agitated with water. 4. Zeolite, of a bright and pure white colour; in maſſes, varying in weight from a grain to a pound; generally diſpoſed in cavities of the cellular baſaltes; often affecting a cryſtallization, in which the fibres proceed as rays from a centre; and in ſome inſtances have a beautiful ſpangled appearance, reſembling that of thiſtle-down. The moſt remarkable property of this ſubſtance is, that with any of the mineral acids, but eſpecially with that of nitre, it forms a gelatinous mixture in the courſe of a few hours. 5. Peperino ſtone, a friable matrix of indurated clay and iron, ſtudded with little bits of zeolite or other ſubſtances; and which is often of a reddiſh burnt colour. 6. Pumice ſtone of a black colour, containing iron not entirely dephlogiſticated, but ſtill acting on the magnetical needle.

Theſe ſubſtances are found among the baſaltes of the Giant's Cauſeway in Ireland. In other places its attendants may perhaps vary according to circumſtances. The baſaltes itſelf has been conſidered by ſome as a cryſtallization from water; but others ſtrenuouſly maintain that it is only a ſpecies of lava, and in defence of theſe opinions very conſiderable diſputes have been carried on. The following are the arguments on both ſides, as ſtated by Mr. Hamilton.

In ſupport of the volcanic origin of the baſaltes it has been alleged,

1. That it agrees almoſt entirely with lava in its elementary principles, in its grain, the ſpecies of the foreign bodies it includes, and all the diverſities of its texture.

2. The iron of the baſaltes is found to be in a metallic ſtate, capable of acting on the magnetical needle, which is alſo the caſe with that found in compact lava.

3. The baſaltes is fuſible *per ſe*; a property which it has in common with lavas.

4. The baſaltes is a foreign ſubſtance ſuperinduced on the original limeſtone-ſoil of the country, in a ſtate of ſoftneſs capable of allowing the flints to penetrate conſiderably within its lower ſurface.

5. Thoſe extenſive beds of red ochre which abound among our baſaltes are ſuppoſed to be an iron earth reduced to this ſtate by the powerful action of heat; for ſuch a change may be produced on iron in our common furnaces, provided there be a ſufficient afflux of freſh air; and the baſaltes itſelf, in

ſuch circumſtances, is eaſily reducible to an impure ochre. This is alſo found to take place in the living volcanoes, particularly within their craters; and is therefore ſuppoſed to afford a preſumptive argument of the action of fire in the neighbourhood of baſaltes.

6. Though zeolite is not yet proved to be the actual production of a volcano, yet its preſence is always ſuppoſed to give countenance to this hypotheſis; becauſe zeolite is found in countries where the action of ſubterraneous fire is ſtill viſible, and where there is reaſon to believe that the whole ſoil has been ravaged by that principle. Thus it abounds in Iceland, where the flames of Hecla yet continue to blaze; and in the iſle of Bourbon, where there is ſtill a volcano in force. It is therefore ſuppoſed to ariſe from the decompoſition of the products of a volcano, where the fires have been long extinct.

7. Cryſtals of ſchoerl appear in great plenty among many kinds of our baſaltes; and theſe, though not abſolutely limited to volcanic countries, yet, being found in great abundance among the Italian lavas, in circumſtances exactly correſponding to thoſe of our baſaltes, are thought to ſupply a good probable argument in the preſent caſe.

8. The peperino ſtone is thought to be undoubtedly of a volcanic origin. It has frequently the burnt and ſpongy appearance of many of the volcanic products; and that of the Giant's Cauſeway agrees exactly with the peperino of Iceland and Bourbon.

9. Puzzolane earth is met with among the baſaltes of France; and there is very little reaſon to doubt that our baſaltes, if pulveriſed, would agree with it in every reſpect; that is, it would produce a fine ſharp powder, containing the ſame elementary parts, and probably agreeing with it in its valuable uſes as a cement. This earth is alſo found in the Canary iſlands, which are thought to have other marks of fire: it is met with in all the volcaniſed parts of Italy, and is never found excepting where there are other evident marks of fire.

10. Pumice ſtone is univerſally allowed to be produced by fire, and indeed bears the reſemblance of a cinder ſo obviouſly, that one muſt be inſtantly convinced of its original. This is alſo found among the baſaltes of Iceland.

11. There are three living volcanoes, within whoſe neighbourhood the baſaltes and moſt of its uſual attendant foſſils have been obſerved, viz. Ætna in Sicily, Heela in Iceland, and the iſland of Bourbon on the coaſt of Africa. To which it may be added, that it is found throughout all the volcaniſed parts of Italy, though not any where immediately in the neighbourhood of Veſuvius. Sir William Hamilton, however, informs us, that in the year 1779 he "picked up ſome fragments of large and regular cryſtals of cloſe grained lava or baſalt; the diameter of which, when the priſms are complete, might have been eight or nine inches." He obſerves, that Veſuvius does not exhibit any lavas regularly cryſtallized, and forming what are called *Giants Cauſeways*, except a lava that ran into the ſea, near Torre del Græco, in the year 1631, which has a ſmall degree of ſuch an appearance. As the fragments of baſaltes which he found on this mountain, however, had been evidently thrown out of the crater in their proper form, he puts the queſtion, "May not lavas be more ready to cryſtallize within the bowels of a volcano than after their emiſſion? And may not many of the Giants Cauſeways already diſcovered be the nuclei of volcanic mountains, whoſe lighter and leſs ſolid parts may have been worn away by the hand of time? Mr. Faujais de St. Fond gives an example of baſalt columns placed deep within the crater of a volcano whoſe fires were extinguiſhed.

12. It is well aſcertained by experience, that there are vaſt beds of pyrites diſperſed through the interior parts of the earth at all depths; and it is alſo a certain fact, that this compound ſubſtance may be decompounded by the accidental affuſion of water, in ſuch a manner as to become hot, and at laſt to burn with great fury. This accenſion of pyrites is by many ſuppoſed to be the true origin of the volcanic fire; and an argument for this is, that the preſent volcanoes do pour forth great quantities of the component parts of pyrites, particularly ſulphur, iron, and clay. Now, among the ſuperinduced ſubſtances of the county of Antrim, and the ſame may probably be ſaid of every other baſaltic country, it is certain that the quantity of iron and clay diffuſed through almoſt every ſpecies of foſſil, amounts to more than one-half of the whole material; ſo that two of the principal elements of the pyrites are ſtill found there, reduced in many inſtances to a ſlag or ſcoria. The third principle, viz. the ſulphur, cannot be expected to remain; becauſe ſulphur is totally conſumed by combuſtion; and what might perhaps eſcape and be ſublimed would no doubt have ſince periſhed by decompoſition, in conſequence of expoſure to the atmoſphere.

13. Another argument, which Sir William Hamilton appears to think very convincing, is, that glaſs ſometimes takes on the appearance of priſms, or cryſtallizes in cooling. He received ſome ſpecimens of this kind from Mr. Parker of Fleet-ſtreet, who informed him that a quantity of his glaſs had been rendered unſerviceable by taking ſuch a form. Some of theſe were in laminæ which may be eaſily ſeparated, and others reſemble baſaltic columns in miniature, having regular faces. "Many of the rocks of lava in the iſland of Ponza (ſays he) are, with reſpect to their configurations, ſtrikingly like the ſpecimens of Mr. Parker's glaſs above mentioned; none being very regularly formed baſaltes, but all having a tendency towards it. Mr. Parker could not account for the accident that occaſioned his glaſs to take the baſaltic form; but I have remarked, both in Naples and Sicily, that ſuch lavas as have run into the ſea are either formed into regular baſaltes, or have a great tendency towards ſuch a form. The lavas of Mount Ætna, which ran into the ſea near Jacic, are perfect baſaltes; and a lava that ran into the ſea from Veſuvius, near Torre del Græco, in 1631, has an evident tendency to the baſaltic form."

On the other ſide of the queſtion it is urged, that in many of the countries where baſaltes moſt abound, there are none of the characteriſtics of volcanic mountains. They aſſert, therefore, that the baſaltes is a foſſil, very extenſively ſpread over the ſurface of the earth; and that, where it is found in the neighbourhood of volcanic mountains, we ought to ſuppoſe theſe to be accidentally raiſed on a baſaltic ſoil rather than to have created it. But the advocates for the volcanic ſyſtem are not much embarraſſed with this argument. According to them, the baſaltes has been formed under the earth itſelf, and within the bowels of theſe very mountains: where it could never have been expoſed to view until, by length of time or ſome violent ſhock of nature, the incumbent maſs muſt have undergone a very conſiderable alteration, ſuch as ſhould go near to deſtroy every exterior volcanic feature. In ſupport of this it may alſo be obſerved, that the promontories of Antrim do bear evident marks of ſome very violent convulſion, which has left them in their preſent ſituation; and that the iſland of Ragherry, and ſome of the weſtern iſles of Scotland, do really appear like the ſurviving fragments of a country great part of which might have been buried in the ocean. It is further added, that though the exterior volcanic character be in great meaſure loſt in the baſaltic countries, yet this negative evidence can be of little weight, when we conſider, that the few inſtances where the features have been preſerved afford a ſufficient anſwer to this objection. Thus the Montagne de la Coupe in France ſtill bears the marks of its having been formerly a volcano: and this mountain is obſerved to ſtand on a

baſe of baſaltic pillars, not diſpoſed in the tumultuary heap into which they muſt have been thrown by the furious action of a volcanic eruption, tearing up the natural ſoil of the country; but arranged in all the regularity of a Giant's Cauſeway, ſuch as might be ſuppoſed to reſult from the cryſtallization of a bed of melted lava, where reſt and a gradual refrigeration contributed to render the phænomenon complete.

But beſides theſe arguments ſtated by Mr. Hamilton, we ſhall add another from Mr. Ferber; viz. That at the time he went from Rome to Oſtia they were paving the road with a ſpecies of black lava. In ſome of the broken pieces he obſerved little empty holes, of the bigneſs of a walnut, incruſtated all round their ſides by white or amethyſtine ſemipellucid, pointed, or truncated, pyramidal cryſtallizations, entirely reſembling the agate nodules or geodes, which are commonly filled with quartz cryſtallizations. There was no crack or fiſſure in the ambient compact lava; the cryſtal ſhoerls were pretty hard, and might rather be called *quartz*. Some fine browniſh duſt lay in the reſt of the holes, as impalpable and light as aſhes. He tells us alſo, that in the greateſt part of the Paduan, Veroneſe, and Vicentine lavas, we meet with an infinite quantity of white polygonal ſhoerl cryſtallizations, whoſe figure is as regular, and ſtill more polygonal than the baſaltes appears to be.

The late celebrated Mr. Bergman, in diſcuſſing the volcanic theory, expreſſes himſelf to the following effect:—"Ten years ago (ſays he) it was a general opinion, that the ſurface of the earth, together with the mountains, had been produced by moiſture. It is true that ſome declared fire to be the firſt original cauſe, but the greater number paid little attention to this opinion. Now, on the contrary, the opinion that ſubterraneous fire had been the principal agent gains ground daily; and every thing is ſuppoſed to have been melted, even to the granite. My own opinion is, that both the fire and water have contributed their ſhare in this operation; though in ſuch a proportion, that the force of the former extends much farther than the latter; and, on the contrary, that the fire has only worked in ſome parts of the ſurface of the earth. It cannot be doubted that there has been ſome connection betwixt the baſaltic pillars and ſubterraneous fire; as they are found in places where the marks of fire are yet viſible; and as they are even found mixed with lava, tophus, and other ſubſtances produced by fire.

"As far as we know, nature makes uſe of three methods to produce regular forms in the mineral kingdom: 1. That of cryſtallization or precipitation; 2. The cruſting or ſettling of the external ſurface of a liquid maſs while it is cooling; and, 3. The burſting of a moiſt ſubſtance while it is drying.

"The firſt method is the moſt common; but, to all appearance, nature has not made uſe of it in the preſent caſe. Cryſtals are ſeldom or never found in any quantity running in the ſame direction; but either inclining from one another, or, what is ſtill more common, placed towards one another in ſloping directions. They are alſo generally ſeparated a little from one another when they are regular. The nature of the thing requires this, becauſe the ſeveral particles of which the cryſtals are compoſed muſt have the liberty of obeying that power which affects their conſtitution. The baſaltic columns, on the contrary, whoſe height is frequently from 30 to 40 feet, are placed parallel to one another in conſiderable numbers, and ſo cloſe together that the point of a knife can hardly be introduced between them. Beſides, in moſt places, each pillar is divided into ſeveral parts or joints, which ſeem to be placed on one another. And indeed it is not uncommon for cryſtals to be formed above one another in different layers, while the ſolvent has been viſibly diminiſhed at different times: but then the upper cryſtals never ſit ſo exactly upon one another as to produce connected priſms of the ſame length or depth in all the ſtrata taken together; but each ſtratum, ſeparately taken, produces its own cryſtals.

"Precipitation, both in the wet and dry way, requires that the particles ſhould be free enough to arrange themſelves in a certain order; and as this is not practicable in a large melted maſs, no cryſtallizations appear, excepting on its ſurface or in its cavities. Add to this, that the baſaltes in a freſh fracture do not ſhow a plain ſmooth ſurface under the microſcope; but appear ſometimes like grains of different magnitude, and at other times reſemble fine rays running in different directions, which does not correſpond with the internal ſtructure of cryſtals.

"Hence the opinion of baſaltes being formed by cryſtallization either in the wet or dry method muſt become leſs probable; but it muſt not be omitted, that the ſpars exhibit a kind of cryſtallization, which at firſt ſight reſembles a heap of baſaltes, but upon a cloſer examination a very great difference is to be found. The form of the ſpar is every where alike, but the baſaltes differ from one another in ſize, and the number of their ſides. The former, when broken, conſiſts of many ſmall unequal cubes; but the baſalt does not ſeparate in regular parts, &c. &c.

"Nature's ſecond method of producing regular forms is that of cruſting the outer ſurface of a melted maſs. By a ſudden refrigeration, nature, to effect this purpoſe, makes uſe of polyhedrous and irregular forms. If we ſuppoſe a conſiderable bed which is made fluid by fire, and ſpread over a plain, it evidently appears, that the ſurface muſt firſt of all loſe the degree of heat requiſite for melting, and begin to congeal. But the cold requiſite for this purpoſe likewiſe contracts the uppermoſt congealed ſtratum into a narrower ſpace; and conſequently cauſes it to ſeparate from the remaining liquid maſs, as the ſide expoſed to the air is already too ſtiff to give way. In this manner a ſtratum is produced, running in a parallel direction with the whole maſs; others are ſtill produced by the ſame cauſe in proportion as the refrigeration penetrates deeper. Hence we may very plainly ſee how a bed may be divided into ſtrata. In the ſame manner the refrigeration advances on the ſides; which conſequently divides the ſtrata into polyhedrous pillars, which can hardly ever be exactly ſquare, as the ſtrongeſt refrigeration into the inner parts of the maſs advances almoſt in a diagonal line from the corners. If we add to this, that a large maſs cannot be equal through its compoſition, nor every where liquid in the ſame degree, it will be eaſy to diſcover the cauſe of ſeveral irregularities. If the depth of the bed be very conſiderable in proportion to its breadth, priſmatic pillars without croſs diviſions will be formed at leaſt lengthwiſe from the uppermoſt ſurface downwards.

"The third way is perfectly ſimilar to the preceding in its effect; but it is different from it by the maſs being ſoaked in water, and by the burſting of it aſunder, being the effect of the contraction while it is drying. If we ſuppoſe ſuch a bed to be ſpread over a level ſpace, the drying advances in the ſame manner as the refrigeration in the former caſe. This ſeparation into ſtrata properly happens when a conſiderable quantity of clay enters into the whole compoſition, becauſe the clay decreaſes more than any other kind of earth in drying.

"It is moſt probable, therefore, that the pillars have been produced out of the baſaltic ſubſtance while it was yet ſoft, or at leaſt not too hard to be ſoftened by exhalations. If we therefore ſuppoſe a bed to be ſpread over a place where a volcano begins to work, it is evident that a great quantity of the water always preſent on ſuch occaſions muſt be driven upwards in exhalations or vapours; which, it is well known, poſſeſs a penetrating, ſoftening power, by means of which they produce their firſt effect: but when they are increaſed to a ſuffi-

cient quantity, they force this tough moiſt ſubſtance upwards; which then gradually falls, and during this time burſts in the manner above deſcribed.

"The reaſons for this ſuppoſition are as follow: 1. We do not find the internal ſubſtance of the baſaltes melted or vitrified; which, however, ſoon happens by fuſion; and for which only a very ſmall degree of fire is requiſite. It is of conſequence very hard to explain how this ſubſtance could have been ſo fluid that no traces of bubbles appear in it; and yet, when broken, ſeem dull and uneven. Lava is ſeldom vitrified within; but the great number of bubbles and pores which are found in the whole maſs, are more than ſufficient proofs, that it has not been perfectly melted to its ſmalleſt parts, but has only been brought to be near fluid. 2. Secondly, the baſaltes ſo much reſemble the finer trapp, both in their grain and original compoſition, that they can hardly be diſtinguiſhed in ſmall fragments."

The opinion of Mr. Kirwan is, that the baſaltes owe their origin both to fire and water: they ſeem to have been at firſt a lava; but this, while immerſed in water, was ſo diffuſed or diſſolved in it with the aſſiſtance of heat, as to cryſtallize when cold, or coaleſce into regular forms. That baſaltes is not the effect of mere fuſion, he concludes from comparing its form with its texture. Its form, if produced by fuſion, ought to be the effect of having flowed very thin; but in that caſe its texture ſhould be glaſſy: whereas it is merely earthy, and devoid of cavities. Hence we may underſtand how it comes to paſs that lava perfectly vitrified, and even water, have been found incloſed in maſſes of baſaltes.

Mr. Houel, in his *Voyage Pittureſque*, is at conſiderable pains to account for the origin of the different ſpecies of baſaltes he met with in the neighbourhood of Mount Ætna. "Some modern writers (ſays he) attribute the configuration of the baſaltes to the ſudden cooling of the lava in conſequence of the effects produced upon it by the coldneſs of ſea-water, when it reaches the ſea in a ſtate of fuſion. They ſuppoſe that the ſhock, which it then receives, is the cauſe of thoſe different configurations which this ſubſtance aſſumes; the moſt remarkable of which have been already mentioned. This aſſertion, however, ſeems to be ill founded. By conſidering the baſaltic rock, the firſt of the cyclops repreſented in the plate, we find that the pile is not in its original ſtate, and that the ſeries of columns is at preſent incomplete. It is very probable, that the ſpecies of clay found there, and which is extraneous to the baſaltes, has by ſome means taken poſſeſſion of its place; and it likewiſe appears, that not one of the baſaltes here deſcribed is entire.

"It ſeems incredible, however, that a maſs of matter reduced by fire to a ſtate of liquefaction, and flowing into the ſea, ſhould be ſuddenly changed into regular figures by the ſhock of coming into contact with cold water; and that all the figures which are thus formed ſhould be diſpoſed in the ſame manner with regard to one another. For if we ſuppoſe that the water made its way into the cavity of the lava at the inſtant when it retreated backwards, then might the ſame quantity of water penetrate into the moſt remote parts of the maſs; and by that means prolong the cavity which it had begun to form when it firſt entered the maſs. The water then being lodged within this burning maſs, and being in a ſtate of dilatation, would have expelled whatever oppoſed it, and ſwelled the whole maſs in ſuch a manner as to form much larger interſtices than thoſe which appear between the baſaltic columns; ſince theſe are every where in cloſe contact with one another. Beſides, how could the ſudden cooling of the lava divide the upper part and ſides of ſuch an enormous maſs as exactly as if they had been caſt in a mould made on purpoſe?

"It remains alſo for thoſe who adopt the hypotheſis in queſtion to explain how the ſhock occaſioned by the cold water ſhould make itſelf felt beyond a certain depth; ſince the very firſt moment it comes into contact with the liquid lava, it muſt ceaſe to be cold; for the lava cannot but communicate to it a greater degree of heat than it communicates of cold in return, as the water is more eaſily penetrable by the burning lava than the maſs of lava by the ſurrounding water. But farther, if at the firſt moment after the lava enters the water it were cooled and contracted, the water would ſoon prevent, by the contraction of its whole ſurface, any continuation of the effect which it had firſt occaſioned.

"This ſeems to be the great difficulty: for how is it thus poſſible for the water to extend its influence to the centre of any very conſiderable maſs? and even ſuppoſing it to act at the centre, how could it be able to fix the common centre of all the different columns?

"Let us next conſider what a degree of ebullition muſt take place in the water when it receives ſuch a vaſt quantity of lava heated not only more intenſely than common fire, but than red-hot iron? Though that maſs, 100 fathoms in diameter, were to proceed from the bottom of the ſea; or though it were immerſed in it, the degree of ebullition would ſtill be the ſame; and it is difficult to conceive what ſhock can be occaſioned by a cold which does not exiſt, on a maſs which burns, or cauſes to boil, whatever comes near it.

"One peculiarity attending the baſaltes is, that it remains fixed in the receſs which it has once occupied. Another, not leſs eſſential, is its power of dividing itſelf in the midſt of any one of its hardeſt parts, and to form two diſtinct pieces, one of which is always concave, and the other convex; a diviſion which ſeems the moſt ſingular curioſity of the whole.

"A third peculiarity might ſtill be found in the interior part of theſe columns, if we were to meet with any that had ſuffered more by the lapſe of time than thoſe already deſcribed; but it is impoſſible for all this to be effected by water. How can water, which is every where the ſame, and which may be expected always to produce the ſame effects, produce ſuch a variety on baſaltes by mere contact?

"The cauſe of all theſe varieties, therefore, ſeems to be this, that theſe lavas are originally compoſed of materials extremely different in their natures, and from which ſuch a variety of effects naturally proceed. The ſame ſpecies of matter, when actuated by the ſame cauſe, will conſtantly produce the ſame effects. This variety of effects therefore is much leſs owing to the influence of the water, than to the variety of materials of which thoſe lavas are compoſed; and theſe are combined in different forms and quantities according to the nature and quantity of the various materials which have been reduced by the volcano to a ſtate of fuſion.

"The forms of the baſaltes therefore proceed from two cauſes. One of them, viz. the cooling, belongs indifferently to every ſpecies, independent of its meeting with water. The other is the diverſity of the quantities and of the materials of which the lava is compoſed. From theſe cauſes alone proceed all the beauties and varieties which are beheld with admiration in this claſs of bodies. Theſe take place, from the moſt irregular fractures in the lava, to thoſe which diſplay the greateſt exactneſs and ſymmetry. Every new erupted lava differs from thoſe which preceded it, and from thoſe which will follow. In the various principles of theſe lavas we muſt ſeek for the cauſes of thoſe cavities diſcoverable in the baſaltes, and for the cauſes which produce thoſe baſaltes, at the time when the matter of which it is compoſed contracted itſelf, and conſolidated all its parts. In the act of condenſation, it appears to have formed various foci, around which we may diſtinguiſh the line which ſets bounds to the power of each of them; and this is the line which marks the ſpaces intervening between the different pieces; becauſe all of them are poſſeſſed of the ſame attractive force. The fire emitted by the lava, at the time the ba-

ſaltes is formed, produces upon it the ſame effect that is produced by the evaporation of the aqueous moiſture from thoſe bodies where water forms a part of the original conſtitution; which bodies harden in proportion as they become dry, by reaſon of the approach of their conſtituent parts to one another. The abſtraction of fire produces the ſame effect upon baſaltes, by ſuffering its component parts to come into cloſer union.

"A new proof of this theory is deducible from the form of the baſaltes in ſmall heaps as repreſented in Plate 45. The interſtices there are pretty numerous; becauſe the lava being of that ſpecies denominated *dirty*, and conſiſting of parts, moſt of which have but little ſolidity, they have left much larger ſpaces between them at their contraction. From this want of ſolidity we may perceive how much the baſaltic maſs loſt of the fire by which it was dilated while in a ſtate of fuſion.

"The void ſpaces left by the contraction of the baſaltes, are filled with a ſpongy matter, which by drying has alſo left large interſtices; and theſe have been filled in their turn with a kind of yellow matter ſimilar to that which covers the promontory of Caſtel d'Iaci.

"Whatever variety of forms we meet with among the baſaltes, and whatever diviſions and ſubdiviſions may be obſervable among theſe varieties, they are owing, 1. To the minuteneſs, 2. To the homogeneous nature, or, 3. To the diverſity among the particles which compoſe the baſaltes. Among the varieties already enumerated, we find reddiſh, earthy, ſoft and porous ſubſtances, together with the zeolite cryſtals. We ſee others extremely hard and compact, very finely grained, and containing likewiſe ſchoerl and zeolite cryſtals. Others are very hard and denſe, which appear to be a mixture of ſmall grey and white bodies; and of each of theſe colours many different ſhades, from light to darker, containing alſo zeolite cryſtals. Laſtly, we find ſome conſiſting of a matter ſimilar to clay, mixed with round black ſand.

"It may be objected, that the late eruptions of Ætna afford no baſaltes, nor have they any diviſions ſimilar to thoſe above mentioned. But to this we may reply, that if they afford neither ſuch baſaltes, nor ſuch regular diviſions, the reaſon is, that neither their quantity, nor the ingredients of which they are compoſed, are ſuch as are neceſſary for the production of baſaltes: and for a proof of this we may refer to lavas of the moſt remote antiquity, which have no more reſemblance to baſaltes than thoſe that are more modern.

"Laſtly, an argument, to which no plauſible reply can be made, that the baſaltes are not formed by ſea-water, is, that in the year 1699 the lava of mount Ætna ran into the ſea for two leagues and an half, without having the leaſt appearance of being converted into baſaltes."

BASARTSCHIK, a conſiderable town of Romania in Turkey of Europe. It is pretty well built, and has clean and broad ſtreets; has a great trade; and is ſituated on the river Meritz, in E. long. 24. 30. N. lat. 41. 49.

BASARUCO, in commerce, a ſmall baſe coin in the Eaſt Indies, being made only of very bad tin. There are, however, two ſorts of this coin, a good and a bad; the bad is one ſixth in value lower than the good.

BASE, in geometry, the loweſt ſide of the perimeter of a figure: Thus, the baſe of a triangle may be ſaid of any of its ſides, but more properly of the loweſt, or that which is parallel to the horizon. In rectangled triangles, the baſe is properly that ſide oppoſite to the right angle.

Base *of a Solid Figure*, the loweſt ſide, or that on which it ſtands.

Base *of a Conic Section*, a right plain in the hyperbola and parabola, ariſing from the common interſection of the ſecant plain and the baſe of the cone.

Base, in architecture, is uſed for any body which bears another, but particularly for the lower part of a column and pedeſtal. The ancients, in the early times of architecture, uſed no baſes. The Doric columns in the temple of Minerva at Athens have none, but ſtand immediately upon the floor of the porch. Columns afterwards came to be ſupported on ſquare pieces called *plinths*, and after that on pedeſtals. When we ſee a column, of whatſoever order, on a pedeſtal, the baſe is that part which comes between the top of the pedeſtal and the bottom of the ſhaft of the column; when there is no pedeſtal, it is the part between the bottom of the column and the plinth. Some have included the plinth as a part of the baſe; but it is properly the piece on which the baſe ſtands, as the column ſtands upon that. The pedeſtal alſo has its baſe as well as the column, and the pilaſter. The baſe of columns is differently formed in the different orders; but in general it is compoſed of certain ſpires or circles, and was thence in early times called the *ſpire of a column*. Theſe circles were in this caſe ſuppoſed to repreſent the folds of a ſnake as it lies rolled up; but they are properly the repreſentations of ſeveral larger and ſmaller rings or circles of iron, with which the trunks of trees, which were the ancient columns, were ſurrounded to prevent their burſting: theſe were rude and irregular, but the ſculptor who imitated them in ſtone found the way to make them elegant.

Base, in fortification, the exterior ſide of the polygon, or that imaginary line which is drawn from the flanked angle of a baſtion to the angle oppoſite to it.

Base, in gunnery, the leaſt ſort of ordnance, the diameter of whoſe bore is $1\frac{1}{4}$ inch, weight 200 pounds, length 4 feet, load 5 pound, ſhot $1\frac{1}{2}$ pound weight, and diameter $1\frac{1}{8}$ inch.

Base, in chemiſtry. See Basis.

Base, in law. *Baſe eſtate*, ſuch as baſe tenants have in their hands. *Baſe tenure*, the holding by villenage, or other cuſtomary ſervices; as diſtinguiſhed from the higher tenures *in capite*, or by military ſervice. *Baſe fee*, is to hold in fee at the will of the lord, as diſtinguiſhed from ſoccage tenure. *Baſe court*, any court not of record.

BASELLA, CLIMBING NIGHTSHADE *from Malabar;* a genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 12th order *Holoraceæ*. The calyx is wanting; the corolla is ſeven-cleft, with the two oppoſite diviſions broader, and at laſt berried; there is one ſeed.

The *Species* are, 1. The rubra, with red leaves and ſimple footſtalks, has thick, ſtrong, ſucculent ſtalks and leaves, which are of a deep purple colour. The plant will climb to the height of ten or twelve feet, provided it is kept in a ſtove; but in the open air it will not grow ſo large in this country; nor will the ſeeds come to perfection in the open air, unleſs in very warm ſeaſons. The flowers of this plant have no great beauty, but it is cultivated on account of the odd appearance of its ſtalks and leaves. There is a variety of this with green ſtalks and leaves, and the flowers of a whitiſh green colour tipped with purple. 2. The alba, with oval waved leaves. This ſort hath flaccid leaves, and ſmaller flowers and fruit than the firſt. The plants will climb to a conſiderable height, and ſend forth a great number of branches; ſo they ſhould be trained up to a trellis, or faſtened to the back of the ſtove, otherwiſe they will twiſt themſelves about whatever plants ſtand near them, which will make a very diſagreeable appearance.

With regard to *Culture*, theſe plants are propagated from ſeeds, which ſhould be ſown on a moderate hot-bed in the ſpring; and when the plants are fit to remove, they ſhould be each planted in a ſeparate pot, and plunged into the tan bed, where they are to be treated like other tender exotics. They

may be alſo propagated from cuttings; but as they riſe ſo eaſily from the ſeeds, the latter method is ſeldom practiſed.

The berries of the firſt ſpecies are ſaid to be uſed for ſtaining callicoes in India. Mr. Miller aſſures us, that he has ſeen a very beautiful colour drawn from them, but which did not continue long when uſed in painting. He is of opinion, however, that a method of fixing the colour might be invented, in which caſe the plant would be very uſeful.—This, we apprehend, might be accompliſhed by means of a ſolution of tin in aqua regia, which is known to have a ſurpriſing effect both in brightening and giving durability to other vegetable dyes.

BASEMENT, in architecture. See the Treatiſe on ARCHITECTURE.

BASHARIANS, a ſect of Mahometans, being a branch or ſubdiviſion of the Motazalites. The Baſharians are thoſe who maintain the tenets of Baſhar Ebn Motamer, a principal man among the Motazalites, who varied, in ſome points, from the general tenets of the ſect, as carrying man's free agency to a great length, and even to the making him independent.

BASHAW, PASCHA, or PACHA, a Turkiſh governor of a province, city, or other diſtrict. Thus we ſay, the baſhaw of Babylon, the baſhaw of Anatolia, the baſhaw of Bender, &c.

All Egypt is, on the part of the grand ſeignior, governed by a baſhaw, who has in reality but little power; but ſeems principally to be meant for the means of communicating to his divan of beys, and to the divans of the ſeveral military ogiacs, the orders and commands of the grand ſeignior, and to ſee that they be executed by the proper officers. If he farms the country of the grand ſeignior, the fines that are paid, when any life drops upon the lands, belong to him; for originally all the lands of Egypt belonged to the grand ſeignior; and the Porte ſtill looks on them as its own: but the grand ſeignior's power being now loſt, they all go to the next heir; who muſt, however, be inveſted by the baſhaw, and is glad to compound for a ſmall ſum. The nature of the baſhaw's office requires him to be ever attempting means to cut off ſuch as are too aſpiring, or engaged in deſigns that may be any way prejudicial to the Porte. This often occaſions his own depoſition; but he is unconcerned about that, as his perſon is always ſacred; and his loſing his poſt is only a ſtep to higher preferment.

Baſhaws include beglerbegs, and ſometimes ſangiachegs; though a diſtinction is ſometimes made, and the name baſhaw is appropriated to the middle ſort, or ſuch as have two enſigns or horſe-tails carried before them.—Thoſe who have the honour of three tails are called beglerbegs; and thoſe who have only one, ſangiachegs.

A baſhaw is made with the ſolemnity of carrying a flag or banner before him, accompanied with muſic and ſongs, by the mirialem, an officer on purpoſe for the inveſtiture of baſhaws. *Baſhaw*, uſed abſolutely, denotes the prime vizier; the reſt of the denomination being diſtinguiſhed by the addition of the province, city, or the like, which they have the command of; as the baſhaw of Egypt, of Paleſtine, &c. The baſhaws are the emperors ſponges. We find loud complaints among Chriſtians of their avarice and extortion. As they buy their governments, every thing is venal with them. When glutted with wealth, the emperor frequently makes them a preſent of a bow-ſtring, and becomes heir to all their ſpoils.

The appellation *baſhaw* is given by way of courteſy to almoſt every perſon of any figure at the grand ſeignior's court.

BASIL (St.) the Great, one of the moſt learned and eloquent doctors of the church, was born at Cæſarea in Cappadocia, about the year 328; and went to finiſh his ſtudies at Athens, where he contracted a ſtrict friendſhip with St. Gregory Nazianzen. He returned to his native country in 355, where he taught rhetoric. Some time after, he travelled into Syria, Egypt, and Lybia, to viſit the monaſteries of theſe countries; and the monaſtic life ſo much ſuited his diſpoſition, that upon his return home he reſolved to follow it, and he was the firſt inſtitutor thereof in Pontus and Cappadocia. His reputation became ſo great, that upon the death of Euſebius biſhop of Cæſarea, in 370, he was choſen his ſucceſſor. It was with ſome difficulty that he accepted of this dignity; and no ſooner was he raiſed to it, than the emperor Valens began to perſecute him becauſe he refuſed to embrace the doctrine of the Arians. Being at length let alone, he began to uſe his utmoſt endeavours to bring about a re-union betwixt the eaſtern and weſtern churches, who were then much divided about ſome points of faith, and in regard to Meletius and Paulinus two biſhops of Antiochia. But all his efforts were ineffectual, this diſpute not being terminated till nine months after his death. Baſil had a ſhare in all the diſputes which happened in his time in the eaſt in regard to the doctrine of the church; and died the 1ſt of January, 379.—There have been ſeveral editions of his works in Greek and Latin. The beſt is that of Father Garnier, printed in Greek and Latin, in three volumes folio. St. Baſil's ſtyle is pure and elegant, his expreſſions are grand and ſublime, and his thoughts dignified and full of energy.

BASIL, a canton of Switzerland, which joined the confederacy in 1501. It is bounded on the ſouth by the canton of Solothurn; on the north by part of the margravate of Baden Dourlach, and the territory of Rheinfelden; on the eaſt by Frickthal; and on the weſt by part of Solothurn, the dioceſe of Baſil, and the Sundgare; being upwards of 20 miles in length, and about 18 in breadth. It is entirely proteſtant; and contains 27 pariſhes, and ſeven bailiwics. The lower parts of it are fruitful in corn and wine, and alſo fit for paſture; but the mountains are extremely barren. Here are many medicinal ſprings and baths, and the air is wholeſome and temperate. Both men and women for the moſt part wear the French dreſs; but the language commonly ſpoken is the High-Dutch, though the French alſo is much uſed. The government is ariſtocratical; and its revenues ariſe chiefly from ſecularized abbeys, and impoſts on goods carried through the country, to and from France, Italy, and Germany. Beſides the military eſtabliſhment of the city of Baſil, there are two provincial regiments, conſiſting each of ten companies, and a troop of dragoons.—The places of moſt note are Baſil the capital, Wallenburg, St. Jacob, Neue-Haus, &c.

BASIL, the capital of the canton of that name, is the largeſt city in all Switzerland, having 220 ſtreets, and ſix market-places or ſquares. Its environs are exceeding beautiful, conſiſting of a fine level tract of fields and meadows. The city is divided into two parts by the Rhine, over which there is a handſome bridge. It is thought by ſome to have riſen on the ruins of the old Auguſta Rauracorum. For its name of *Baſilia* it is indebted to Julian the Apoſtate, who would have it ſo called in honour of his mother Baſilina. It is fortified with walls, moats, towers, and baſtions, and contains ſeveral churches, beſides the cathedral, which is an old Gothic ſtructure; a commandery of the order of St. John, and another of the Teutonic order; a public granary and arſenal; a ſtately town-houſe, in which is an exquiſite piece of the ſufferings of Chriſt, by Holbein, and a ſtatue of Munatius Plancus a Roman general, who, about 50 years before Chriſt, built the ancient city of Auguſta Rauracorum; an univerſity, which was founded in 1459, and has a curious phyſic-garden, library, and muſeum; a gymnaſium; a ſtately palace, belonging to the margrave of Baden-Dourlach; beſides a chamber of curioſities, ſeveral hoſpitals, &c. In the arſenal is ſhown the armour in

which Charles the Bald loſt his life, with the furniture of his horſe, and the kettle-drums and trumpets of his army. On the ſtair-caſe of the council-houſe, is a picture of the laſt judgment, in which, though drawn before the reformation, popes, cardinals, monks, and prieſts, are repreſented in the torments of hell. Over-againſt the French church, on a long covered wall, is painted the dance of death; where the king of terrors is repreſented as mixing with all ranks and ages, and complimenting them, in German verſes, on their arrival at the grave. St. Peter's ſquare, planted with elm and lime-trees, makes a pleaſant walk; but a ſpot regularly planted with trees, cloſe by the river, and near the minſter, makes a ſtill finer, as commanding a moſt beautiful and extenſive proſpect. The celebrated Eraſmus died here in 1536, in the 70th year of his age, and was buried in the great church. He left his library and cabinet of rarities to one Amberbach, a learned lawyer of this city, of whoſe heirs they were purchaſed by the univerſity. Beſides this cabinet, there are ſeveral other curious private ones. The clocks of this city go an hour faſter than elſewhere, except at Conſtance; a circumſtance which ſome aſcribe to the famous councils held there, when it was thought the beſt expedient to bring the fathers earlier to the aſſembly, for the quicker diſpatch of buſineſs; but others ſay, that, in Baſil, it was owing to an aſſault being defeated by that means. About 400 years ago, according to the ſtory, the city was threatened with an aſſault by ſurpriſe. The enemy was to begin the attack when the large clock of the tower at one end of the bridge ſhould ſtrike one after midnight. The artiſt who had the care of the clock, being informed that this was the expected ſignal, cauſed the clock to be altered, and it ſtruck two inſtead of one; ſo the enemy thinking they were an hour too late, gave up the attempt: and in commemoration of this deliverance, all the clocks in Baſil have ever ſince ſtruck two at one o'clock, and ſo on. In caſe this account of the matter ſhould not be ſatisfactory, they ſhow, by way of confirmation, a head, which is placed near to this patriotic clock, with the face turned to the road by which the enemy was to have entered. This ſame head lolls out its tongue every minute, in the moſt inſulting manner poſſible. This was originally a piece of mechanical wit of the famous clockmaker's who ſaved the town. He framed it in deriſion of the enemy, whom he had ſo dexterouſly deceived. It has been repaired, renewed, and enabled to thruſt out its tongue every minute for theſe four hundred years, by the care of the magiſtrates, who think ſo excellent a joke cannot be too often repeated. Trade ſtill flouriſhes here, eſpecially in ſilk, ribbons, and wines; and the police is under excellent regulations. Moſt of the offices are beſtowed by lot among well qualified perſons. No perſon, without the city, muſt wear lace of gold or ſilver. All young women are prohibited from wearing ſilks; and the neareſt relations only are to be invited to a marriage-feaſt. For the government of the city there are ſeveral councils or colleges, and officers. Of the laſt, the two burgomaſters, and two wardens of trades, are the chief. The great council is compoſed of the repreſentatives of the ſeveral companies of the greater and leſſer city. Baſil was the ſee of a biſhop till the Reformation; but though there is one that ſtill bears the title, he has now no juriſdiction here, and lives at Porentru, near the Upper Alſace. The two Buxtorffs, father and ſon, and the famous painter Holbein, were natives of this place. The council held here, in 1431, ſat in the veſtry of the cathedral church.

Basil, *ocymum*, in botany. Ocymum is a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The upper lip of the calyx is orbiculated, the inferior one quadrifid; the corolla is reſupinated, with one lip quadrifid, the other undivided; the exterior filament ſends out a reflected proceſs at the baſe. There are eight ſpecies, all of them natives of warm climates, riſing from ſix inches to two feet in height, and having a ſtrong aromatic ſmell, reſembling that of cloves. One of the ſpecies is uſed in the kitchen, particularly by the French cooks, who make great uſe of it in their ſoups and ſauces. This riſes about ten inches high, ſending out branches by pairs oppoſite, from the bottom; the ſtalks and branches are four-cornered; the leaves are oval, ſpear-ſhaped, ending in acute points, and are indented on their edges; the whole plant is hairy, and has a ſtrong ſcent of cloves too powerful for moſt perſons, but to ſome it is very agreeable. Theſe plants are propagated by ſeeds, and will thrive in this country in the open air, and will even ripen their ſeeds if placed in a ſtove or airy glaſs-caſe.

Basil, among joiners, the ſloping edge of a chiſſel, or of the iron of a plane, to work on ſoft wood: they uſually make the baſil 12 degrees, and for hard wood 18; it being remarked, that the more acute the baſil is, the better the inſtrument cuts; and the more obtuſe, the ſtronger and fitter it is for ſervice.

BASILEUS, βασιλευς, a title aſſumed by the emperors of Conſtantinople, excluſive of all other princes, to whom they give the title *rex* "king." The ſame quality was afterwards given by them to the kings of Bulgaria, and to Charlemagne, from the ſucceſſors of which laſt they endeavoured to wreſt it back again.—The title *baſileus* has been ſince aſſumed by other kings, particularly the kings of England, *Ego Edgar totius Angliæ baſileus confirmavi.* Hence alſo the queen of England was intitled *Baſilea* and *Baſiliſſa*.

BASILIAN monks; Religious of the order of St. Baſil. That ſaint, having retired into a deſert, in the province of Pontus, founded a monaſtery for the convenience of himſelf and his numerous followers: and for the better regulation of this new ſociety, he drew up in writing the orders and rules he would have them follow. This new order ſoon ſpread all over the eaſt; nor was it long before it paſſed into the weſt. The rule of St. Baſil was approved by pope Liberius, the ſame year in which it was written and publiſhed; and afterwards by ſeveral other popes; and, in theſe laſt ages, by pope Gregory XIII. who approved the abridgment made of it by cardinal Beſſarion, in the pontificate of Eugenius IV.—Some authors pretend, that St. Baſil, before he died, ſaw himſelf the ſpiritual father of more than 90,000 monks, in the eaſt only. But this order, which flouriſhed ſo greatly for more than three centuries, was afterwards conſiderably diminiſhed by hereſy, ſchiſm, and a change of empire. The greateſt ſtorm it felt, was in the reign of Conſtantine Copronymus; who perſecuted the monks of St. Baſil, impriſoning ſome, and baniſhing others; inſomuch that the monaſteries were abandoned and ſpoiled of all their property.

The hiſtorians of this order tell us, that it has produced 1805 biſhops; and beatified, or acknowledged as ſaints, 3010 abbots, 11,805 martyrs, and an infinite number of confeſſors and virgins. They likewiſe place among the religious of the order of St. Baſil 14 popes, ſome cardinals, and a very great number of partriarchs, archbiſhops, and biſhops. This order likewiſe boaſts of ſeveral emperors and empreſſes, kings and queens, princes and princeſſes, who have embraced its rules.

The order of St. Baſil was introduced in the weſt in 1057; and was reformed in 1569, by pope Gregory XIII. who united the religious of this order in Italy, Spain, and Sicily, into one congregation; of which the monaſtery of St. Saviour at Meſſina is the chief, and enjoys pre-eminence over the reſt. Each community has its particular rule, beſides the rule of St. Baſil, which is very general, and preſcribes little more than the common duties of a Chriſtian life.

BASILIC, or Basilica, in the ancient architecture, denotes a kind of public hall or court of judicature, where the

princes or magiſtrates ſat to adminiſter. The word is originally Greek, Βασιλικη, *q. d. royal houſe, palace.*—The baſilics conſiſted of a great hall, with ailes, porticoes, tribunes, and tribunals. The bankers too had one part of the baſilica allotted for their reſidencè. The ſcholars alſo went thither to make their declamations, according to the teſtimony of Quintilian. In after-times the denomination *baſilica* was alſo given to other buildings of public uſe, as town-houſes, exchanges, burſes, and the like. The Roman *baſilicæ* were covered, by which they were diſtinguiſhed from the *fora*, which were public places open to the air. The firſt baſilica was built at Rome by Cato the elder, whence it was called *Porcia;* the ſecond was called *Opimia;* the third was that of Paulus, built at a great expence, and with much magnificence, whence it was called by ſome *regia Pauli:* another was built by Julius Cæſar, called *baſilica Julia*; of which Vitruvius tells us he had the direction. There were others alſo, to the number of eighteen or twenty. The *baſilica Julia* not only ſerved for the hearing of cauſes, but for the reception and audience of foreign ambaſſadors. It was ſupported by a hundred marble pillars in four rows, and enriched with decorations of gold and precious ſtones. In it were 13 tribunals or judgment ſeats, where the prætors ſat to adminiſter juſtice.

Basilic is a term alſo uſed by eccleſiaſtical writers, for a church; in which ſenſe the word frequently occurs in St. Ambroſe, St. Auſtin, St. Jerom, Sidonius Apollinaris, and other writers of the fourth and fifth centuries. It is thought that the name was thus applied, from many of the ancient churches having been formed of the Roman halls mentioned in the preceding article. In reality, on the converſion of Conſtantine, many of the ancient *baſilicæ* were given to the church, and turned to another uſe, *viz.* for Chriſtian aſſemblies to meet in, as may be collected from that paſſage in Auſonius, where ſpeaking to the emperor Gratian, he tells him the *baſilicæ*, which heretofore were wont to be filled with men of buſineſs, were now thronged with votaries praying for his ſafety. By which he muſt needs mean, that the Roman halls or courts were turned into Chriſtian churches: and hence, we conceive, the name *baſilicæ* came to be a general name for churches in after ages.

Basilic is chiefly applied, in modern times, to churches of royal foundation; as thoſe of St. John de Lateran, and St. Peter of the Vatican at Rome, founded by the emperor Conſtantine:

Basilics were alſo little chapels built by the ancient Franks over the tombs of their great men, ſo called, as reſembling the figure of the ſacred *baſilicæ* or churches. Perſons of inferior condition had only *tumbæ* or *porticuli* erected over them. By an article in the Salic law, he that robbed a *tumba* or *porticulus*, was to be fined fifteen *ſolidi*; but he that robbed a baſilica, thirty *ſolidi*.

Basilics, in literary hiſtory, a name ſuppoſed to have been given by the emperor Leo to a collection of laws in honour of his father Baſilius Macedo, who began it in the year 867, and in the execution chiefly made uſe of Sabbathius Protoſpatharius, who carried the work as far as 40 books. Leo added 20 books more, and publiſhed the work in 880. The whole, 30 years after, was corrected and improved by Conſtantine Porphyrogenitus, ſon of Leo; whence many have held him the author of the baſilica. Six books of the baſilica were tranſlated into Latin in 1557, by Gentian Hervetus. An edition of the Greek baſilics, with a Latin verſion, has been ſince publiſhed at Paris, in 1647, by Annib. Fabrottus, in 7 volumes. There ſtill want 19 books, which are ſuppoſed to be loſt. Fabrottus has endeavoured to ſupply in ſome meaſure the defect from the ſynopſis of the baſilica, and the gloſſes; of which ſeveral had been made under the ſucceeding emperors, and contained the whole Juſtinian law, excepting the ſuperfluities, in a new and more conſiſtent order, together with the later conſtitutions of the emperors poſterior to Juſtinian. The whole collection, conſiſting of ſixty books, was for that reaſon called εξηκονταβιβλος.

BASILICA, in anatomy, the interior branch of the axillary vein, running the whole length of the arm. See Anatomy.

BASILICATA, a territory of Italy, bounded on the north by the Otranto, Bari, and Capitanata; on the weſt by the Principato, and a ſmall part of the Tuſcan ſea; on the ſouth by Calabria; and on the eaſt by the gulph of Taranto. It is watered by ſeveral rivers: but as it is almoſt all occupied by the Apennine mountains, it is neither very populous nor fertile: however it produces enough to maintain its inhabitants, and has a ſmall quantity of cotton. The principal towns are Cirenza the capital, Meſi, Turſi, Rapollo, Muro, Lavello, Tracarico, Monte Peloſe, and Veneſo, which are all epiſcopal ſees.

BASILICI, a denomination given in the Greek empire to the prince's mandatories, or thoſe who carried the emperor's orders and commands.

BASILICON, in pharmacy, a name given to ſeveral compoſitions to be found in ancient medical writers. Of late years it has been confined to three officinal ointments, diſtinguiſhed by their colours, *viz.* black, yellow, and green. The laſt reviſed pharmacopœia of the London college retains only the two firſt, under the names of *unguentum reſinæ flavæ*, and *unguentum picis*. See Pharmacy.

BASILIDIANS, ancient heretics, the followers of Baſilides, an Egyptian, who lived near the beginning of the ſecond century. He was educated in the Gnoſtic ſchool, over which Simon Magus preſided; with whom he agreed that Chriſt was a man in appearance, that his body was a phantom, and that he gave his form to Simon the Cyrenian, who was crucified in his ſtead. We learn from Euſebius, that this hereſiarch wrote 24 books upon the goſpel, and that he forged ſeveral prophets; to two of which he gave the names *Barcaba* and *Barcoph*. We have ſtill the fragment of a Baſilidian goſpel. His diſciples ſuppoſed there were particular virtues in names; and taught with Pythagoras and Plato, that names were not formed by chance, but naturally ſignified ſomething. —Baſilides, to imitate Pythagoras, made his diſciples keep ſilence for five years together.

Generally ſpeaking, the Baſilidians held much the ſame opinions with the Valentinians, another branch of the Gnoſtic family. They aſſerted, that all the actions of men are neceſſary; that faith is a natural gift, to which men are forcibly determined, and ſhould therefore be ſaved though their lives were ever ſo irregular. Irenæus and others aſſure us, they acted conſiſtently with this principle; committing all manner of villanies and impurities, in confidence of their natural election. They had a particular hierarchy of divine perſons, or Æons. Under the name *Abraxas*, they are ſaid to have worſhipped the ſupreme God, from whom as a principle, all other things proceeded. There are ſeveral gems ſtill ſubſiſting, inſcribed with the name *Abraxas*, which were uſed by the Baſilidians as amulets againſt diſeaſes and evil ſpirits. See Abraxas.

BASILICUS, in zoology, the trivial name of a ſpecies of lizard. Lacerta, the *lizard*, is a genus of amphibious animals, belonging to the order of reptilia, the characters of which are theſe: The body is naked, with four feet and a tail. There are 49 ſpecies: the moſt remarkable of which are theſe:

1. The crocodylus, or crocodile, has a compreſſed jagged tail, five toes on the fore and four on the hind-feet. This is the largeſt animal of the lizard kind. One that was diſſected

at Siam, an account of which was ſent to the Royal Academy at Paris, was 18 feet and a half long, of which the tail was no leſs than five feet and a half, and the head and neck above two and a half. This animal was four feet and nine inches in circumference at its thickeſt part. The hind legs, including the thigh and the paw, were two feet and two inches long; the paws, from the joint to the extremity of the longeſt claws, were above nine inches, They were divided into four toes; of which three were armed with large claws, the longeſt of which was an inch and a half, and ſeven lines and a half broad at the root. The fourth toe was without a nail, and of a conical figure; but was covered with a thick ſkin like ſhagreen leather. Theſe toes were united with membranes like thoſe of ducks, but much thicker. The fore legs had the ſame parts and conformation as the arms of a man, both within and without; but they were ſomewhat ſhorter than thoſe behind. The hands had five fingers, the two laſt of which had no nails, and were of a conical figure, like the fourth toe on the hind paws. The head was long, and had a little riſing at the top; but the reſt was flat, and eſpecially towards the extremity of the jaws. It was covered with a ſkin, which adhered firmly to the ſkull and to the jaws. The ſkull was rough and unequal in ſeveral places; and about the middle of the forehead there were two bony creſts, about two inches high. They were not quite parallel, but ſeparated from each other in proportion as they aſcended. The eye was very ſmall in proportion to the reſt of the body; and was ſo placed within its orbit, that the outward part, when ſhut, was only a little above an inch in length, and run parallel to the opening of the jaws. The noſe was placed in the middle of the upper jaw, near an inch from its extremity, and was perfectly round and flat, being two inches in diameter, of a black, ſoft, ſpongy ſubſtance, not unlike the noſe of a dog. The noſtrils were in the form of a Greek capital Σ; and there were two caruncles which filled and cloſed them very exactly, and which opened as often as he breathed through the noſe. The jaws ſeemed to ſhut one within another by means of ſeveral apophyſes, which proceeded from above downwards, and from below upwards, there being cavities in the oppoſite jaw to receive them. They had 27 dog-teeth in the upper jaw and 15 in the lower, with ſeveral void ſpaces between them. They were thick at the bottom, and ſharp at the point; being all of different ſizes, except ten large hooked ones, ſix of which were in the lower jaw, and four in the upper. The mouth was 15 inches in length, and eight and a half in breadth where broadeſt; and the diſtance of the two jaws, when opened as wide as they could be, was 15 inches and a half. The ſkull, between the two creſts, was proof againſt a muſket-ball, which only rendered the part of a whitiſh caſt.

The body was of a dark brown colour on the upper part, and of a light citron below, with large ſpots of both colours on the ſides. From the ſhoulders to the extremity of the tail he was covered with large ſcales of a ſquare form, diſpoſed like parallel girdles, and were 52 in number; but thoſe near the tail were not ſo thick as the reſt. In the middle of each girdle there were four protuberances, which became higher as they approached the end of the tail, and compoſed four rows; of which the two in the middle were lower than the remaining two, forming three channels, which grew deeper the nearer they came to the tail, and were confounded with each other about two feet from its termination.

The ſkin was defended with a ſort of armour, which, however, was not proof againſt a muſket-ball, as it has been commonly ſuppoſed. It muſt indeed be acknowledged, that the attitude in which the animal was placed in making the experiment, might contribute not a little thereto; for probably, if the ball had ſtruck obliquely againſt the ſhell, it would have flown off. Thoſe parts of the girdles which lay underneath the belly were of a whitiſh colour, and were made up of ſcales of different ſhapes. They were about one-ſixth of an inch in thickneſs, and were not ſo hard as thoſe on the back.

This ſpecies of lacerta, however, is ſaid to grow to a ſtill larger ſize than that above-mentioned, ſome having been known to meaſure 25 feet in length. They have no tongue; but in place of that organ there is a ſort of membrane attached by its edges to the two ſides of the lower jaw.

According to Mr. Haſſelquiſt, the crocodile ſwallows ſtones to aſſiſt digeſtion, after the manner of ſeed eating birds, which commit to the ſtomach the work of maſtication as well as digeſtion, being deſtitute of the inſtruments adapted to that purpoſe. The Egyptians ſay, that his excrements do not paſs by the anus: this ſeems to be confirmed by the ſtructure of the gut, which is near the pylorus; for it cannot eaſily be conceived that excrements ſhould paſs through ſuch a narrow paſſage, ſeemingly deſtined for the conveyance of the chyle only; but the ſtructure of the parts, and the gut being ſo near the pylorus, ſeem to indicate that the excrements paſs through it into the ventricle, and are vomited up. The inhabitants above Cairo ſay they ſee this daily; and obſerve, that the crocodile is obliged to come on ſhore as often as he has occaſion to eaſe himſelf. There is a folliculus, of the bigneſs of a hazel nut, under the ſhoulders of the old crocodiles, which contains a thick matter ſmelling like muſk. The Egyptians are very anxious to get this when they kill a crocodile, it being a perfume much eſteemed by the grandees. When the male copulates with the female, he turns her with his ſnout on her back. The Egyptians uſe the fat againſt the rheumatiſm, eſteeming it a powerful remedy outwardly applied. They alſo apply different parts of this animal to other medicinal purpoſes, in which their belief is very ſuperſtitious.

The crocodile is a very dangerous and terrible animal, and does a great deal of miſchief among the common people of Upper Egypt, often killing and devouring women who come to the river to fetch water, and children playing on the ſhore or ſwimming in the river. In the ſtomach of one diſſected before Mr. Barton the Engliſh conſul, they found the bones of the legs and arms of a woman, with the rings which they wear in Egypt as ornaments. Theſe animals are ſeen in ſome places lying for whole hours, and even days, ſtretched in the ſun and motionleſs; ſo that one not uſed to them might miſtake them for trunks of trees covered with a rough and dry bark: but the miſtake would ſoon be fatal; for the ſeemingly torpid animal, at the near approach of any living creature, inſtantly darts upon it, and carries it to the bottom. In the time of an inundation they ſometimes enter the cottages of the natives, where they ſeize the firſt animal they meet with. There have been ſeveral examples of their taking a man out of a canoe in the ſight of his companions, without their being able to lend him any aſſiſtance. The crocodile, however, except when preſſed with hunger, or with a view of depoſiting its eggs, ſeldom leaves the water. Its uſual method is to float along upon the ſurface, and ſeize whatever animals come within its reach; but when this method fails, it then goes cloſer to the bank. There it waits in patient expectation of ſome land animal that comes to drink; the dog, the bull, the tiger, or man himſelf. Nothing is to be ſeen as the animal approaches, nor is its retreat diſcovered till it is too late for ſafety. It ſeizes the victim with a ſpring, and goes at a bound much faſter than ſuch an unwieldy animal could be ſuppoſed to do; then having ſecured the creature both with teeth and claws, it drags it into the water, inſtantly ſinks with it to the bottom, and in this manner quickly drowns it. Sometimes it happens, that the creature wounded by the crocodile makes its eſcape; in which caſe, the latter purſues with great celerity, and often takes it a

ſecond time. In theſe depredations, however, this terrible animal often ſeizes on another as formidable as itſelf, and meets with a deſperate reſiſtance. We are told of frequent combats between the crocodile and the tiger. All creatures of the tiger kind are continually oppreſſed by a parching thirſt, that keeps them in the vicinity of great rivers, whither they deſcend to drink very frequently. On theſe occaſions they are ſeized by the crocodile; upon whom they inſtantly turn with the greateſt agility, and force their claws into his eyes, while he plunges with his fierce antagoniſt into the river. There they continue to ſtruggle for ſome time, till at laſt the tiger is drowned. Notwithſtanding all this, however, we are aſſured by Labat, that a negro, with no other weapon than a knife in his right hand, and his left arm wrapped round with a cow-hide, ventures boldly to attack this animal in its own element. As ſoon as he approaches the crocodile, he preſents his left arm, which the animal ſwallows moſt greedily: but as it ſticks in his throat, the negro has time to give it ſeveral ſtabs below the chin, where it is eaſily vulnerable; and the water alſo getting in at the mouth, which is held involuntarily open, the creature is ſoon deſtroyed.

The natives of Siam take crocodiles, by throwing three or four ſtrong nets acroſs a river, at proper diſtances from each other; ſo that if the animal breaks through the firſt, it may be caught by one of the reſt. When it is firſt taken, it employs the tail, which is the grand inſtrument of ſtrength, with great force; but after many unſucceſsful ſtruggles, the animal's ſtrength is at laſt exhauſted. Then the natives approach their priſoner in boats, and pierce him in the moſt tender parts till he is weakened by loſs of blood. When he has done ſtirring, they begin by tying up his mouth, and with the ſame cord tie his head to his tail, which laſt they bend back like a bow. However, they are not yet perfectly ſecure from his fury; but for their greater ſafety they tie his fore-feet, as well as thoſe behind, to the top of his back. Theſe precautions are not uſeleſs; for if they were to omit them, the crocodile would ſoon recover ſtrength enough to do a great deal of miſchief. When thus brought into ſubjection, or when taken young and tamed, this formidable animal is uſed to divert and entertain the great men of the eaſt. It is often managed like an horſe; a curb is put into its mouth, and the rider directs it as he thinks proper. Though awkwardly formed, it does not fail to proceed with ſome degree of ſwiftneſs; and is thought to move as faſt as ſome of the moſt unwieldy of our own animals, the hog or the cow. Some indeed aſſert, that no animal could eſcape it but for its ſlowneſs in turning; which, however, ſeems very improbable, as its back-bone is full of articulations, and ſeemingly very flexible. See 2d Plate 46.

All crocodiles breed near freſh waters; and though they are ſometimes found in the ſea, yet that may be conſidered rather as a place of excurſion than abode. They produce their young by eggs, as was ſaid above; and for this purpoſe, the female, when ſhe comes to lay, chooſes a place by the ſide of a river, or ſome freſh-water lake, to depoſit her brood in. She always pitches upon an extenſive ſandy ſhore, where ſhe may dig a hole without danger of detection from the ground being freſh turned up. The ſhore muſt alſo be gentle and ſhelving to the water, for the greater convenience of the animal's going and returning; and a convenient place muſt be found near the edge of the ſtream, that the young may have a ſhorter way to go. When all theſe requiſites are adjuſted, the animal is ſeen cautiouſly ſtealing up on ſhore to depoſit her burden. The preſence of a man, a beaſt, or even a bird, is ſufficient to deter her at that time; and if ſhe perceives any creature looking on, ſhe infallibly returns. If, however, nothing appears, ſhe then goes to work, ſcratching up the ſand with her fore-paws, and making a hole pretty deep in the ſhore. There ſhe depoſits from 80 to 100 eggs, of the ſize of a tennis-ball, and of the ſame figure, covered with a tough white ſkin like parchment. She takes above an hour to perform this taſk; and then covering up the place ſo artfully that it can ſcarcely be perceived, ſhe goes back to return again the next day. Upon her return, with the ſame precaution as before, ſhe lays about the ſame number of eggs; and the day following alſo a like number. Thus having depoſited her whole quantity, and having covered them cloſe up in the ſand, they are ſoon viviſied by the heat of the ſun; and at the end of 30 days the young ones begin to break open the ſhell. At this time the female is inſtinctively taught that her young ones want relief; and ſhe goes upon land to ſcratch away the ſand and ſet them free. Her brood quickly avail themſelves of their liberty; a part run unguided to the water; another part aſcend the back of the female, and are carried thither in greater ſafety. But the moment they arrive at the water, all natural connection is at an end; when the female has introduced her young to their natural element, not only ſhe, but the male, become amongſt the number of their moſt formidable enemies, and devour as many of them as they can. The whole brood ſcatters into different parts at the bottom; by far the greateſt number are deſtroyed, and the reſt find ſafety in their minuteneſs or activity in eſcaping purſuit.

But it is not the parent alone that is thus found to thin their numbers; the eggs of this animal are not only a delicious feaſt to the ſavage, but are eagerly ſought after by every beaſt and bird of prey. The ichneumon was erected into a deity among the ancients for its ſucceſs in deſtroying the eggs of theſe monſters: at preſent that ſpecies of the vulture called the *gallinazo* is their moſt prevailing enemy. All along the banks of great rivers, for thouſands of miles, the crocodile is ſeen to propagate in numbers that would ſoon over-run the earth, but for the vulture, that ſeems appointed by Providence to abridge its fecundity. Theſe birds are ever found in great numbers where the crocodile is moſt numerous; and hiding themſelves within the thick branches of the trees that ſhade the banks of the river, they watch the female in ſilence, and permit her to lay all her eggs without interruption. Then when ſhe has retired, they encourage each other with cries to the ſpoil; and flocking all together upon the hidden treaſure, tear up the eggs, and devour them in a much ſhorter time than they were depoſited. Nor are they leſs diligent in attending the female while ſhe is carrying her young to the water; for if any one of them happens to drop by the way, it is ſure to be devoured.

This extraordinary account communicated by late travellers of the propagation of this animal, has been adopted by Linnæus and the moſt learned naturaliſts of the age. Yet if one might argue from the general analogy of nature, the crocodile's devouring her own young when ſhe gets them to the water ſeems doubtful. This may be a ſtory raiſed from the general idea of this animal's rapacious cruelty; when in fact the crocodile only ſeems more cruel than other animals, becauſe it has more power to do miſchief. It is probable that it is not more diveſted of parental tenderneſs than other creatures; and we are the more led to think ſo, from the peculiar formation of that ſpecies of lacerta which we come next to deſcribe, viz.

2. *Lacerta gangetica*, the *open bellied crocodile*; which is furniſhed with a falſe belly like the opoſſum, where the young creep out and in as their dangers or neceſſities require. The crocodile, thus furniſhed at leaſt, cannot be ſaid to be an enemy to her own young, ſince ſhe thus gives them more than parental protection. It is probable alſo that this open-bellied crocodile is viviparous, and ſoſters her young that are prematurely excluded, in this ſecond womb until they arrive at maturity. This ſpecies of crocodile was not deſcribed by Linnæus; but has been inſerted in the *Syſtema Naturæ* ſince his death, under

the name above ſtated. Mr. Edwards tells us, that three of theſe creatures were ſent from Bengal about the year 1747, to the late Dr. Mead phyſician in ordinary to the king. Two of them the Doctor preſerved in his collection, and preſented the third to the late curious Mrs. Kennon; and ſince the deceaſe of theſe worthy perſons, they became the property of Mr. James Lemon of London, who obliged our author with one of them to produce to the Royal Society. The narrowneſs of the beak is the moſt extraordinary circumſtance in this crocodile, which appears like the bill of the bird called *gooſeander*. It has ſmall ſharp teeth. Another peculiarity is a paunch or open purſe in the middle of the under ſide of the belly, which ſeems to be naturally formed with round hips, and hollow within, to receive its young in time of danger, as it appears in the American animal called *opoſſum*. Dr. Parſons gave it as his opinion, that the opening in the belly was really natural, it having no appearance of being cut or torn open. In other reſpects it has all the marks common to alligators or crocodiles. The beak was finely creaſed tranſverſely. The animal appeared in the ſpirits all over of a yellowiſh olive colour, the under ſide lighter than the upper, the latter having ſome duſky marks and ſpots. This ſpecies inhabits the banks of the Ganges; and it is very ſtrange that they ſhould never have been deſcribed before, as our India Company have been ſo long ſettled there, and the common crocodile is ſcarcely larger than this animal when at its full growth.

With reſpect to the period to which the crocodile lives we are not certainly informed. If we may believe Ariſtotle, it lives the age of a man: but the ancients ſo much amuſed themſelves in inventing fables concerning this animal, that even truth from them is ſuſpicious. What we know for certain from the ancients is, that among the various animals that were produced to fight in the amphitheatre at Rome, the combat of the crocodile was included.

3. The *al'igator*, or American crocodile, has a vaſt mouth, furniſhed with ſharp teeth; from the back to the end of the tail, ſerrated; ſkin tough and brown, and covered on the ſides with tubercles. This dreadful ſpecies, which grows to the length of 17 or 18 feet, is found in the warmer parts of North America; and moſt numerous as we approach the South, and the more fierce and ravenous. Yet in Carolina it never devours the human ſpecies, but on the contrary ſhuns mankind; it will, however, kill dogs as they ſwim the rivers, and hogs which feed in the ſwamps. It is often ſeen floating like a log of wood on the ſurface of the water, and is miſtaken for ſuch by dogs and other animals, which it ſeizes and draws under water to devour at its leiſure. Like the wolf, when preſſed by long hunger, it will ſwallow mud, and even ſtones and pieces of wood. They often get into the wears in purſuit of fiſh, and do much miſchief by breaking them to pieces. They are torpid during the winter in Carolina; and retire into their dens, which they form by burrowing far under ground. It makes the entrance under water, and works upwards. In ſpring it quits its retreat, and reſorts to the rivers, which it ſwims up and down; and chiefly ſeeks its prey near the mouth, where the water is brackiſh. It roars and makes a dreadful noiſe at its firſt leaving its den, and againſt bad weather. It lays a vaſt number of eggs in the ſand, near the banks of lakes and rivers, and leaves them to be hatched by the ſun: multitudes are deſtroyed as ſoon as hatched either by their own ſpecies or by fiſh of prey. In South America the carrion vulture is the inſtrument of Providence to effect this deſirable purpoſe.

4. The *Cayman*, or Antilles crocodile, which has by different authors been confounded with the two preceding ſpecies, is evidently different from both; and has accordingly been properly diſtinguiſhed by the Abbe Bonnaterre in the *Encyclopédie Methodique*. See our figure, where the differences are ſo apparent as to require no detail. The greateſt ſtrength of this animal, according to M. Merian, conſiſts in its teeth, of which there are two rows croſſing one another, by means of which it grinds with the greateſt eaſe whatever it ſeizes upon. But it muſt not be underſtood from this that there is a double row of teeth, as Seba pretends, on each ſide of the under jaw; but only that there are two rows on each jaw, one on the right and the other on the left ſide. The *Cayman* is ſo called from ſome ſmall iſles of that name among the Antilles, where theſe creatures are ſaid to be very numerous. They are of exceeding ſtrength, and equally the dread both of men and animals; for they live on land as well as in the water, and devour every creature they meet with. A figure of this animal at the time of breaking the ſhell of the egg, may be ſeen in the Plate.

5. The *caudiverbera*, has a depreſſed pinnatifid tail, and palmated feet. It is larger than the common green lizard, is found in Peru, and has got its name from its beating the ground with its tail.

6. The *ſtellio* has a verticillated tail, and dentated ſcales. It is a native of Africa, and the warm parts of Aſia. It frequents the ruinous walls of Natolia, Syria, and Paleſtine. The Arabs call it *hardun*. The Turks kill it; for they imagine, that, by declining the head, it mimics them while they ſay their prayers.

7. The *agilis*, has a pretty long verticillated tail, with ſharp ſcales, and a ſcaly collar. This is the common green lizard, and is a native both of Europe and India. This ſpecies is extremely nimble: in hot weather it baſks on the ſides of dry banks or old trees; but, on being obſerved, immediately retreats to its hole. The food of this ſpecies, as well as of all the other Britiſh lizards, is inſects; and they themſelves are devoured by birds of prey. They are all perfectly harmleſs; yet their form ſtrikes one with diſguſt, and has occaſioned great obſcurity in their hiſtory. Mr. Pennant mentions a lizard killed in Worceſterſhire in the year 1714, which was two feet ſix inches long, and four inches in girth. The fore-legs were placed eight inches from the head; the hind-legs five inches beyond thoſe: the legs were two inches long; the feet divided into four toes, each furniſhed with a ſharp claw. Another of the ſame kind was afterwards killed in that county; but whether theſe large lizards were natives of other countries and imported into England, or whether they were of Britiſh growth, is not certainly known.

8. The *chamæleon*, has a crooked cylindrical tail. The head of a large chamæleon is almoſt two inches long, and from thence to the beginning of the tail it is four inches and a half. The tail is five inches long, and the feet two and a half. The thickneſs of the body is different at different ſeaſons; for ſometimes from the back to the belly it is two inches, and ſometimes but one; for he can blow himſelf up and contract himſelf at pleaſure. This ſwelling and contraction is not only of the back and belly, but alſo of the legs and tail. Theſe different motions are not like thoſe of other animals, which proceed from a dilatation of the breaſt in breathing, and which riſes and falls ſucceſſively; but they are very irregular, as in tortoiſes and frogs. The chamæleon has continued as it were blown up for two hours together, and then he would grow leſs and leſs inſenſibly; for the dilatation was always more quick and viſible than the contraction. In this laſt ſtate he appeared extremely lean, and the ſpine of the back was ſharp, and all his ribs might be told: the tendons of the arms and legs might alſo be ſeen very diſtinctly.

The ſkin of this animal is very cold to the touch; and notwithſtanding he ſeems ſo lean, there is no feeling the beating of the heart. The ſurface of the ſkin is unequal, and has a grain not unlike ſhagreen, but very ſoft, becauſe each eminence is as ſmooth as if it was poliſhed. Some of theſe are as

large as a middling pin's head on the arms, legs, belly, and tail; but on the ſhoulders and head they are of an oval figure, and a little larger. Thoſe under the throat are ranged in the form of a chaplet, from the lower lip to the breaſt. Some on the head and back are amaſſed together in cluſters, with ſpaces between them, on which are almoſt imperceptible ſpots of a pale red and yellow colour, as well as the ground of the ſkin itſelf, which plainly appears between theſe cluſters. This ground changes colour when the animal is dead, becoming of a greyiſh brown, and the ſmall ſpots are of a whitiſh hue.

The colour of all thoſe eminences, when the chamæleon is at reſt in a ſhady place, is of a blueiſh grey, except on the claws, where it is white with a little yellow: and the ſpaces between the cluſters is of a pale red and yellow, as was before obſerved. But when he is in the ſun, all parts of the body which are affected with the light become of a greyiſh brown, or rather of a tawney. That part of the ſkin which the ſun does not ſhine on, changes into ſeveral brighter colours, which form ſpots of the ſize of half one's finger. Some of theſe deſcend from the ſpine half way on the back; and others appear on the ſides, arms, and tail. They are all of an Iſabella colour, from a mixture of a pale yellow and of a bright red, which is the colour of the ground of the ſkin.

The head of a chamæleon is not unlike that of a fiſh, being joined to the breaſt by a very ſhort neck, covered on each ſide with cartilaginous membranes reſembling the gills of fiſhes. There is a creſt directly on the top of the head, and two others on each ſide above the eyes, and between theſe there are two cavities near the top of the head. The muzzle is blunt, and not much unlike that of a frog: at the end there is a hole on each ſide for the noſtrils; but there are no ears, nor the leaſt appearance of any.

The jaws are furniſhed with teeth, or rather with a bone in the form of teeth, which he makes little or no uſe of, becauſe he lives upon ſwallowing flies and other inſects without chewing them; and hence aroſe the vulgar notion of his living upon air, becauſe he was never ſeen to eat. The tongue, which Linnæus ſays reſembles an earthworm, is of conſiderable length, and is enlarged and ſomewhat flattened at the end. From this member there continually oozes out a very glutinous liquor, by means of which it catches ſuch inſects as come within its reach, and it is ſurpriſing to ſee with what quickneſs it retracts its tongue the inſtant it has arreſted any prey. The form, ſtructure, and motion of the eyes, have ſomething very particular; for they are very large, being almoſt half an inch in diameter. They are of a globular figure; which may be eaſily ſeen, becauſe they ſtand out of the head. They have a ſingle eye-lid like a cap, with a ſmall hole in the middle, through which the ſight of the eye appears, no bigger than a pin's head, and of a ſhining brown, encircled by a little ring of a gold colour. This eye-lid has a grain like ſhagreen, as well as the other parts of the ſkin; and when the reſt of the body changes colour, and aſſumes ſpots of different ſhapes, thoſe on the lid always keep the ſame form, though they are tinctured with the ſame colour as the ſkin. But the moſt extraordinary thing relating to the eyes is, that this animal often moves one when the other is entirely at reſt; nay, ſometimes one eye will ſeem to look directly forward and the other backward, and one will look up to the ſky when the other is directed downwards.

The trunk, which comprehends the thorax and belly in a chamæleon, is almoſt all thorax, with little or no belly. The four feet are all of a length; and the only difference between them is, that thoſe before are turned backwards, and thoſe behind forwards. There are five toes on each paw, which have a greater reſemblance to hands than feet. They are all divided into two, which gives the appearance of two hands to each arm, and two feet to each leg; and though one of theſe parts have three toes, and the other but two, yet they ſeem to be all of the ſame ſize. Theſe toes lie together under the ſame ſkin as in a mitten; however, their ſhape is plainly ſeen through the ſkin. With theſe paws the chamæleon can lay hold of the ſmall branches of trees in the ſame manner as a parrot. When he is about to perch, he parts his toes differently from birds, becauſe he puts two behind and two before. The claws are little, crooked, very ſharp, and of a pale yellow, proceeding but half way out of the ſkin, while the other half is hid beneath it. His walk is ſlower than that of a tortoiſe, and he ſeems to move along with an affectation of gravity. He ſeems to ſeek for a proper place to ſet his feet upon; and when he climbs up trees, he does not truſt to his feet like ſquirrels, but endeavours to find out cleſts in the bark, by which he may hold the faſter.

The tail, when puffed up and round, is like that of a viper: for otherwiſe the bones may be ſeen in the ſame manner as on the back. He always wraps his tail round the branches of trees, and it ſerves him as it were inſtead of a fifth hand. He is a native of Africa and Aſia. Mr. Haſſelquiſt is of opinion, that the change of colour in the chamæleon is owing to its being exceedingly ſubject to the jaundice, which particularly happens either when it is expoſed to the ſun or when it is made angry. The mixture of the bile with its blood is then very perceptible, and, as the ſkin is tranſparent, makes it ſpotted with green and yellow. He never ſaw it coloured with red, blue, or purple; and does not believe that theſe colours are ever exhibited in this animal. See 3d Plate 46.

9. The *gecko*, has a cylindrical tail, concave ears, and a warty body. It is the Indian ſalamander of Bontius. "This animal is very frequent in Cairo (ſays Haſſelquiſt), both in the houſes and without them. The poiſon of this animal is very ſingular, as it exhales from the lobuli of the toes. The animal ſeeks all places and things impregnated with ſea-ſalt, and, paſſing over them ſeveral times, leaves this very noxious poiſon behind it. In July 1750, I ſaw two women and a girl in Cairo at the point of death, from eating cheeſe new ſalted, bought in the market, and on which this animal had dropt its poiſon. Once at Cairo, I had an opportunity of obſerving how acrid the exhalations of the toes of this animal are, as it ran over the hand of a man who endeavoured to catch it; there immediately roſe little puſtules over all thoſe parts the animal had touched; theſe were red, inflamed, and ſmarted a little, greatly reſembling thoſe occaſioned by the ſtinging of nettles. It emits an odd ſound, eſpecially in the night, from its throat, not unlike that of a frog."

10. The *ſcincus*, has a cylindrical tail compreſſed at the point, and blunt marginated toes. This animal is found in Arabia Petræa near the Red Sea, and in Upper Egypt near the Nile. It is much uſed by the inhabitants of the eaſt as an aphrodiſiac, but not at this time by the Europeans, whatever may have been the caſe formerly. The fleſh of the animal is alſo given in powder as a medicine by the Arabs.

11. The *nilotica*, has a long tail with a triangular edge, and four lines of ſcales on the back. It is met with in the moiſt places of Egypt near the Nile. The Egyptians ſay that this lizard proceeds from the eggs of the crocodile laid in the ſand, but that the crocodile proceeds from thoſe laid in the water. Mr. Haſſelquiſt has detected the fallacy of this account, however, very completely.

12. The *paluſtris*, has a lanceolated tail, and four toes on the fore-feet, and inhabits the ſtagnant waters of Europe. It has a ſlow and crawling pace. Mr. Pennant mentions his having more than once found, under ſtones and old logs, ſome very minute lizards, that had much the appearance of this kind: they were perfectly formed, and had not the leaſt veſtige of fins; which circumſtance, joined to their being found in a dry

place remote from water, ſeems to indicate, that they had never been inhabitants of that element, as it is certain many of our lizards are in their firſt ſtate. At that period they have a fin above and below their tail; that on the upper part extends along the back as far as the head; but both drop off as ſoon as the animal takes to the land, being then no longer of any uſe. Mr. Ellis has remarked certain pinnated fins at the gills of one very common in moſt of our ſtagnating waters, and which is frequently obſerved to take a bait as a fiſh does.

13. The *ſalamandra*, or ſalamander, has a ſhort cylindrical tail, four toes on the fore-feet, and a naked porous body. This animal has been ſaid, even in the Philoſophical Tranſactions, to live in the fire; but this is found to be fabulous. It is found in the ſouthern countries of Europe. The following account of this ſpecies is extracted from the Count de la Cepede's Natural Hiſtory of Serpents. Whilſt the hardeſt bodies cannot reſiſt the violence of fire, the world have endeavoured to make us believe that a ſmall lizard can not only withſtand the flames, but even extinguiſh them. As agreeable fables readily gain belief, every one has been eager to adopt that of a ſmall animal ſo highly privileged, ſo ſuperior to the moſt powerful agent in nature, and which could furniſh ſo many objects of compariſon to poetry, ſo many pretty emblems to love, and ſo many brilliant devices to valour. The ancients believed this property of the ſalamander, wiſhing that its origin might be as ſurpriſing as its power: and being deſirous of realizing the ingenious fictions of the poets, they have pretended that it owes its exiſtence to the pureſt of elements, which cannot conſume it; and they have called it the daughter of fire, giving it however a body of ice. The moderns have followed the ridiculous tales of the ancients; and as it is difficult to ſtop when one has paſſed the bounds of probability, ſome have gone ſo far as to think that the moſt violent fire could be extinguiſhed by the land ſalamander. Quacks ſold this ſmall lizard, affirming, that when thrown into the greateſt conflagration, it would check its progreſs. It was very neceſſary that philoſophers and naturaliſts ſhould take the trouble to prove by facts what reaſon alone might have demonſtrated; and it was not till after the light of ſcience was diffuſed abroad, that the world gave over believing in this wonderful property of the ſalamander. This lizard, which is found in ſo many countries of the ancient world, and even in very high latitudes, has been however very little noticed, becauſe it is ſeldom ſeen out of its hole, and becauſe for a long time it has inſpired much terror. Even Ariſtotle ſpeaks of it as an animal of which he had ſcarcely any knowledge.

The largeſt of this ſpecies, preſerved in the late French king's cabinet, is ſeven inches five lines in length, from the end of the muzzle to the root of the tail, which is three inches eight lines. The ſkin does not appear to be covered with ſcales, but it is furniſhed with a number of excreſcences like teats, containing a great many holes, ſeveral of which may be very plainly diſtinguiſhed by the naked eye, and through which a kind of milk oozes, that generally ſpreads itſelf in ſuch a manner as to form a tranſparent coat of varniſh above the ſkin of this oviparous quadruped, which naturally is dry.

The ſalamander has the eyes placed in the upper part of the head, which is a little flatted; their orbit projects into the interior part of the palate, and is there almoſt ſurrounded by a row of very ſmall teeth, like thoſe in the jaw bones: theſe teeth eſtabliſh a near relation between lizards and fiſhes; many ſpecies of which have alſo ſeveral teeth placed in the bottom of the mouth. The colour of this lizard is very dark: upon the belly it has a blueiſh caſt, intermixed with pretty large irregular yellow ſpots, which extend over the whole body, and even to the feet and eye-lids; ſome of theſe ſpots are beſprinkled with ſmall black ſpecks; and thoſe which are upon the back often touch without interruption, and form two long yellow bands. The colour muſt, however, be ſubject to vary; and it appears that ſome ſalamanders are found in the marſhy foreſts of Germany, which are quite black above and yellow below. To this variety we muſt refer the black ſalamander, found by Mr. Laurenti in the Alps, which he conſidered as a diſtinct ſpecies. The ſalamander has no ribs; neither have frogs, to which it has a great reſemblance in the general form of the anterior part of its body. When touched, it ſuddenly covers itſelf with that kind of coat of which we have ſpoken, and it can alſo very rapidly change its ſkin from a ſtate of humidity to a ſtate of dryneſs. The milk which iſſues from the ſmall holes in its ſurface is very acrid; when put upon the tongue one feels as it were a kind of ſcar at the part which it touched. This milk, which is conſidered as an excellent ſubſtance for taking off hair, has ſome reſemblance to that which diſtils from thoſe plants called eſula and euphorbium. When the ſalamander is cruſhed, or when it is only preſſed, it has the peculiar property of exhaling an offenſive ſmell.

Thick ſhades, tufted woods, or high mountains, and the banks of ſtreams that run through meadows, are the uſual retreats of theſe animals. Yet they ſometimes retire in great numbers to hollow trees, hedges, and below old rotten ſtumps; and they paſs the winter in places of high latitude, in a kind of burrows, where they are found collected, ſeveral of them being joined and twiſted together. The ſalamander being deſtitute of claws, having only four toes on each of the fore feet, and no advantage of conformation making up its deficiencies, its manner of living muſt, as is indeed the caſe, be very different from that of other lizards. It walks very ſlowly; far from being able to climb trees with rapidity, it often appears to drag itſelf with great difficulty along the ſurface of the earth. It ſeldom goes far from the place of ſhelter which it has fixed on; it paſſes its life under the earth, often at the bottom of old walls during ſummer; it dreads the heat of the ſun, which would dry it; and it is commonly only when rain is about to fall that it comes forth from its ſecret aſylum, as if by a kind of neceſſity, to bathe itſelf, and to imbibe an element to which it is analogous. Perhaps it finds then with greateſt facility thoſe inſects upon which it feeds. It lives upon flies, beetles, ſnails, and earth worms; when it repoſes, it rolls up its body in ſeveral folds like a ſerpent. It can remain ſome time in the water without danger, and it caſts a very thin pellicle of a greeniſh grey colour. Salamanders have been kept more than ſix months in the water of a well without giving them any food; care only being taken to change the water occaſionally.

It has been remarked, that every time a ſalamander is plunged into the water, it attempts to raiſe its noſtrils above the ſurface as if to ſeek for air, which is a new proof that all oviparous quadrupeds find it neceſſary to breathe during the time they are not in a ſtate of torpor. The ſalamander has apparently no ears, and in this it reſembles the ſerpent. It has even been pretended that it does not hear, and on this account it has got the name of *ſourd* in ſome provinces of France. This is very probable, as it has never been heard to utter any cry, and ſilence in general is coupled with deafneſs. Having then perhaps one ſenſe leſs than other animals, and being deprived of the faculty of communicating its ſenſations to thoſe of the ſame ſpecies, even by imperfect ſounds, it muſt be reduced to a much inferior degree of inſtinct: it is therefore very ſtupid; and not bold, as has been reported: it does not brave danger, as is pretended, but it does not perceive it. Whatever geſtures one makes to frighten it, it always advances without turning aſide; however, as no animal is deprived of that ſentiment neceſſary for its preſervation, it ſuddenly com-

preſſes its ſkin, as is ſaid, when tormented, and ſpurts forth upon thoſe who attack it that corroſive milk which is under it. If beaten, it begins to raiſe its tail: afterwards it becomes motionleſs, as if ſtunned by a kind of paralytic ſtroke; for we muſt not, with ſome naturaliſts, aſcribe to an animal ſo devoid of inſtinct, ſo much art and cunning as to counterfeit death. In ſhort, it is difficult to kill it; but when dipped in vinegar, or ſurrounded with ſalt, it expires in convulſions, as is the caſe with other animals of the ſame kind.

We cannot, it ſeems, allow a being a chimerical quality, without refuſing it at the ſame time a real property. The cold ſalamander has been conſidered as an animal endued with the miraculous power of reſiſting, and even of extinguiſhing, fire; but at the ſame time, it has been debaſed, as much as elevated by this ſingular property. It has been made the moſt fatal of animals: the ancients, and even Pliny, have devoted it to a kind of anathema, by affirming that its poiſon is the moſt dangerous of all. They have written, that infecting with its poiſon almoſt all the vegetables of a large country, it might cauſe the deſtruction of *whole nations*. The moderns alſo for a long time believed the ſalamander to be very poiſonous; they have ſaid, that its bite is mortal, like that of the viper: they have ſought out and preſcribed remedies for it; but they have at length had recourſe to experiment, by which they ought to have begun. The famous Bacon wiſhed naturaliſts would endeavour to aſcertain the truth reſpecting the poiſon of the ſalamander. Geſner proved by experiments that it did not bite, whatever means were uſed to irritate it; and Wurſbainus ſhowed that it might ſafely be touched, and that one might without danger drink the water of thoſe wells which it inhabited. M. de Maupertuis ſtudied alſo the nature of this lizard. In making reſearches to diſcover what might be its pretended poiſon, he demonſtrated experimentally, that fire acted upon the ſalamander in the ſame manner as upon all other animals. He remarked, that it was ſcarcely upon the fire, when it appeared to be covered with the drops of its milk, which, rarefied by the heat, iſſued through all the pores of the ſkin, but in greater quantity from the head and dugs, and that it immediately became hard. It is needleſs to ſay, that this milk is not ſufficiently abundant to extinguiſh even the ſmalleſt fire. M. de Maupertuis, in the courſe of his experiments, in vain irritated ſeveral ſalamanders: none of them ever opened their mouths: he was obliged to open them by force. As the teeth of this lizard are very ſmall, it was very difficult to find an animal with a ſkin ſufficiently fine to be penetrated by them: he tried without ſucceſs to force them into the fleſh of a chicken ſtripped of its feathers; he in vain preſſed them againſt the ſkin: they were diſplaced, but they could not enter. He however made a ſalamander bite the thigh of a chicken, after he had taken off a ſmall part of the ſkin. He made ſalamanders newly caught bite alſo the tongue and lips of a dog, as well as the tongue of a turkey; but none of theſe animals received the leaſt injury. M. de Maupertuis afterwards made a dog and a turkey ſwallow ſalamanders whole, or cut into pieces; and yet neither of them appeared to be ſenſible of the leaſt uneaſineſs.—Mr. Laurenti ſince made experiments with the ſame view: he forced grey lizards to ſwallow the milk proceeding from the ſalamander, and they died very ſuddenly. The milk, therefore, of the ſalamander, taken internally, may hurt, and even be fatal to certain animals, eſpecially thoſe which are ſmall; but it does not appear to be hurtful to animals of a large ſize.

Credulous people have long ſuppoſed that the ſalamander was of no ſex; and that each individual had the power of engendering its like, as ſome ſpecies of worms do. This is not the moſt abſurd fable which has been imagined with reſpect to the ſalamander; but if the manner in which they come into the world is not ſo marvellous as has been written, it is remarkable in this, that it differs from that in which moſt other lizards are brought forth, as it is analogous to that in which the chalcide and the ſeps, as well as vipers and ſeveral kinds of ſerpents are produced. On this account the ſalamander merits the attention of naturaliſts, much more than on account of the falſe and brilliant reputation which it has ſo long enjoyed. M. de Maupertuis having opened ſome ſalamanders, found eggs in them, and at the ſame time ſome young perfectly formed; the eggs were divided into two long bunches like grapes, and the young were incloſed in two tranſparent bags; they were equally well formed as the old ones, and much more active. The ſalamander, therefore, brings forth young from an egg hatched within its belly like the viper; and her fecundity is very great: naturaliſts have long written that ſhe has forty or fifty at one time: and M. de Maupertuis found 42 young ones in the body of a female ſalamander, and in another inſtance 54.

The colour of young ſalamanders is generally black, and almoſt without ſpots; and this they preſerve ſometimes during their whole lives in certain countries, where they have been taken for a diſtinct ſpecies, as we have ſaid. Mr. Thunberg has given, in the Memoirs of the Academy of Sweden, the deſcription of a lizard, which he calls the *Japaneſe lizard*, and which appears not to differ from our ſalamander but in the arrangement of its colours. This animal is almoſt black, with ſeveral whitiſh and irregular ſpots, both on the upper part of the body and below the paws; on the back there is a ſtripe of dirty white, which becomes narrower to the point of the tail. This whitiſh ſtripe is interſperſed with very ſmall ſpecks which form the diſtinguiſhing characteriſtic of our land ſalamander. We are of opinion, therefore, that we may conſider this Japaneſe lizard, deſcribed by Mr. Thunberg, as a variety of the ſpecies of our land ſalamander, modified a little, perhaps, by the climate of Japan. It is in the largeſt iſland of that empire, named *Nipkon*, that this variety is found. It inhabits the mountains there, and rocky places. The Japaneſe conſider it as a powerful ſtimulant, and a very active remedy; and on this account, in the neighbourhood of Jedo, a number of theſe Japaneſe ſalamanders may be ſeen dried, hanging from the cieling of ſome of their ſhops.

14. The *baſiliſkus*, has a long cylindrical tail, a radiated fin on the back, and a creſt on the throat. It is a native of the Indies. It is a very harmleſs creature; and altogether deſtitute of thoſe wonderful qualities which have been attributed to the fabulous animal of the ſame name. See the article Basilisk.

15. The *ſex-lineata*, or lion-lizard, is about ſix inches long; the body of a grey colour, marked lengthwiſe on each ſide with three whitiſh lines: the legs are long; and it has a very long tail, which it curls up, looking fierce at the ſame time, whence probably it has received its Engliſh name. It inhabits South Carolina and the greater Antilles. It is very inoffenſive, and remarkably agile; but is, nevertheleſs, a prey to rapacious birds.

16. The *green* lizard, of Carolina, is ſo denominated from its colour. This ſpecies is very ſlender; the tail is near double the length of the body, and the whole length about five inches. It inhabits Carolina; where it is domeſtic, familiar, and harmleſs. It ſports on tables and windows, and amuſes with its agility in catching flies. Cold affects the colours: in that uncertain climate, when there is a quick tranſition in the ſame day from hot to cold, it changes inſtantly from the moſt brilliant green to a dull brown. They are a prey to cats and ravenous birds. They appear chiefly in ſummer; and at the approach of cold weather they retire to their winter receſſes, and lie torpid in the hollows and crevices of rotten trees. It

frequently happens that a few warm ſunſhiny days ſo invigorate them, that they will come out of their holes and appear abroad; when on a ſudden the weather changing to cold, ſo enfeebles them, that they are unable to return to their retreats, and will die from this cauſe.

17. The *iguana*, or *guana*, with the top of the back and tail ſtrongly ſerrated, and the gullet ſerrated in the ſame manner, is ſometimes found to be five feet long. It has ſmall teeth, and will bite hard. It inhabits the rocks of the Bahama iſlands, and lurks in cliffs or hollow trees. It feeds entirely on vegetables and fruits; and the fat of the abdomen aſſumes the colour of that which it has laſt eaten. It is ſlow of motion, and has a moſt diſguſting look; yet it is eſteemed a moſt delicate and wholeſome food, noxious only to venereal patients, according to Linnæus. It is not amphibious, yet if neceſſary will continue long under water; it ſwims by means of the tail, keeping its legs cloſe to the body. Guanas are the ſupport of the natives of the Bahama iſlands, who go in their ſloops from rock to rock in ſearch of them. They are taken with dogs trained for the purpoſe; and as ſoon as caught, their mouths are ſewed up, to prevent them from biting. Some are carried alive for ſale to Carolina; others are ſalted and barrelled for home conſumption.

18. The *bullaris*, or green lizard of Jamaica, is about ſix inches long, of a ſhining graſs green colour. It is common in Jamaica, frequenting hedges and trees. When approached, theſe animals, by filling the throat with wind, ſwell it into a globular form with a ſcarlet colour; but, when contracted, the ſcarlet diſappears, and the part returns to the colour of the reſt of the body. The plate repreſents the animal with its throat thus inflated. This ſwelling action ſeems to proceed from menacing, or deterring one from coming near them, though they are in reality very inoffenſive creatures.

19. The *muricata*, or prickly lizard, has a long rounded tail; its body, which is of a browniſh grey colour, is covered with ſharp-pointed ſcales, and the whole upper part marked with tranſverſe duſky bars. The ſcales are furniſhed with a prominent line on the upper ſurface, and towards the back part of the head run into a ſort of weak ſpines.

20. The *laticauda*, or broad-tailed lizard, has a flattened lanceolate tail, ſomewhat ſpiny on the margin. It is about four inches and a half in length. The head is diſproportionably large. The upper ſurface of the body is of a duſky grey colour, and beſet with ſmall tubercles, which in ſome parts ſharpen to a point. The colour of the under ſurface of the body is pale, or almoſt white. This and the preceding ſpecies are inhabitants of New South Wales.

Beſides the foregoing, we might mention the *axoloti*, and above 60 other ſpecies of this genus; two of which, the *ſcps* and *chalcides*, being very different from the other ſpecies, and approaching in form to the ſerpent tribe, figures of them are added in the Plate. A ſimilar ſpecies is the *bipes*, which was tranſferred to this genus, in the laſt edition of the Syſtema Naturæ, from the *Anguis* of former editions, where it was denominated the *anguis bipes*.

BASILISK, a fabulous kind of ſerpent, ſaid to kill by its breath or ſight only. Galen deſcribes it as of a colour inclining to yellow; and ſays that it has three little eminences upon its head, ſpeckled with whitiſh ſpots, which have the appearance of a ſort of crown. Ælian ſays, that its poiſon is ſo penetrating as to kill the largeſt ſerpents with its vapour only; and that if it bite but the end of any man's ſtick, it kills him. It drives away all other ſerpents by the noiſe of its hiſſing. Pliny, magnifying theſe wonderful properties ſtill farther, ſays, it kills thoſe who even *look* upon it.—The generation of the baſiliſk is not leſs marvellous, being ſaid to be produced from a cock's egg, brooded on by a ſerpent. Theſe, and other things equally ridiculous, are related by Matthiolus, Galen, Dioſcorides, Pliny, and Eraſiſtratus. Kirchmayer and Vander Wiel have given the hiſtory of the baſiliſk, and detected the folly and impoſture of the traditions concerning it.—In ſome apothecaries ſhops there uſed to be kept little dead ſerpents, which were ſaid to be baſiliſks, and which ſerved to excite wonder in illiterate minds. Theſe however ſeem rather to have been a kind of ſmall bird, almoſt like a cock, but without feathers: its head loſty, its wings almoſt like a bat's, its eyes large, and its neck very ſhort. As to thoſe which are ſhown and ſold at Venice, and in other places, they are nothing but little thornbacks artificially put into a form like that of a young cock, by ſtretching out their fins, and contriving them with a little head and hollow eyes: and this, Calmet ſays, he has in reality obſerved in a ſuppoſed baſiliſk, at an apothecary's ſhop in Paris, and in another at the Jeſuits of Pont-a-Mouſſon.

Basilisk, in military affairs, a large piece of ordnance, thus denominated from its reſemblance to the ſuppoſed ſerpent of that name. The baſiliſk throws an iron ball of 200 pounds weight. It was much talked of in the time of Solyman emperor of the Turks, in the wars of Hungary; but ſeems now out of uſe. Paulus Jovius relates the terrible ſlaughter made by a ſingle ball from one of theſe baſiliſks in a Spaniſh ſhip; after penetrating the boards and planks in the ſhip's head, it killed above 30 men. Maffeus ſpeaks of baſiliſks made of braſs, which were drawn by 100 yoke of oxen.—Modern writers alſo give the name *baſiliſk* to a much ſmaller and ſizeable piece of ordnance, which the Dutch make 15 feet long, and the French only 10. It carries 48 pounds.

BASILIUS, ſurnamed the *Macedonian*, emperor of the Greeks. He was a common ſoldier, and of an obſcure family in Macedonia, and yet raiſed himſelf to the throne; for, having pleaſed the emperor Michael by his addreſs in the management of his horſes, he became his firſt equerry, and then his great chamberlain. He at length aſſaſſinated the famous Bardas, and was aſſociated to the empire in 849. He held the eighth general council at Conſtantinople; depoſed the patriarch Photius, but in 858 reſtored him to the patriarchate; and declared againſt the popes, who refuſed to admit him into their communion. He was dreaded by his enemies the Saracens, whom he frequently vanquiſhed; and loved by his ſubjects, for his juſtice and clemency. He died in 886. Under his reign the Ruſſians embraced Chriſtianity, and the doctrine of the Greek church. He ought not to be confounded with Baſilius the Young, who ſucceeded Zemiſces in 975, and died in 1025, after a reign of 50 years.

BASINGSTOKE, a corporation town of Hampſhire in England, and a great thoroughfare on the weſtern road. It is ſeated on a ſmall brook, in W. long. 1. 10. N. lat. 51. 20.

BASSIOGLOSSUS, a muſcle ariſing from the baſe of the os hyoides. See the treatiſe on Anatomy, *Table of the Muſcles*.

BASIS, or baſe, in geometry. See Base.

Basis, or *Baſe*, in chemiſtry, any body which is diſſolved by another body, which it receives and fixes, and with which it forms a compound, may be called the *baſis* of that compound. Thus, for example, the baſes of what have been popularly called *neutral* ſalts are the alkaline, earthy, and metallic matters which are ſaturated by the ſeveral acids. In this ſenſe it is that theſe neutral ſalts are called *ſalts with earthy baſes*, *ſalts with alkaline baſes*, *ſalts with metallic baſes*: alſo the appellations *baſis of alum*, *baſis of nitre*, *baſis of Glauber's ſalt*, *baſis* of *vitriol*, &c. ſignify the argillaceous earth, which, with the vitriolic acid, forms alum; the vegetable alkali, which, with the nitrous acid, forms nitre; the mineral alkali, which, with the vitriolic acid, forms Glauber's ſalt; and the metal

which, with the vitriolic acid, forms a vitriol; becauſe theſe ſubſtances are ſuppoſed to be fixed, inactive, and only yielding to the action of the acids which they fix, and to which they give a body and conſiſtence.

The chemical philoſophers have for a long time been in the habit of conſidering the acids as bodies poſſeſſing an activity peculiar to themſelves; and have, in general, overlooked the circumſtance, that an equal activity, or power of attraction, muſt exiſt in thoſe ſubſtances with which they combine, and are by that means deprived of their diſtinctive properties. The ſubſtances with which acids enter into combination, and are ſaid to be neutralized, are for the moſt part, leſs volatile than the acids themſelves; and accordingly communicate a degree of fixity to thoſe acids. From both theſe reaſons, writers have been led to diſtinguiſh the ſubſtance which is united with any acid, by the name of the baſis of the compound, or neutral ſalt. As a conſiderable advantage, with regard to chemical language, is obtained from the uſe of this term, which is not altogether improper, it is ſtill much uſed by chemical authors. Thus, we ſay, ſalts with earthy baſes, ſalts with alkaline baſes, or ſalts with metallic baſes, accordingly as the caſe may be; by which it is to be underſtood that theſe ſubſtances are united with an acid. And ſo, likewiſe, the expreſſions, vitriolic ſalt with baſis of clay, nitrous ſalt with baſis of vegetable alkali, marine ſalt with baſis of iron, and other ſimilar expreſſions, are uſed to advantage by chemical writers, who wiſh to deſcribe combinations, and at the ſame time to avoid the uſual names which in many inſtances refer to theories either exploded or doubtful.

Basis, among phyſicians, denotes the principal ingredients in compound medicines.

BASKERVILLE (John), an eminent artiſt, eſpecially in letter-founding and printing, of the preſent century. He was born in 1706 at Woverley in Worceſterſhire, and was heir to an eſtate of about 60l. a year; the whole of which income he allowed to his parents till their death. In his early years he conceived a love for fine writing, and cutting in ſtone; and being brought up to no particular profeſſion, he commenced writing-maſter in Birmingham when about 20 years of age. The improvements in different manufactures there ſoon drew his attention, and he applied to the japan buſineſs, which he carried on for a long time with diſtinguiſhed excellence and ſucceſs. In 1750 he applied himſelf to letter-founding, the bringing of which to perfection coſt him much labour and expence. In a few years he proceeded to printing; and his firſt work was an edition of Virgil on royal quarto, which now ſells for three guineas. In a ſhort time he obtained leave from the univerſity of Cambridge to print a Bible in royal folio, and editions of the Common Prayer in three ſizes; for which he paid a large ſum to the univerſity. He afterwards printed Horace, Terence, Catullus, Lucretius, Juvenal, Salluſt, and Florus, in royal quarto; Virgil, in octavo; and ſeveral books in duodecimo. He publiſhed likewiſe ſome of the Engliſh claſſics. The beſt teſtimonies of the merit of theſe performances are themſelves; and Mr. Baſkerville's name is deſervedly ranked among thoſe who, in modern times, have brought the art of printing to its greateſt perfection. Not meeting, however, with that encouragement from the bookſellers which he expected, he ſet up a letter-foundery for ſale a little before his death. He died without iſſue in the year 1775.

BASKET, a well-known utenſil made of twigs interwoven together, in order to hold fruit, earth, &c. As a meaſure, it denotes an uncertain quantity; as, a baſket of medlars is two buſhels, of aſafœtida from 20 to 50 pounds weight. The ancient Britons were noted for their ingenuity in making baſkets, which they exported in large quantities. Theſe baſkets were of very elegant workmanſhip, and bore a high price; and are mentioned by Juvenal among the extravagant expenſive furniture of the Roman tables in his time.

Adde et baſcaudas et mille eſcaria.

Add baſkets, and a thouſand other diſhes.

That theſe baſkets were manufactured in Britain, we learn from the following epigram of Martial:

Barbara de pictis veni baſcauda Britannis,
Sed me jam mavult dicere Roma ſuam.

A baſket I, by painted Britons wrought,
And now to Rome's imperial city brought.

Baskets *of Earth*, in the military art, called by the French *corbeilles*, are ſmall baſkets uſed in ſieges, on the parapet of a trench, being filled with earth. They are about a foot and a half high, about a foot and a half in diameter at the top, and 8 or 10 inches at bottom; ſo that, being ſet together, there is a ſort of embraſure left at their bottoms, through which the ſoldiers fire, without expoſing themſelves to the fire of the enemy.

Basket-*Fiſh*, in natural hiſtory, a name given by the Engliſh in North America to a very remarkable fiſh, ſometimes caught in the ſeas thereabout, though not frequent any where. Mr. Hooke, to whom it was referred by the Royal Society to name it, has called it *Piſcis echinoſtellaris viſciformis*, the body of it reſembling an egg-fiſh, or *echinus marinus*, and the arms a ſtar-fiſh, and finally, the dividing of the branches being more like that of the branches of miſletoe than any other natural production we are acquainted with.

This fiſh ſpreads itſelf from a pentagonal mouth-piece, or root, in the centre of which the mouth is placed, into five main limbs or branches; and each of theſe, at its firſt iſſuing out of the body, is divided into two: this makes ten. Each of theſe ten again divides into two, which makes twenty, and ſo on, each dividing to the fourteenth time; at which place they make more than fourſcore thouſand limbs. Theſe are too ſmall to be traced farther by the eye, or preſerved in carriage: but it is very probable that even theſe were again divided, perhaps, ſeveral times. The branches between the joints are not all equally of a length, though, for the moſt part, they are pretty nearly ſo. The arms or branches are never very ſtrong; but, when they are dry, they are greatly more brittle than before, the leaſt force imaginable deſtroying them.

The ſhoals of Nantucket, an iſland on the coaſt of New-England, at times furniſh the fiſhermen with this animal; but it is remarkable, that they are never ſeen there, unleſs when taken by hooks in fiſhing for other fiſh. They claſp the hook-bait faſt, and encircle it with all their arms, coming up, when drawn by it, in form of a wicker baſket; whence their name: but, when they have been ſome time out of the water, they become flat.

The uſe of the numerous arms of this fiſh is plainly to catch its prey. It probably extends them to their full length while under the water, and then claſps hold of any thing fit for food that chances to ſwim over them. The fiſhermen have ſometimes found the arms containing ſmall mackarel, or pieces of larger. Phil. Tranſ. No. 57 and 74. It is evident from the deſcription, that this fiſh is of the *ſtella arboreſcens*, or branched ſtar-fiſh kind; but whether the ſame with the commonly known kind, called the *caput meduſæ*, is not evident from this deſcription. The body of this fiſh, by what is related of its protuberance, and reſemblance to the *echini marini*, may probably be the *aſteropodium*, in its foſſil ſtate. See Asterias.

Basket *Salt*. This is a brine ſalt, made from the water of our ſalt ſprings in Cheſhire, and elſewhere, differing from the common brine ſalt in the ſmeneſs of the grain, and in its white-

ncſs and purity. In the preparing of this kind of ſalt, ſome uſe reſin, and other additions to break the grain, and make it ſmall: others effect this by keeping up a very briſk fire under it, and ſtirring it all the while; but the moſt approved method is only to take out of this kind the third draught of every pan that is working for the common brine ſalt, and to do this before the granules or cryſtals are perfectly formed. By this means the ſalt is very fine; and when it has been hard preſſed down into ſmall wicker baſkets, it is dried at the ſtove in them, and ſo kept for ſale.

BASKING-SHARK or SUN-*Fiſh of the Iriſh*. See SQUALUS.

BASON, in hydraulics, a term uſed on various occaſions for a ſmall reſervatory of water: as the baſon of a *jet d'eau*, or fountain; the baſon of a port, of a bath, &c. which laſt Vitruvius calls *labrum*. Baſons are made either with clay, cement, or lead; but they are moſt uſually made with clay. In the making them this way, the diameter muſt be made four feet longer on each ſide than the baſon is to be. This will be taken up by the walls of clay. For the ſame reaſon, it muſt be dug two feet deeper than the intended depth of the water; becauſe it is to be laid over eighteen inches thick with clay, and ſix inches with gravel and paving. The wall is to be made with ſhards, rubbiſh, or flints, with the natural earth for mortar; and the clay muſt be well worked, and trod firmly down with the naked feet.

The way of making them with cement is, to allow one foot nine inches every way for the work; then cut the banks perpendicularly, and raiſe a wall of maſonry a foot thick, made of pebble-ſtones, or the like, laid in mortar of lime and ſand: the bottom is then to be covered to the ſame thickneſs; and then the ſolid lining of the cement is to be backed up againſt the walls, and over the bottom. This is to be made of ſmall flints in beds of mortar made of lime and cement. When this ſolid is eight inches thick, it muſt be plaſtered over the whole ſurface with cement well ſifted, before it be mixed with the lime; and with this it is to be wrought over ſmooth with a trowel. The proportion of this cement ſhould be two-thirds of the cement, or powdered tile, to one-third of lime; and this cement has the property of hardening ſo under water, that it will become like ſtone or marble, and it will not be ſubject to decay for a long time. After it is finiſhed, the baſon ſhould, for four or five days, be anointed over very often with drying oil, to keep it from ſlawing or cracking in the drying; and after this, the water ſhould be let in as ſoon as may be.

The leaded baſons are made with walls a foot thick, and a bottom of half a foot. Theſe muſt be of rubble ſtones cemented with plaſter; for the lime will injure and eat the lead. The ſheets of lead are to be ſpread over the walls and bottom, and ſeamed with ſolder. Theſe baſons, however, are but little in uſe now, from the expence of making them, the noxious qualities they are apt to communicate to the water, and the danger of the lead being ſtolen. The waſte pipes of fountains ought always to be made large enough for fear of choaking. When the waſte water is to be carried off into common ſewers, it may be carried away in drains, or earthen pipes; but when it is to ſerve for baſons that lie below, it ſhould be conveyed through leaden ones.

The baſons we have been ſpeaking of are made of various forms and dimenſions, according to the fancy of the perſons who conſtruct them, or the particular purpoſe they are meant to ſerve. A circular DOCK for the reception of ſhips, is frequently denominated a *Baſon*.

BASON, in Jewiſh antiquities, the laver of the tabernacle, made of the braſs looking-glaſſes belonging to thoſe devout women that watched and ſtood ſentinels at the door of the tabernacle.

BASON, or *Diſh*, among glaſs-grinders. Theſe artificers uſe various kinds of baſons, of copper, iron, &c. and of various forms, ſome deeper, others ſhallower, according to the focus of the glaſſes that are to be ground. In theſe baſons it is that convex glaſſes are formed, as concave ones are formed on ſpheres or bowls. Glaſſes are worked in baſons two ways. In the firſt, the baſon is fitted to the arbor or tree of a lathe, and the glaſs (fixed with cement to a handle of wood) preſented and held faſt in the right hand within the baſon, while the proper motion is given by the foot to the baſon. In the other, the baſon is fixed to a ſtand or block, and the glaſs with its wooden handle moved. The moveable baſons are very ſmall, ſeldom exceeding five or ſix inches in diameter; the others are larger, ſometimes above ten feet diameter. After the glaſs has been ground in the baſon, it is brought ſmoother with greaſe and emery; and poliſhed firſt with tripoli, and finiſhed with paper cemented to the bottom of the baſon.

BASON, among hatters, is a large round ſhell or caſe, ordinarily of iron, placed over a furnace; wherein the matter of the hat is moulded into form. The hatters have alſo baſons for the brims of hats, uſually of lead, having an aperture in the middle, of a diameter ſufficient for the largeſt block to go through.

BASQUES, a ſmall territory of France, toward the Pyrenées. It included Lower Navarre, Labourd, and Soule, and now forms, with Bearn, the department of the Lower Pyrenées. The ſuppleneſs of the limbs, and the agility of the inhabitants, are proverbial. It is not eaſy to imagine more grace and expreſſion than they diſplay in their motions. Even when engaged in the labours of huſbandry, or carrying a burden, it would ſoon be perceived with what ſpirit and activity they can dance.

BASS, the loweſt in the four parts of muſic: of uncertain etymology; whether from the Greek word *βασις a foundation*; or from the Italian adjective *baſſo*, ſignifying "low." Of all the parts it is the moſt important, and it is upon this that the chords proper to conſtitute a particular harmony are determined. Hence the maxim among muſicians, that when the baſs is properly formed, the harmony can ſcarcely be objectionable. Baſſes are of different kinds. Of which in their order, viz.

1. *Thorough*-BASS is the harmony made by the baſs-viols, or theorbos, continuing to play both while the voices ſing and the other inſtruments perform their parts, and alſo filling up the intervals when any of the other parts ſtop. It is played by figures marked over the notes, on the organ, ſpinnet, harpſichord, &c. and frequently ſimply and without figures on the baſs-viol and baſſoon.

2. *Counter*-BASS is a ſecond or double baſs, where there are ſeveral in the ſame concert.

BASS-*Viol*, a muſical inſtrument of the like form with that of a violin, but much larger. It is ſtruck with a bow, as that is; has the ſame number of ſtrings; and has eight ſtops, which are ſubdivided into ſemi-ſtops: its ſound is grave, and has a much nobler effect in a concert than that of the violin.

BASS, a great inſulated rock in the Britiſh Ocean, one mile from the coaſt of Haddington, between the towns of North Berwick and Dunbar in Scotland. On the S. ſide it is almoſt conic; on the other it overhangs the ſea in a tremendous manner. It is ſteep and inacceſſible on all ſides, except in the S. W. and there it is with great difficulty that a ſingle man can climb up with the help of a rope or ladder. It is ſupplied with water by a ſpring at the top, and in May and June is quite covered with the neſts, eggs, and young birds of the gannets, or ſolon geeſe; ſo that it is ſcarce poſſible to walk without treading on them. The flocks of birds, in flight, are ſo prodigious, as to darken the air, like clouds; and their noiſe

is ſuch, that people, cloſe by each other, hear what is ſpoken with difficulty. Theſe birds come hither to breed. The rock is one mile in circumference. A ruinous caſtle, once the ſtate priſon of Scotland, ſtands at the edge of the precipice, facing the little village of Caſtleton. The garriſon here, in 1694, ſurrendered to king William, after a long reſiſtance; and the fortifications were demoliſhed. A cavern runs through the rock, from N. W. to S. E. quite dark in the centre, where, it is ſaid, there is a deep pool of freſh water. The rock has a rabbit warren, and paſture for a few ſheep. Long. 2. 35. W. Lat. 56. 3. N.

BASSAD, or Besd, an Arabian name for the purple *fucus* of the Greek, uſed by the women to paint their cheeks, and by the dyers of cloths. It has been ſo far miſunderſtood by late authors as to be interpreted by the word coral; but the error of this is evident, ſince coral has none of theſe properties.

BASSAN (Giacomo de Pont), or le Bassan, a celebrated Venetian painter, was born in 1510. The ſubjects on which he employed his pencil, generally were peaſants and villagers, buſy at their different rural occupations, according to the various ſeaſons of the year; cattle, landſcapes, and hiſtorical deſigns; and in all thoſe ſubjects the figures are well deſigned, and the animals and landſcapes have an agreeable reſemblance of ſimple nature. His compoſitions cannot boaſt of much elegance or grandeur of taſte, not even thoſe which are hiſtorical; but they have abundance of force and truth. His local colours are very well obſerved, his carnations are freſh and brilliant, and the chiaro-oſcuro and perſpective well underſtood. His touch is free and ſpirited; and the diſtances in his landſcapes are always true, if not ſometimes too dark in the nearer parts. His works are ſpread all over Europe: many of them were purchaſed by Titian; and there were ſeveral in the late French king's cabinet, the royal palace, and the Hotel de Toulouſe. They are more readily known than thoſe of moſt other painters; from the ſimilitude of characters and countenances in the figures and animals; from the taſte in the buildings, utenſils, and draperies; and particularly from a violet or purple tint that predominates in every one of his pictures. But the genuine pictures of his hand are not ſo eaſily aſcertained; becauſe he frequently repeated the ſame deſign, and his ſons were moſtly employed in copying the works of their father, which he ſometimes retouched. As he lived to be very old, he finiſhed a great number of pictures: yet notwithſtanding his application and years, the real pictures of Giacomo are not commonly met with; many of thoſe which are called originals, by purchaſers as well as dealers, being at beſt no more than copies by the ſons of Baſſan, who were far inferior to him; or perhaps by ſome painter of ſtill meaner abilities. But the true pictures of Giacomo always bear a conſiderable price if they happen to be undamaged. He died in 1592, aged 82. Franeis and Leander, his ſons, diſtinguiſhed themſelves in the ſame art; but inheriting a ſpecies of lunacy from their mother, both fell victims to the deſperation of mental derangement.

BASSANI (Giovanni Battiſta), maeſtro di capella of the cathedral church of Bologna about the middle of the laſt century, was a very voluminous compoſer of muſic, having given to the world no fewer than 31 different works. He is equally celebrated as a compoſer for the church and for concerts; and was beſides a celebrated performer on the violin, and, it is ſaid, taught Corelli on that inſtrument. His compoſitions conſiſt of maſſes, pſalms, motets with inſtrumental parts, and ſonatas for violins: his fifth opera in particular, containing 12 ſonatas for two violins and a baſs, is much eſteemed; it is written in a ſtyle wonderfully grave and pathetic, and abounds with evidences of great learning and fine invention. The firſt and third operas of Corelli are apparently formed after the model of this work. Baſſani was one of the firſt who compoſed motets for a ſingle voice, with accompaniments of violins; a practice which is liable to objection, as it aſſimilates church-muſic too nearly to that of the chamber; and of his ſolo-motets it muſt be confeſſed that they differ in ſtyle but little from opera airs and cantatas. Two operas of them, *viz.* the eighth and thirteenth, were printed in London by Pearſon above 50 years ago, with the title of *Harmonia Feſtiva*.

BASSANUS, in Ornithology, a ſpecies of the pelican.

BASSE, in Ichthyology, the Engliſh name of the ſea-wolf, the *lupis piſcis* of authors. The Greeks have called this *labrax*; and ſome of the later writers, as Paulus Jovius, and others, *ſpigola*. It is properly a ſpecies of perch, and is diſtinguiſhed by Artedi by the name of the perch with thirteen rays in the ſecond fin of the back, and fourteen in the pinna ani.

Basse-*cour*, in Building, a court ſeparated from the principal one, and deſtined for the ſtables, coach-houſes, and livery ſervants.

Basse-*cour* of a country-ſeat, is the yard, or place where the cattle, fowls, &c. are kept. That where ſtraage creatures of divers ſorts are kept for curioſity, is called by the French *menagerie*. The Romans gave the name of *vivarium* to that place where beaſts were kept for the public ſhews.

Basse, in Middle Age Writers, denotes a collar for cart-horſes, made of flags. Hence alſo the round, matted cuſhions of flags uſed for kneeling in churches, is called *baſſe*; in Kent, a *truſh*.

Basse, or Bass, a town of France in the department of the North and late province of Flanders, on the confines of Artois, remarkable on account of the many ſieges it has ſuſtained; but its fortifications are now demoliſhed. It is ſeated on a canal which runs as far as Deule; 18 miles South Weſt of Liſle. E. long. 3. 0. N. lat. 50. 53.

Basse *Terre*, part of the iſland of St. Chriſtopher's, one of the Carribbee iſlands, formerly occupied by the French, but ceded to Great Britain by the treaty of Utrecht in 1713.

BASSEEN, a city and fortreſs of note, in the Deccan of Hindooſtan, oppoſite the N. end of Salſette. It was taken by the Engliſh in 1780, but reſtored to the Mahrattas in 1783. It is 27 miles N. of Bombay. Lon. 72. 10. E. lat. 19. 19 N.

BASSET, or Basette, a game played with cards, ſaid to have been invented by a noble Venetian, for which he was baniſhed. It was firſt introduced into France by Signior Juſtiniani, ambaſſador of Venice, in 1674. Severe laws were made againſt it by Louis XIV. to elude which they diſguiſed baſſet under the name of *pour & contre*, that is, "for and againſt," which occaſioned new arrêts and prohibitions of parliament. The parties concerned in it are, a dealer or banker; his aſſiſtant, who ſuperviſes the loſing cards; and the punter, or any one who plays againſt the perſon who holds the bank.

Yet there are other terms beſides theſe uſed in the game; as, 1. The *taſſe* or *face*, which is the firſt card turned up by the tailleur belonging to the pack, by which he gains half the value of the money laid down on every card of that ſort by the punters. 2. The *couch*, or firſt money which every punter puts on each card; each perſon that plays having a book of 13 ſeveral cards before him, on which he may lay his money, more or leſs, at diſcretion. 3. The *paroli*; which is, when a punter, having won the firſt ſtake, and having a mind to purſue his good fortune, crooks the corner of his card, and lets his prize lie, aiming at a *ſept et le va*. 4. The *maſſe*; when having won the firſt ſtake, the punter is willing to venture more money on the ſame card. 5. The *pay*; when the punter having won the firſt ſtake, be it a ſhilling, half-crown, guinea, or whatever he laid down on his card, and not caring to hazard the paroli, leaves off, or *goes the pay*: in which caſe, if the card turn up wrong, he loſes nothing, having won the couch before; whereas, if it turn right, he by this adventure wins double the

money ſtaked. 6. The *alpiew;* much the ſame with paroli, and uſed when a couch is won by turning up or crooking the corner of the winning card. 7. *Sept et le va*, the firſt great chance or prize, when the punter, having won the couch, makes a paroli, and goes on to a ſecond chance; ſo that if his winning card turns up again, it comes to *ſept et le va*, which is ſeven times as much as he laid down on his card. 8. *Quinze et le va* is the next higher prize, when the punter, having won the former, is reſolved to puſh his fortune, and lay his money a ſecond time on the ſame card by crooking another corner; in which caſe, if it comes up, he wins fifteen times the money he laid down. 9. *Trent et le va* is the next higher prize, when the punter, crooking the fourth corner of his winning card, if it turn up, wins 33 times the money he firſt ſtaked. 10. *Soixant et le va* is the higheſt prize, and intitles the winner to 67 times his firſt money; which, if conſiderable, may chance to break the bank: though the bank poſſeſſes many chances of firſt breaking the punter. This cannot be won but by the tailleur's dealing the cards over again.

The following are the rules of the game of baſſet: 1. The banker holds a pack of 52 cards, and having ſhuffled them, he turns the whole pack at once, ſo as to diſcover the laſt card; after which he lays down all the cards by couples. 2. The punter has his book of 13 cards in his hand, from the king to the ace; out of theſe he takes one card, or more, at pleaſure, upon which he lays a ſtake. 3. The punter may, at his choice, either lay down his ſtake before the pack is turned, or immediately after it is turned, or after any number of couples are down. 4. Suppoſing the punter to lay down his ſtake after the pack is turned, and calling 1, 2, 3, 4, 5, &c. the places of theſe cards which follow the card in view, either immediately after the pack is turned, or after any number of couples are drawn. Then, 5. If the card upon which the punter has laid a ſtake comes out in any even place, except the firſt, he wins a ſtake equal to his own. 6. If the card upon which the punter has laid a ſtake comes out in any even place, except the ſecond, he loſes his ſtake. 7. If the card of the punter comes out in the firſt place, he neither wins nor loſes, but takes his own ſtake again. 8. If the card of the punter comes out in the ſecond place, he does not loſe his whole ſtake, but only one half; and this is the caſe in which the punter is ſaid to be *faced*. 9. When the punter chooſes to come in after any number of couples are down, if his card happens to be but once in the pack and is the laſt of all, there is an exception from the general rule; for though it come out in an odd place, which ſhould intitle him to win a ſtake equal to his own, yet he neither wins nor loſes from that circumſtance, but takes back his own ſtake.

Some have made this game the object of mathematical calculation. M. de Moivre ſolves this problem: to eſtimate at baſſet the loſs of the punter under any circumſtance of cards remaining in the ſtock when he lays his ſtake, and of any number of times that his card is repeated in the ſtock. From this ſolution he has formed a table ſhowing the ſeveral loſſes of the punter in whatſoever circumſtances he may happen to be. From this table it appears, 1. That the fewer the cards are in the ſtock, the greater is the loſs of the punter. 2. That the leaſt loſs of the punter, under the ſame circumſtances of cards remaining in the ſtock, is when his card is but twice in it; the next greater when but three times; ſtill greater when four times; and the greateſt when but once. The gain of the banker upon all the money riſqued at baſſet is 15s. 3d. *per cent.* as appears by the calculations of the ſame writer.

BASSETING, in the coal mines, denotes the riſing of a vein of coal towards the ſurface of the earth, till it come within two or three feet of the ſurface itſelf. This is alſo called by the workmen *croping;* and ſtands oppoſed to *dipping*, which is the deſcent of the vein to ſuch a depth that it is rarely, if ever, followed to the end.

BASSIA; a genus of the monogynia order, belonging to the dodecandria claſs of plants; the characters of which are: The calyx is quadriphyllous; the corolla octofid, with the tube inflated; the ſtamina are 16; and the drupe is quinqueſpermous. There is but one ſpecies, the longifolia, a native of Malabar.

BASSO RELIEVO, or BASS-RELIEF; a piece of ſculpture, where the figures or images do not project or ſtand out, far above the plane on which they are formed.—Whatever figures or repreſentations are thus cut, ſtamped, or otherwiſe wrought, ſo that not the entire body, but only part of it, is raiſed above the plane, are ſaid to be done in *relief*, or *relievo;* and when that work is low, flat, and but little raiſed, it is called *low relief*. When a piece of ſculpture, a coin, or a medal, has its figure raiſed ſo as to be well diſtinguiſhed, it is called *bold*, and we ſay its *relief is ſtrong*.

BASSOON, a muſical inſtrument of the wind ſort, blown with a reed, furniſhed with 11 holes, and uſed as a baſs in a concert of hautboys, flutes, &c.—To render this inſtrument more portable, it is divided into two parts, whence it is alſo called a *fagot*. Its diameter at bottom is nine inches, and its holes are ſtopped like thoſe of a large flute.

BASSORA, BALSORA, or *Baſrah*, a city between Arabia and Perſia, ſituated in the extremity of the deſarts of Irak, a little to the weſt of the Tigris, in about 57° eaſt longitude, and 30° north latitude. It was built by the command of the khalif Omar, in the 15th year of the Hegira, for the ſake of carrying on more commodiouſly an extenſive commerce between the Syrians, Arabians, Perſians, and Indians. It is at preſent a very famous empory of the Eaſt; and ſtands upon a thick ſtony ſoil, as the word *baſra* imports, about a day and a half's journey from one of the mouths of the Tigris, where it empties itſelf into the Perſian Gulf, denominated likewiſe from this town the *Bay of Baſra*. The circumjacent tract is looked upon by the Arabs to be one of the moſt delightful ſpots in Aſia, and even as one of the moſt beautiful gardens in the world; however, the hot winds that frequently blow there are very troubleſome to travellers, and ſometimes overwhelm them with ſand driven by the force of theſe winds out of the neighbouring deſarts. The city is inhabited by Jacobites, Neſtorians, Jews, Mahometans, and Chaldean Chriſtians, commonly called *Chriſtians of St. John*, which laſt are pretty numerous at this place.

According to the Abbé Raynal, the merchandiſe annually brought to Baſſora, is equal in value to 525,000l. of which the Engliſh furniſh 175,000l. the Dutch 87,000l. and the Moors, Banians, Armenians, and Arabs, furniſh the remainder. "The cargoes of theſe nations (ſays he) conſiſt of rice; ſugar; plain, ſtriped, and flowered muſlins from Bengal; ſpices from Ceylon and the Molucca iſlands; coarſe white and blue cottons from Coromandel; cardamom, pepper, ſanders-wood, from Malabar; gold and ſilver ſtuffs, turbans, ſhawls, indigo, from Surat; pearls from Baharen, and coffee from Mocha; iron, lead, and woollen cloth, from Europe. Other articles of leſs conſequence are imported from different places. Some of theſe commodities are ſhipped on board ſmall Arabian veſſels; but the greater part is brought by European ſhips, which have the advantage of a conſiderable freight.

"This merchandiſe is ſold for ready money; and paſſes through the hands of the Greeks, Jews, and Armenians. The Banians are employed in changing the coin current at Baſſora, for that which is of higher value in India.

"The different commodities collected at Baſſora are diſtributed into three channels. One half of them goes to Perſia, whither they are conveyed by the caravans; there being no

navigable river in the whole empire. The chief conſumption is in the northern provinces, which have not been ſo much ravaged as thoſe of the ſouth. Both of them formerly made their payments in precious ſtones, which were become common by the plunder of India. They had afterwards recourſe to copper utenſils, which had been exceedingly multiplied from the great abundance of copper mines. At laſt they gave gold and ſilver in exchange, which had been concealed during a long ſcene of tyranny, and are continually dug out of the bowels of the earth. If they do not allow time for the trees that produce gum, and have been cut to make freſh ſhoots; if they neglect to multiply the breed of goats which afford ſuch fine wool; and if the ſilks, which are hardly ſufficient to ſupply the few manufactures remaining in Perſia, continue to be ſo ſcarce; in a word, if this empire does not riſe again from its aſhes; the mines will be exhauſted, and this ſource of commerce muſt be given up."

BASTARD, a natural child, or one begotten and born out of lawful wedlock. The great Blackſtone ſays, The civil and canon laws do not allow a child to remain a baſtard, if the parents afterwards intermarry; and herein they differ moſt materially from our law; which, though not ſo ſtrict as to require that the child ſhall be *begotten*, yet makes it an indiſpenſable condition that it ſhall be *born*, after lawful wedlock. And the reaſon of our law is ſurely much ſuperior to that of the Roman, if we conſider the principal end and deſign of eſtabliſhing the contract of marriage, taken in a civil light; abſtractedly from any religious view, which has nothing to do with the legitimacy or illegitimacy of the children. The main end and deſign of marriage, therefore, being to aſcertain and fix upon ſome certain perſon, to whom the care, the protection, the maintenance, and the education of the children, ſhould belong; this end is undoubtedly better anſwered by legitimating all iſſue born after wedlock, than by legitimating all iſſue of the ſame parties, even born before wedlock, ſo as wedlock afterwards enſues: 1. Becauſe of the very great uncertainty there will generally be, in the proof that the iſſue was really begotten by the ſame man; whereas, by confining the proof to the birth, and not to the begetting, our law has rendered it perfectly certain, what child is legitimate, and who is to take care of the child. 2. Becauſe by the Roman law a child may be continued a baſtard, or made legitimate, at the option of the father and mother, by a marriage *ex poſt facto*; thereby opening a door to many frauds and partialities, which by our law are prevented. 3. Becauſe by thoſe laws a man may remain a baſtard till 40 years of age, and then become legitimate by the ſubſequent marriage of his parents; whereby the main end of marriage, the protection of infants, is totally fruſtrated. 4. Becauſe this rule of the Roman law admits of no limitation as to the time, or number, of baſtards to be ſo legitimated; but a dozen of them may, 20 years after their birth, by the ſubſequent marriage of their parents, be admitted to all the privileges of legitimate children. This is plainly a great diſcouragement to the matrimonial ſtate; to which one main inducement is uſually not only the deſire of having children, but alſo the deſire of procreating lawful heirs. Whereas our conſtitution guards againſt this indecency, and at the ſame time gives ſufficient allowance to the frailties of human nature. For if a child be begotten while the parents are ſingle, and they will endeavour to make an early reparation for the offence, by marrying within a few months after, our law is ſo indulgent as not to baſtardize the child, if it be born, though not begotten, in lawful wedlock; for this is an incident that can happen but once; ſince all future children will be begotten, as well as born, within the rules of honour and civil ſociety.

From what has been ſaid it appears, that all children born before matrimony are baſtards by our law: and ſo it is of all children born ſo long after the death of the huſband, that, by the uſual courſe of geſtation, they could not be begotten by him. But this being a matter of ſome uncertainty, the law is not exact as to a few days. But if a man dies, and his widow ſoon after marries again, and a child is born within ſuch a time as that by the courſe of nature it might have been the child of either huſband: in this caſe, he is ſaid to be more than ordinarily legitimate; for he may, when he arrives to years of diſcretion, chooſe which of the fathers he pleaſes. To prevent this, among other inconveniences, the civil law ordained that no widow ſhould marry *infra annum luctus*; a rule which obtained ſo early as the reign of Auguſtus, if not of Romulus: and the ſame conſtitution was probably handed down to our early anceſtors from the Romans, during their ſtay in this iſland; for we find it eſtabliſhed under the Saxon and Daniſh governments.

As baſtards may be born before the coverture or marriage-ſtate is begun, or after it is determined, ſo alſo children born during wedlock may in ſome circumſtances be baſtards. As if the huſband be out of the kingdom of England (or as the law looſely phraſes it, *extra quatuor maria*) for above nine months, ſo that no acceſs to his wife can be preſumed, her iſſue during that period ſhall be baſtards. But generally during the coverture, acceſs of the huſband ſhall be preſumed, unleſs the contrary ſhall be ſhown; which is ſuch a negative as can only be proved by ſhowing him to be elſewhere; for the general rule is, *præſumitur pro legitimatione*. In a divorce *a menſa et thoro*, if the wife breeds children, they are baſtards; for the law will preſume the huſband and wife conformable to the ſentence of ſeparation, unleſs acceſs be proved: but in a voluntary ſeparation by agreement, the law will ſuppoſe acceſs, unleſs the negative be ſhown. So alſo, if there is an apparent impoſſibility of procreation on the part of the huſband, as if he be only eight years old, or the like, there the iſſue of the wife ſhall be baſtard. Likewiſe, in caſe of divorce in the ſpiritual court *a vinculo matrimonii*, all the iſſue born during the coverture are baſtards; becauſe ſuch divorce is always upon ſome cauſe that rendered the marriage unlawful and null from the beginning.

As to the *duty* of parents to their baſtard children, by our law, it is principally that of maintenance. For though baſtards are not looked upon as children to any civil purpoſes; yet the ties of nature, of which maintenance is one, are not ſo eaſily diſſolved: and they hold indeed as to many other intentions; as particularly that a man ſhall not marry his baſtard ſiſter or daughter. The method in which the Engliſh law provides maintenance for them is as follows: When a woman is delivered, or declares herſelf with child, of a baſtard, and will by oath before a juſtice of the peace charge any perſon with having got her with child, the juſtice ſhall cauſe ſuch perſon to be apprehended, and commit him till he gives ſecurity, either to maintain the child, or appear at the next quarter-ſeſſions to diſpute and try the fact. But if the woman dies, or is married, before delivery, or miſcarries, or proves not to have been with child, the perſon ſhall be diſcharged; otherwiſe the ſeſſions, or two juſtices out of ſeſſions, upon original application to them, may take order for the keeping of the baſtard, by charging the mother or the reputed father with the payment of money or other ſuſtentation for that purpoſe. And if ſuch putative father, or lewd mother, run away from the pariſh, the overſeers, by direction of two juſtices, may ſeize their rents, goods, and chattels, in order to bring up the ſaid baſtard child. Yet ſuch is the humanity of our laws, that no woman can be compulſively queſtioned concerning the father of her child till one month after her delivery: which indulgence is however very frequently a hardſhip upon pariſhes, by giving the parents an opportunity to eſcape.

As to the *rights* and *incapacities* which appertain to a baſtard: The former are very few, being only ſuch as he can *acquire*; for he can *inherit* nothing, being looked upon as the ſon of nobody, and ſometimes called *filius nullius*, ſometimes *filius populi*. Yet he may gain a ſirname by reputation, though he has none by inheritance. All other children have their primary ſettlement in their father's pariſh; but a baſtard in the pariſh where born, for he hath no father. However, in caſe of fraud, as if a woman either be ſent by order of juſtices, or comes to beg as a vagrant, to a pariſh which ſhe does not belong to, and drops her baſtard there; the baſtard ſhall, in the firſt caſe, be ſettled in the pariſh from whence ſhe was illegally removed; or, in the latter caſe, in the mother's own pariſh, if the mother be apprehended for her vagrancy. Baſtards alſo, born in any licenſed hoſpital for pregnant women, are ſettled in the pariſhes to which the mothers belong.—The *incapacity* of a baſtard conſiſts principally in this, that he cannot be heir to any one; for being *nullius filius*, he is therefore of kin to nobody, and has no anceſtor from whom any inheritable blood can be derived: therefore, if there be no other claimant upon an inheritance than ſuch illegitimate child, it ſhall eſcheat to the lord. And as baſtards cannot be heirs themſelves, ſo neither can they have any heirs but thoſe of their own bodies. For as all collateral kindred conſiſts in being derived from the ſame common anceſtor, and as a baſtard has no legal anceſtors, he can have no collateral kindred; and conſequently can have no legal heirs, but ſuch as claim by a lineal deſcent from himſelf. And therefore, if a baſtard purchaſes land, and dies ſeiſed thereof without iſſue, and inteſtate, the land ſhall eſcheat to the lord of the fee. A baſtard was alſo, in ſtrictneſs, incapable of holy orders; and though that were diſpenſed with, yet he was utterly diſqualified from holding any dignity in the church: but this doctrine ſeems now obſolete; and in all other reſpects, there is no diſtinction between a baſtard and another man. And really any other diſtinction but that of not inheriting, which civil policy renders neceſſary, would, with regard to the innocent offspring of his parents' crimes, be odious, unjuſt, and cruel to the laſt degree; and yet the civil law, ſo boaſted of for its equitable deciſions, made baſtards in ſome caſes incapable even of a gift from their parents. A baſtard may, laſtly, be made legitimate, and capable of inheriting, by the tranſcendant power of an act of parliament, and not otherwiſe: as was done in the caſe of John of Gaunt's baſtard children, by a ſtatute of Richard II.

With regard to the *puniſhment* for having baſtard children: By the ſtatute 18 Eliz. c. 3. two juſtices may take order for the puniſhment of the mother and reputed father: but what that puniſhment ſhall be, is not therein aſcertained; though the cotemporary expoſition was, that a corporeal puniſhment was intended. By ſtatute 7 Jac. I. c. 4. a ſpecific puniſhment (*viz.* commitment to the houſe of correction) is inflicted on the woman only. But in both caſes, it ſeems that the penalty can only be inflicted, if the baſtard becomes chargeable to the pariſh; for otherwiſe the very maintenance of the child is conſidered as a degree of puniſhment. By the laſt mentioned ſtatute the juſtices may commit the mother to the houſe of correction, there to be puniſhed and ſet on work for one year; and in caſe of a ſecond offence, till ſhe find ſureties never to offend again in like manner.

It has been ſaid, he who gets a baſtard in the hundred of Middleton in Kent, forfeits all his goods and chattels to the king: and Dr. Plott, in his Hiſtory of Staffordſhire, p. 279, aſſerts, that if a baſtard be got under the umbrage of a certain *oak* in Knollwood in Staffordſhire, belonging to the manor of Terley-caſtle, no puniſhment can be inflicted, nor can the lord nor the biſhop take cognizance of it.

Statute 21 Jac. I. c. 27. enacts, that if any woman be delivered of a child, which if born alive ſhould by law be a baſtard; and endeavours privately to conceal its death, by burying the child or the like; the mother ſo offending ſhall ſuffer death, as in the caſe of murder, unleſs ſhe can prove by one witneſs at leaſt that the child was actually born dead. This law, which favours pretty ſtrongly of ſeverity, in making the concealment of the death almoſt concluſive evidence of the child's being murdered by the mother, is nevertheleſs to be alſo met with in the criminal codes of many other nations of Europe; as the Danes, the Swedes, and the French: but it has of late years been uſual with us, upon trials for this offence, to require ſome ſort of preſumptive evidence that the child was born alive, before the other conſtrained preſumption (that the child, whoſe death is concealed, was therefore killed by its parent) is admitted to convict the priſoner.

Bastard, in reſpect of artillery, is applied to thoſe pieces of ordnance which are of an unuſual or illegitimate make or proportion. Theſe are of two kinds, long and ſhort, according as the defect is on the redundant or defective ſide. The long baſtards again, are either common or uncommon. To the common kind belong the double culverin extraordinary, half culverin extraordinary, quarter culverin extraordinary, falcon extraordinary, &c. The ordinary baſtard culverin carries a ball of eight pounds weight.

Bastards are alſo an appellation given to a kind of faction or troop of banditti who roſe in Guienne about the beginning of the fourteenth century, and joining with ſome Engliſh parties, ravaged the country, and ſet fire to the city of Xaintes.—Mezeray ſuppoſes them to have conſiſted of the natural ſons of the nobility of Guienne, who being excluded the right of inheriting from their fathers, put themſelves at the head of robbers and plunderers to maintain themſelves.

Bastard *Flower-fence*. See Adenanthera. The flowers of this plant bruiſed and ſteeped in breaſt-milk are ſuppoſed to poſſeſs the virtues of a gentle anodyne; for which purpoſe they are often given in the Weſt Indies to quiet very young children. The leaves are uſed inſtead of ſena in Barbadoes and the Leeward Iſlands. In Jamaica, the plant is called by the name of *ſena*.

Bastard-*Hemp*. See Datisca.

Bastard-*Rocket*, *Dyers'-weed*, or *Wild Woad*. See Reseda.

Bastard *Star-of-Bethlehem*. See Albuca.

Bastard-*Scarlet* is a name given to red dyed with bale-madder, as coming neareſt the bow-dye, or new ſcarlet.

BASTARDY is a defect of birth objected to one born out of wedlock. Euſtathius will have baſtards among the Greeks to have been in equal favour with legitimate children, as low as the Trojan war; but the courſe of antiquity ſeems againſt him. Potter and others ſhow, that there never was a time when baſtardy was not in diſgrace.—In the time of William the Conqueror, however, baſtardy ſeems not to have implied any reproach, if we may judge from the circumſtance of that monarch himſelf not ſcrupling to aſſume the appellation of baſtard. His epiſtle to Alan count of Bretagne begins, *Ego Willielmus cognomento baſtardus*, &c. Du Cange, Gloſſ. Lat. t. 1. p. 502.

Bastardy, in relation to its trial in law, is diſtinguiſhed into general and ſpecial. *General* baſtardy is a certificate from the biſhop of the dioceſe, to the king's juſtices, after inquiry made, whether the party is a baſtard or not, upon ſome queſtion of inheritance. Baſtardy *ſpecial* is a ſuit commenced in the king's courts againſt a perſon that calls another a baſtard.

Arms of Bastardy ſhould be croſſed with a bar, fillet, or traverſe, from the left to the right. They were not formerly allowed to carry the arms of their father, and therefore they invented arms for themſelves; and this is ſtill done by the natural ſons of a king.

Right of BASTARDY, *Droit de batardiſe*, in the former French laws, was a right, in virtue whereof the effects of baſtards dying inteſtate devolved to the king or the lord.

BASTARNÆ, or BASTERNÆ, a people of German original, manners, and language; who extended themſelves a great way to the eaſt of the Viſtula, the eaſt boundary of Germany, among the Sarmatæ, as far as the mouth of the Iſter and the Euxine; and were divided into ſeveral nations.

BASTARNICÆ ALPES, in ancient geography, mountains extending between Poland, Hungary, and Tranſylvania, called alſo the *Carpates*, and now the *Carpathian* mountains.

BASTI, in ancient geography, a town of the province of Bætica in Spain, ſituated to the weſt of the Campus Spartarius. Now *Baza* in Granada.

BASTIA, a ſea-port town of Albania in Turkey in Europe, over againſt the iſland of Corfu, at the mouth of the river Calamu. E. long. 10. 35. N. lat. 39. 40.

BASTIA, the capital of the iſland of Corſica in the Mediteranean. It has a good harbour; and is ſeated on the eaſtern part of the coaſt, in E. long. 9. 42. N. lat. 42. 35.

BASTILE, denotes a ſmall antique caſtle, fortified with turrets. Such was the Baſtile of Paris, which was the only caſtle that had retained the name. It was begun to be built in 1369 by order of Charles V. and was finiſhed in 1383 under the reign of his ſucceſſor.—Its chief uſe was for the cuſtody of ſtate priſoners; or, more properly ſpeaking, for the clandeſtine purpoſes of unfeeling deſpotiſm.

Before the French people, weary of the unſpeakable oppreſſion of their ancient government, threw off the yoke of abſolute monarchy by demoliſhing that hated fortreſs, the lieutenant-general of the police of Paris was the ſub-delegate of the miniſtry for the department of the Baſtile. He had under him a titular commiſſary, who was called the commiſſary of the Baſtile. He had a fixed ſalary for drawing up what were called inſtructions, but had no inſpection nor function but in caſes where he received orders; the reaſon of which plainly was, that all that was done in this caſtle was arbitrary.

Every priſoner, on coming to the Baſtile, had an inventory made of every thing about him. His trunks, clothes, linen, and pockets were ſearched, to diſcover whether there were any papers in them relative to the matter for which he was apprehended. It was not uſual to ſearch perſons of a certain rank; but they were aſked for their knives, razors, ſciſſars, watches, canes, jewels, and money. After this examination, the priſoner was conducted into an apartment, where he was locked up within three doors. They who had no ſervants made their own beds and fires.

At the beginning of their confinement, they had neither books, ink nor paper; they went neither to maſs, nor on the walks; they were not allowed to write to any one, not even to the lieutenant of the police. At firſt they were allowed to go to maſs only every other Sunday. When a perſon had obtained leave to write to the lieutenant of the police, he might aſk his permiſſion to write to his family, and to receive their anſwers; to have with him his ſervant or an attendant, &c.; which requeſts were either granted or refuſed according to circumſtances. Nothing could be obtained but through this channel.

The officers of the ſtaff took the charge of conveying the letters of the priſoners to the police. They were ſent regularly at noon and at night: but if they deſired it, their letters were ſent at any hour by expreſſes, who were paid out of the money of the parties confined. The anſwers were always addreſſed to the major, who communicated them to the priſoner. If no notice was taken of any requeſt contained in the letter of the priſoner, it was to be conſidered as a refuſal. The attendants appointed for thoſe who were not allowed their own ſervants, or who had none of their own, were commonly invalid ſoldiers. Theſe people ſlept near the priſoners, and waited upon them. It was neceſſary for a perſon always to be upon his guard with theſe men, as well as with the turnkeys; for all his words were noticed, and carried to the officers, who reported them to the police: it was thus, indeed, they ſtudied the characters of the priſoners. In this caſtle, all was myſtery, trick, artifice, ſnare, and treachery: the officers, attendants, turnkeys, and valets, often attempting to draw a man on to ſpeak againſt the government, merely for the purpoſe of getting a reward for revealing what was ſaid.

Sometimes a priſoner obtained permiſſion to have books, his watch, knife, and razors, and even paper and ink. He might aſk to ſee the lieutenant of the police when he came to the Baſtile. This officer commonly cauſed priſoners to be brought down ſome days after their arrival; though ſometimes he went to viſit them in their chambers; eſpecially the ladies. When the lieutenant of the police talked to a priſoner, the converſation never failed to turn upon the cauſe of his confinement. He ſometimes would aſk for written and ſigned declarations, in which it was of importance that much circumſpection ſhould be uſed; as in theſe conferences, nothing that a perſon ſaid or wrote was forgotten. When a priſoner wanted to tranſmit any thing to the lieutenant of the police, it was always by means of the major. Notes were to be ſent to this officer by the turnkeys. The priſoner was never anticipated in any thing—he muſt aſk for every thing; even for permiſſion to be ſhaved, an office always performed by the ſurgeon; who alſo furniſhed ſick or indiſpoſed priſoners with ſugar, coffee, tea, chocolate, confections, and the remedies neceſſary for their complaints. The time allowed for walking was an hour in a day: ſometimes an hour in the morning and an hour in the evening, in the great court of the fortreſs.

Though a priſoner might be interrogated a few days after his entrance into the Baſtile, very frequently this did not happen till after ſome weeks. Sometimes he was previouſly informed of the day when this was to take place; but often he was only acquainted with it the moment he was brought down to the council-chamber. This commiſſion of interrogatory was executed by the lieutenant of the police, a counſellor of ſtate, a maſter of requeſts, a counſellor or a commiſſioner of the Chatelet. When it ſo happened that the lieutenant of the police did not himſelf propoſe to interrogate, he uſually came at the end of the examination.

Theſe commiſſioners were purely paſſive beings. Frequently they attempted to frighten a priſoner; laying ſnares for him, and employing the meaneſt artifices to draw a confeſſion from him. With this inſidious view, it was cuſtomary to pretend proofs, and exhibit papers without ſuffering him to read them; aſſerting that they were inſtruments of unavoidable conviction. Their interrogatories were always vague, and turned not only on the priſoner's own words and actions, but on his moſt ſecret thoughts, and on the diſcourſe and conduct of perſons of his acquaintance, whom they likewiſe wiſhed to bring into queſtion.

The examiners uſually told the priſoner that his life was at ſtake; that on that day his fate depended on himſelf; that if he made a fair declaration, they were authoriſed to promiſe him a ſpeedy releaſe; but if he refuſed to confeſs, he would be given up to a ſpecial commiſſion: that they were in poſſeſſion of deciſive documents, and authentic proofs, more than ſufficient to ruin him; that his accomplices had diſcovered all; that the government had unknown reſources, of which he could have no ſuſpicion. The priſoners were thus beguiled by varied and infinitely multiplied interrogatories; by promiſes, careſſes, and menaces. Sometimes they uſed inſult, and treated the unhappy ſufferers with an indignity that filled up the meaſure of that tyranny of which they were the

baſe inſtruments. If the priſoner made the required confeſſion, the commiſſioners then told him that they had no preciſe authority for his enlargement, but that they had every reaſon to expect it; that they were going to ſolicit it, &c. The priſoner's confeſſions, far from bettering his condition, uſually gave occaſion to new interrogatories, often lengthened his confinement, drew in the perſons with whom he had connections, and expoſed himſelf to new vexations.

But although there were rules adapted to all occaſions, yet every thing was ſubject to exceptions ariſing from influence, recommendation, protection, intrigue, &c. becauſe the firſt principle in this place was arbitrary will. Very frequently, perſons confined on the ſame account were treated very differently, according as their recommendations were more or leſs conſiderable. As there was a library, founded by a foreign priſoner who died in the Baſtile in the beginning of the preſent century, ſome priſoners were permitted to go to it, and others to have the books carried to their chambers.

The falſeſt things were told the priſoners with an air of ſincerity and concern, as "It is very unfortunate that the king has been prejudiced againſt you. His majeſty cannot hear your name mentioned without being irritated. The affair for which you have loſt your liberty is only a pretext—they had deſigns againſt you before—you have powerful enemies." Theſe diſcourſes were the etiquette of the place. It was in vain for a priſoner to aſk leave to write to the king, for he never could obtain it. What conſtituted the perpetual and moſt inſupportable torment of this cruel and odious inquiſition, was the vague, indeterminate, falſe, or equivocal promiſes, inexhauſtible and conſtantly deceitful hopes of a ſpeedy releaſe, exhortations to patience, and blind conjectures, of which the lieutenant of the police and his officers were very laviſh.

To cover the odium of the barbarities exerciſed here, and ſlacken the zeal of relations or patrons, to obtain juſtice for incarcerated innocence, the moſt abſurd and contradictory ſlanders againſt the priſoner were frequently publiſhed; whilſt the true cauſes of impriſonment, and real obſtacles to his releaſe were concealed. Theſe reſources, ſo infinitely varied, were inexhauſtible.

When a priſoner who was known and protected had entirely loſt his health, and his life was thought in danger, he was always ſent out; the miniſtry not chooſing that perſons *well known* ſhould die in the Baſtile. Whenever a priſoner happened to die there, he was interred in the pariſh of St. Paul, under the name of a domeſtic; and this falſity was alſo written in the regiſter of deaths, in order to deceive poſterity. But there was another regiſter in which the true names of the deceaſed were entered; though it was not without great difficulty that extracts could be procured from it: and whenever this indulgence was granted, the commiſſary of the Baſtile was firſt to be informed of the uſe the family intended to make of the extract.

In 1674 the baggage of Louis chevalier de Rohan, grand huntſman of France, having been taken and rummaged in a ſkirmiſh, ſome letters were found which cauſed a ſuſpicion that he had treated with the Engliſh for the ſurrender of Havre de Grace. He was arreſted and put into the Baſtile. The Sieur de la Tuanderie, his agent, concealed himſelf. The proof was not ſufficient. A commiſſion was named to proceed againſt the accuſed for treaſon. La Tuanderie was diſcovered at Rouen: an attempt was made to arreſt him; but he fired on the aſſailants, and obliged them to kill him on the ſpot. Perſons attached to the chevalier de Rohan went every evening round the Baſtile, crying through a ſpeaking trumpet, "La Tuanderie is dead, and has ſaid nothing;" but the chevalier did not hear them. The commiſſioners not being able to get any thing from him, told him, "that the king knew all, that they had proofs, but only wiſhed for his own confeſſion, and that they were authoriſed to promiſe him pardon if he would declare the truth." The chevalier, too credulous, confeſſed the whole. Then the perfidious commiſſioners changed their language. They ſaid, "that with reſpect to the pardon, they could not anſwer for it; but that they had *hopes* of obtaining it, and would go and ſolicit it." This they troubled themſelves little about, and condemned the criminal to loſe his head. He was conducted on a platform to the ſcaffold, by means of a gallery raiſed to the height of the window of the armoury in the arſenal, which looked towards the little ſquare at the end of the *Rue des Tournelles*, and there beheaded November 27, 1674.

The Jeſuits of the college of Clermont, in the *Rue St. Jacques* at Paris, having, this ſame year 1674, invited the king (Louis XIV.) to honour with his preſence a tragedy to be performed by their ſcholars, that prince accepted the invitation. Theſe able courtiers took care to inſert in the piece ſeveral ſtrokes of flattery, with which the monarch, greedy of ſuch incenſe, was greatly pleaſed. When the rector of the college was conducting the king home, a nobleman in the train applauded the ſucceſs of the tragedy. Louis ſaid, "Do you wonder at it? *this is my college.*" The Jeſuits did not loſe a word of this. The very ſame night they got engraved in large golden letters on black marble, *Collegium Lodovici Magni*, inſtead of the former inſcription which was placed beneath the name of Jeſus on the principal gate of the college (*Collegium Claromontanum Societatis Jeſu*); and in the morning the new inſcription was put up in place of the old one. A young ſcholar of quality, aged 13, who was witneſs to the zeal of the reverend fathers, made the two following verſes, which he poſted up at night on the college gate:

Abſtulit hinc Jeſum, poſuitque inſignia regis
Impia gens: alium non colit illa Deum.

The Jeſuits did not fail to cry out ſacrilege: the young author was diſcovered, taken up, and put into the Baſtile. That implacable ſociety cauſed him, as a matter of *favour*, to be condemned to perpetual impriſonment; and he was transferred to the citadel of the iſle Sainte Marguerite. Several years after, he was brought back to the Baſtile. In 1705 he had been a priſoner 31 years. Having become heir to all his family, who poſſeſſed great property, the Jeſuit Riquelet, then confeſſor of the Baſtile, remonſtrated to his brethren on the neceſſity of reſtoring the priſoner to liberty. The golden ſhower which forced the tower of Danae had the ſame effect on the caſtle of the Baſtile. The Jeſuits made a merit with the priſoner of the protection they granted him; and this man of rank, whoſe family would have become extinct without the aid of the ſociety, did not fail to give them extenſive proofs of his gratitude.

Nowhere elſe on earth, perhaps, has human miſery, by human means, been rendered ſo laſting, ſo complete, or ſo remedileſs, as within the dire walls of the Baſtile of France. This the following caſe, the particulars of which are tranſlated from that elegant and energetic writer M. Mercier, may ſufficiently ſhew. The heinous offence which merited an impriſonment ſurpaſſing torture and rendering death a bleſſing, though for obvious reaſons not ſpecified by our author, is known from other ſources to have conſiſted in ſome unguarded expreſſions of diſreſpect towards the Gallic monarch Louis XV.

Upon the acceſſion of the late unfortunate ſucceſſor of that monarch, the miniſters then in office, being moved by humanity, began their adminiſtration with an act of clemency and juſtice: they inſpected the regiſters of the Baſtile, and ſet many of the priſoners at liberty. Among the number was an old man who had groaned in confinement for a period of 47

ears between four thick and cold ſtone-walls. Hardened by dverſity, which ſtrengthens both the mind and the conſtitu-ion, when men are not overpowered by it, he had reſiſted the orrors of his long impriſonment with an invincible and manly pirit. His locks, white, thin, and ſcattered, had almoſt ac-quired the rigidity of iron; whilſt his body, environed for ſo ong a time by a coffin of ſtone, had borrowed from it a firm nd compact habit. The narrow door of his tomb, turning ipon its grating hinges, opened not as uſual by halves; and n unknown voice announced his liberty, and bade him de-part. Believing this to be a dream, he heſitated; but at ength roſe up and walked forth with trembling ſteps, amazed t the ſpace he traverſed: the ſtairs of the priſon, the halls, the court, ſeemed to him vaſt, immenſe, and almoſt without bounds. He ſtopped from time to time, and gazed around like a bewildered traveller: his viſion was with difficulty recon-ciled to the clear light of day: he contemplated the heavens as a new object: his eyes remained fixed, and he could not even weep. Stupified with the newly acquired power of changing his poſition, his limbs, like his tongue, refuſed, in ſpite of his efforts, to perform their office; at length he got through the formidable gate which ſo long before had cloſed upon him.

When he felt the motion of the carriage deſigned to convey him to his former habitation, he ſcreamed out, and uttered ſome inarticulate ſounds; and as he could not bear this new movement, he was obliged to deſcend. Supported by a bene-volent arm, he ſought out the ſtreet where he had formerly re-ſided: he found it, but no trace of his houſe remained; one of the public edifices occupied the ſpot where it had ſtood. He now ſaw nothing that brought to his recollection, either that particular quarter, the city itſelf, or the objects with which he had formerly been acquainted. The houſes of his neareſt neighbours, which were freſh in his memory, had aſſumed a new appearance. In vain were his looks directed to all the ob-jects around him; he could diſcover nothing of which he had the ſmalleſt remembrance. Terrified, he ſtopped and fetched a deep ſigh. To him, what did it import that the city was peopled with living creatures? none of them were alive to him; he was unknown to all the world, and he knew nobody: and whilſt he wept, he regretted his dungeon.

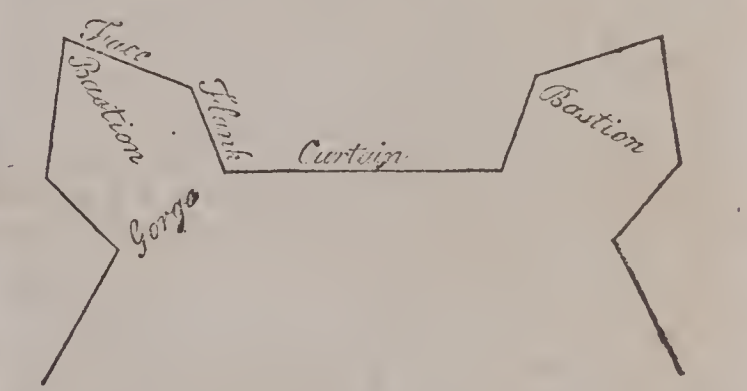
At the name of the Baſtile, which he often pronounced and even claimed as an aſylum, and the ſight of his clothes that marked a former age, the crowd gathered round him: curio-ſity, blended with pity, excited their attention. The moſt aged aſked him many queſtions, but had no remembrance of the circumſtances he recapitulated. At length accident brought in his way an ancient domeſtic, now a ſuperannuated porter, who, confined to his lodge for 15 years, had barely ſufficient ſtrength to open the gate: even he did not know the maſter he had ſerved; but informed him that grief and misfortune had brought his wife to the grave 30 years before, that his children were gone abroad to diſtant climes, and that of all his rela-tions and friends none now remained. This recital was made with the indifference which people diſcover for events long paſſed, and almoſt forgotten. The miſerable man groaned, and groaned alone. The crowd around, offering only unknown features to his view, made him feel the exceſs of his calamities even more than he would have done in the dreadful ſolitude that he had lately quitted.

Overcome with ſorrow, he preſented himſelf before the mi-niſter, to whoſe humanity he owed that liberty which was now a burden to him. Bowing down, he ſaid, "Reſtore me again to that priſon from which you have taken me: I cannot ſur-vive the loſs of my neareſt relations; of my friends; and, in one word, of a whole generation. Is it poſſible in the ſame moment to be informed of this univerſal deſtruction, and not to wiſh for death? This general mortality, which to the reſt of mankind comes ſlowly and by degrees, has to me been in-ſtantaneous, the operation of a moment. Whilſt ſecluded from ſociety, I lived with myſelf only; but here I neither can live with myſelf nor with this new race, to whom my anguiſh and deſpair appear only as a dream. There is nothing terrible in dying; but it is dreadful indeed to be the laſt." The mi-niſter was melted; he cauſed the old domeſtic to attend this unfortunate perſon, as only he could talk to him of his fa-mily. This diſcourſe was the ſingle conſolation that he re-ceived: for he ſhunned all intercourſe with a new race, born ſince he had been exiled from the world; and he paſſed his time in the midſt of Paris in the ſame ſolitude as he had done whilſt confined in a dungeon for almoſt half a century. But the cha-grin and mortification of meeting no perſon who could ſay to him, "*We were formerly known to one another*," ſoon put an end to his exiſtence.

BASTIMENTOS, the name of ſome ſmall iſlands near Terra Firma in South America, at the mouth of the bay of Nombre de Dios.

BASTINADO. See BASTONADO.

BASTION, in the modern fortification, a large maſs of earth at the angles of a work, connecting the curtains to each other; and anſwering to the bulwark of the ancients. It is formed by two faces, two flanks, and two demigorges. The two faces form the faliant angle, or angle of the baſtion; the two flanks form with the faces, the *epaules* or ſhoulders; and the union of the other two ends of the flanks with the curtains forms the two angles of the flanks.



Solid BASTIONS, are thoſe that are entirely filled up with earth to the height of the rampart, without any void ſpace to-wards the centre.

Void or *Hollow* BASTION, has the rampart and parapet ranging only round the flanks and ſpaces, ſo that a void ſpace is left within towards the centre, where the ground is ſo low that if the rampart be taken, no retrenchment can be made in the centre, but what will lie under the fire of the beſieged.

Regular BASTION, is that which has its due proportion of faces, flanks, and gorges.

Deformed or *Irregular* BASTION, is when the irregularity of the lines and angles throws the baſtion out of ſhape: as when it wants one of the demigorges, one ſide of the interior poly-gon being too ſhort, &c.

Demi BASTION, or *Half baſtion*, alſo otherwiſe called an *Epaulment*, has but one face and flank.

Double BASTION, is when one baſtion is raiſed within, and upon the plane of another baſtion.

Flat BASTION, is one built in the middle of the curtain, when it is too long to be defended by the uſual baſtions at the extremities.

Compoſed BASTION, is when the two ſides of the interior polygon are very unequal, which makes the gorges alſo unequal.

Cut BASTION, is that which has a re-entering angle at the point, and is ſometimes called a BASTION *with a Tenaille*, whoſe point is cut off, making an angle inwards, and two points outwards. This is uſed when the ſaliant angle would be too ſharp, or when water or ſome other impediment prevents it from being carried out to its full extent.

BASTOIGNE, a ſmall town of the Netherlands, in the duchy of Luxemburgh. E. long. 6. 0. N. lat. 50. 10.

BASTON, in law, one of the ſervants to the warden of the Fleet-priſon, who formerly attended the king's courts with a red ſtaff, for taking into cuſtody ſuch as were committed by the court. He alſo attended on ſuch priſoners as were permitted to go at large by licence.

BASTON, or *Batoon*, in architecture, a moulding in the baſe of a column, called alſo a *tore*. See *Torus* in Plate 25.

BASTON, *Baton*, or *Batune*. This word is French, and ſignifies a ſtaff or cudgel: it ſhould be ſpelt *Bâton;* but is, by moſt Engliſh writers, corruptly ſpelt as above. It is only borne in Engliſh coats of arms, as a badge of illegitimacy; but the French heralds introduced it in arms as a difference, or mark of conſanguinity.

BASTONADO, BASTONADE, the puniſhment of beating or drubbing a criminal with a ſtick. The word is formed of the French *baſton*, a ſtick or ſtaff. The baſtonade was a puniſhment uſed both among the ancient Grecks, Romans, and Jews, and ſtill obtains among the Turks. The Romans called it *fuſtigatio*, *fuſtium admonitio*, or *fuſtibus cædi*; which differed from the *flagellatio*, as the former was done with a ſtick, the latter with a rod, or ſcourge. The fuſtigation was a lighter puniſhment, and inflicted on freemen; the flagellation a ſeverer, and reſerved for ſlaves. It was alſo called *tympanum*, becauſe the patient here was beat with ſticks, like a drum. This mode of puniſhment is much in uſe in the eaſt to this day. The method there practiſed is thus: the criminal being laid on his belly, his feet are raiſed, and tied to a ſtake, held faſt by officers for the purpoſe; in which poſture he is beaten by a cudgel on the ſoles of his feet, back, chine, &c. to the number of 100 or more blows.

BAT, in Zoology, a genus of quadrupeds, of the order of *feræ*, the characters of which are theſe: the fore-teeth of the upper-jaw are ſix in number, acute, and diſtant from each other; the fore-teeth of the lower jaw are alſo ſix, and acute, but contiguous; the canine teeth are two, both above and below, on each ſide; the feet have each five toes; the fore-feet have the toes connected by a membrane, and expanded into a kind of wings, whereby it flies: whence this animal has been generally, but with the utmoſt impropriety, ranged among birds.

The bat, called alſo by us *lapwing*, and *flittermouſe*, by the Latins *veſpertilio*, ſeems a medium between the quadruped and the feathered kinds; but it partakes moſt of the former tribe; agreeing only with the birds in the ſternum, and the poſition of its liver; and with the quadrupeds in the kidneys, bladder, teeth, penis, teſticles, diaphragm, and lungs. In reality, it only appears to be a bird by its flying. They lay themſelves up in winter in the drieſt apartments of caves; where planting their talons to the roof, they cover their bodies with their wings, and ſo hanging perpendicularly in great numbers, but ſo as not to touch each other, they ſleep for ſome months.

An animal which like the bat (ſays M. Buffon) is half quadruped and half-bird, and which in fact is neither the one nor the other, is a kind of monſter. In the bat, the fore-feet are, properly ſpeaking, neither wings nor feet, though the animal uſes them for the purpoſe of flying, and occaſionally of moving along upon the ground. They are, in fact, two ſhapeleſs extremities, of which the bones are of a monſtrous length, and connected by a membrane, uncovered with feathers, or even with hair, like the reſt of the body: they are a kind of winged paws, or hands ten times larger than the feet, and, in all, four times longer than the whole length of the body of the animal; they are, in a word, parts which have rather the appearance of a capricious and accidental, than a regular and determined production.

To theſe incongruities, theſe diſproportions of the body and members, may be added the ſtill more ſtriking deformities of the head. In ſome ſpecies, the noſe is hardly viſible, the eyes are ſunk near the tip of the ear, and are confounded with the cheeks; in others, the ears are as long as the body, or elſe the face is twiſted into the form of an horſe-ſhoe, and the noſe covered with a kind of cruſt. Averſe, likewiſe, to the ſociety of all other creatures, they ſhun the light, inhabit none but dark and gloomy places, to which, after their nocturnal excurſions, they are ſure to return by break of day, and in which they remain, fixed, as it were, to the walls till night again approaches.

Their motion in the air is with leſs propriety to be termed a flight, than a kind of uncertain flutter, which they ſeem to execute by ſtruggles, and in an awkward manner. They raiſe themſelves from the ground with difficulty, never ſoar to a great height, and are but imperfectly qualified to accelerate, or even to direct, their flight. This, far from being either rapid, or very direct, is performed by haſty vibrations in an oblique and winding direction; and in paſſing along they do not fail to ſeize all the gnats, moths, and other nocturnal inſects that come in their way. Theſe they ſwallow entire; and in their excrements we meet with the remains of wings and the other dry parts, which they have not been able to digeſt. Like quadrupeds, the bat brings forth its young alive, and like them it has teeth and nipples.

It is affirmed that theſe animals do not produce more than two at a birth, and that theſe they ſuckle, and even carry along with them as they fly. They unite in numbers to defend each other from the cold; they paſs the winter without awaking, without ſtirring, and without eating, from the end of autumn till ſpring. Though they can more eaſily ſupport hunger than cold, and can even ſubſiſt a number of days without food, they yet belong to the number of carnivorous animals; for, when opportunity ſerves, they will devour bacon, and meat of all kinds, whether raw or roaſted, whether freſh or corrupted.

Travellers ſpeak of a ſort of bats in Golconda, bigger than hens. In Braſil there is a large ſpecies of this animal, which if men lie aſleep with their legs naked, will, it is ſaid, make a wound in them ſo gently, as not to awake them, but ſo deep, that they will ſuck the blood at it, and leave the perſon in ſome danger of bleeding to death. Piſo. Hiſt. Braſil.

BAT-*Fowling*, a method of catching birds in the night, by lighting ſome ſtraw, or torches, near the place where they are at rooſt; for upon beating them up, they fly to the flame, where, being amazed, they are eaſily caught in nets, or beat down with buſhes fixed to the end of poles, &c.

BAT, *Bate*, or *Batz*, a ſmall copper coin, mixed with a little ſilver, current in ſeveral cities of Germany: it is worth four crutzers. It is alſo a coin in Switzerland, current at five livres, or 100 ſols, French money.—The *bat* or *fladermouſe*, at Nuremburg, is equal to four croitzers; at Zurich, to $\frac{1}{28}$ of the French crown; at Baſil, Schaffhauſen, &c. to $\frac{1}{27}$; and at Bern and Friburg to $\frac{1}{30}$ of the ſame crown. Theſe laſt are called *ſhort bats*.

BATABLE, or DEBATABLE, GROUND, that land which lay between Scotland and England, when the kingdoms were diſtinct, to which both nations pretended a right.

BATACALA, a ſmall kingdom on the coaſt of Malabar

in the East Indies. It had a very large town of the same name; but there is nothing now left, except 11 or 12 small pagods covered with copper and stone. The country produces a good deal of pepper: the English formerly had a factory here; but were all massacred by the natives, because one of their bull-dogs had killed a consecrated cow.

Batacala, a fortified town and castle on the east coast of the island of Ceylon in the East Indies. The Dutch drove away the Portuguese, and possessed themselves of part of the adjacent country. E. long. 18. 3. N. lat. 7. 55.

BATANISTS, or Batenites. See Batenites.

BATASEK, a town of Lower Hungary, seated on the Danube, in E. long. 19. 50. N. lat. 46. 30.

BATAVIA, a city of the kingdom of Bantam in the island of Java, and capital of the Dutch settlements in the East Indies. The account of this place we shall blend with that of Java, a large island lying between 105° and 116° E. long. and from 6° to 8° S. lat. extending in length 700 miles, and in breadth about 100. It is situated to the south of Borneo, and south east from the peninsula of Malacca, having Sumatra lying before it, from which it is separated by a narrow passage, now so famous in the world by the name of the *Straits of Sunda*. The country is mountainous and woody in the middle; but a flat coast, full of bogs and marshes, renders the air unwholesome. It produces pepper, indigo, sugar, tobacco, rice, coffee, cocoa-nuts, plantains, cardamoms, and other tropical fruits. Gold also, but in no great quantities, has been found in it. It is diversified by many mountains, woods, and rivers; in all which nature has very bountifully bestowed her treasures. The mountains are many of them so high as to be seen at the distance of three or four leagues. That which is called the *Blue Mountain* is by far the highest of them all, and seen the farthest off at sea. They have frequent and very terrible earthquakes in this island, which shake the city of Batavia and places adjacent, to such a degree, that the fall of the houses is expected every moment. The waters in the road are excessively agitated, insomuch that their motion resembles that of a boiling pot; and in some places the earth opens, so as to afford a strange and terrible spectacle. The inhabitants are of opinion, that these earthquakes proceed from the mountain Parang, which is full of sulphur, saltpetre, and bitumen. The fruits and plants of this island are all in their several kinds excellent, and almost out of number. There are abundance of forests scattered over it, in which are all kinds of wild beasts, such as buffaloes, tygers, rhinoceroses, and wild horses, with an infinite variety of serpents, some of them of an enormous size. Crocodiles are prodigiously large in Java, and are found chiefly about the mouths of rivers; for, being amphibious animals, they delight mostly in marshes and savannahs. This creature, like the tortoise, lays its eggs in the hot sands, without taking any further care of them; and the sun hatches them at the proper season, when they run instantly into the water. There is, in short, no kind of animal wanting here: fowls they have of all sorts, and exquisitely good, especially peacocks, partridges, pheasants, wood-pigeons: and, for curiosity, they have the Indian bat, which differs little in form from ours; but its wings, when extended, measure a full yard, and the body of it is of the size of a rat. They have fish in great plenty, and very good; so that for the value of three-pence here may be enough bought to dine six or seven men. They have likewise a multitude of tortoises, the flesh of which is very little inferior to veal, and there are many who think it of a better flavour.

It has been asserted, that there are in the island upwards of 30 great towns, which, from the number of their inhabitants, would, in any other part of the world, merit the title of *cities*; and more than 4500 villages, besides hamlets, and straggling houses, lying very near each other, upon the sea-coast, and in the neighbourhood of great towns: hence, upon a fair and moderate computation, there are within the bounds of the whole island, taking in persons of both sexes, and of all ranks and ages, more than thirty millions of inhabitants.

In Java there are a great many princes, of which the most considerable are, the emperor of Materan, who resides at Katasura, and the kings of Bantam and Japara. Upon the first of these many of the petty princes are dependant; but the Dutch are absolute masters of the greatest part of the island, particularly of the north coast, though there are some of the princes beyond the mountains, on the south coast, who still maintain their independency. The natives of the country, who are established in the neighbourhood of Batavia, and for a tract of about 40 leagues along the mountains of the country of Bantam, are immediately subject to the governor-general. The company send drossards, or commissaries, among them, who administer justice and take care of the public expenditure.

The city of Batavia is the capital not only of this island but of all the Dutch dominions in India. It is an exceeding fine city, situated in the latitude of 6° south, at the mouth of the river Jucatra, and in the bosom of a large commodious bay, which may be considered not only as one of the safest harbours in India, but in the world. The city is surrounded by a rampart 21 feet thick, covered on the outside with stone, and fortified with 22 bastions. This rampart is environed by a ditch 45 yards over, and full of water, especially when the tides are high, in the spring. The avenues to the town are defended by several forts, each of which is well furnished with excellent brass cannon: no person is suffered to go beyond these forts without a passport. The river Jucatra passes through the midst of the town, and forms 15 canals of running water, all faced with free-stone, and adorned with trees that are ever green: over these canals are 56 bridges, besides those which lie without the town. The streets are all perfectly straight, and each, generally speaking, 30 feet broad. The houses are built of stone, after the manner of those in Holland. The city is about a league and a half in circumference, and has five gates; but there are ten times the number of houses without that there are within it. There is a very fine town-house, four Calvinist churches, besides other places of worship for all sorts of religions, a spin-huys or house of correction, an orphan-house, a magazine of sea-stores, several for spices, with wharfs and cord-manufactories, and many other public buildings. The garrison consists commonly of between 2000 and 3000 men. Besides the forts mentioned above, there is the citadel of Batavia, a very fine regular fortification, situated at the mouth of the river, and flanked with four bastions; two of which command the sea, and the other two the town. It is in this citadel that the governor general of the Indies has his palace; over against which is that of the director-general, who is the next person to the governor. The counsellors, and other principal officers of the company, have also their apartments there; as have likewise the physician, the surgeon, and the apothecary. There are in it, besides, arsenals and magazines furnished with ammunition for many years. The city of Batavia is not only inhabited by Dutch, French, Portuguese, and other Europeans, established here on account of trade; but also by a vast number of Indians of different nations, Javanese, Chinese, Malayans, Negroes, Amboynese, Armenians, natives of the isle of Bali, Mardykers or Topasses, Macassers, Timors, Bougis, &c. Of the Chinese, there are, it is said, about 100,000 in the island; of which near 30,000 resided in the city till the year 1740, when the Dutch, pretending that they were in a plot against them, sent a body of troops into their quarter, and demanded their arms, which the Chinese readily delivered up; and the next day the governor

ſent another body, with orders to murder and maſſacre every one of the Chineſe, men, women and children. Some relate there were 20,000, others 30,000, that were put to death, without any manner of trial: and yet the barbarous governor, who was the inſtrument of this cruel proceeding, had the aſſurance to embark for Europe, imagining he had amaſſed wealth enough to ſecure him againſt any proſecution in Holland: but the Dutch finding themſelves deteſted and abhorred by all mankind for this piece of tyranny, endeavoured to throw the odium of it upon the governor, though he had the hands of all the council of Batavia, except one, to the order for the maſſacre. The ſtates, therefore, diſpatched a packet to the Cape of Good Hope, containing orders to apprehend the governor, and ſend him back to Batavia to be tried. He was accordingly apprehended at the Cape; but has never been heard of ſince. It is ſuppoſed he was thrown over-board in his paſſage to Batavia, that there might be no farther inquiries into the matter; and it is ſaid, all the wealth this merciful gentleman had amaſſed, and with which he had freighted four ſhips, was, in the paſſage, utterly loſt.

Beſides the armed force of the garriſon here, the Dutch, it is ſaid, have about 15,000 men in the iſland, either Dutch, or formed out of the ſeveral nations they have enſlaved; and they have a fleet of between 20 and 30 men of war, with which they give law to every power on the coaſt of Aſia and Africa, and to all the European powers that viſit the Indian Ocean, unleſs we ſhould now except the Britiſh: it was, however, but a little before the revolution that they expelled us from our ſettlement at Bantam.

BATCHELOR. See Bachelor.

BATENITES, a ſect of apoſtates from Mahometaniſm diſperſed through the Eaſt, who profeſſed the ſame abominable practices with the Iſmaelians and Karmatians. The word properly ſignifies *eſoteric*, or people of inward or hidden light.

BATH, a city of Somerſetſhire in England, ſeated in W. long. 2. 30. N. lat. 51. 27. All the different names that this city has borne in different ages and languages have been taken from its medicinal waters, as the ὑδατα θερμα, or "hot waters," of Ptolemy; the *Aquæ Solis*, or "waters of the ſun," of Antoninus; the *Caer Baden*, and *Caer Ennant*, i. e. "the city of baths," and "the city of ointment," of the Britons; and the *Ackmancheſter*, i. e. "the city of valetudinarians," of the Saxons. The baths conſiſt of the King's-bath, the Queen's bath, the Croſs-bath, the Hot-bath, the Leper's bath, and the Duke of Kingſton's bath. This place was of old a reſort only for cripples and diſeaſed perſons; but now it is more frequented by the ſound for pleaſure than by the ſick for health. The manners of the place, and the motives of thoſe who viſit it, have been moſt ludicrouſly deſcribed in the celebrated poem intitled *The New Bath Guide*. With regard to the medicinal properties of the water, theſe have been ſet forth in a vaſt number of ſucceſſive publications by different phyſicians who have adopted that mode of recommending *themſelves* and the *remedy* at the ſame time. The waters are very pleaſant to the taſte; and are impregnated with a vitriolic principle, yielding, upon evaporation, a little neutral ſalt, and a calcareous earth and iron. They are very efficacious in ſtrengthening the bowels and ſtomach, bracing the relaxed fibres, and invigorating the circulation. In bilious complaints they are reckoned ſpecific; and prove ſerviceable in moſt nervous, paralytic, rheumatic, and gouty complaints. At the King's bath is a handſome pump-room, where the gentlemen and ladies go in a morning to drink the waters; and there is a band of muſic that plays all the time. In the Croſs-bath is a monument of marble, repreſenting the deſcent of the Holy Ghoſt attended by angels, erected by the earl of Melfort (who was ſecretary of ſtate for Scotland) when king James II. met his queen here. The King's-bath is a large baſon of 65 feet 10 inches by 40 feet 10 inches, containing 346 tuns 2 hogſheads and 36 gallons of water when filled to its uſual height. In the middle is a wooden building with niches and ſeats for the accommodation of the bathers. There are alſo iron rings all round for them to hold by; and guides, both male and female, to attend them in the bath. The perſon intending to bathe puts on, at his own lodgings, a bathing dreſs of brown canvas hired for the purpoſe; and is carried in a cloſe chair, of a particular make, to one of the ſlips which open into the bath. There he deſcends by ſteps into the water, where he is attended by a guide. Having ſtaid his ſtated time in the bath, he aſcends again into the ſlip, where he puts off his bathing-dreſs, and being wrapt up in blankets, is carried home to bed, where he lies for ſome time to encourage perſpiration. The King's-bath is overlooked by the company in the pump-room; and adjoining to it are places furniſhed with pumps to pour the hot ſtreams on any particular part of the body. The Queen's bath communicates with the king's, from which it is filled; therefore the water of it is not ſo hot, being at a greater diſtance from the ſource. As the heat is here moderate, the bathers deſcend firſt into the Queen's bath, and advance gradually to the centre of the other. In the year 1755, the abbey-houſe, or priory, belonging to the duke of Kingſton, was taken down, in order to erect a more commodious pile of building; and in digging for the foundation, the workmen diſcovered, about twenty feet below the ſurface of the earth, the remains of Roman baths and ſudatories conſtructed upon an elegant plan, with floors ſuſpended on pillars, and ſurrounded with tubulated bricks, for the conveyance of heat and vapour. Theſe were ſupplied by a ſpring of hot water, of the ſame properties and temperature with thoſe of the King's bath; and the ſewer was found ſtill entire, that conveyed the waſte water into the river. The duke, having cleared the ſpring and the ſewer, erected ſeveral convenient baths and ſudatories on the ſpot, where invalids may be accommodated at all hours, by night as well as by day. The two ſeaſons are the ſpring and fall; but thoſe who take the waters purely for their health do not regard the ſeaſons; but drink them all the year round. There are a number of genteel ſedan chairs which carry people to any diſtance not exceeding half a mile for ſixpence. The company aſſemble in the afternoon alternately, at two ſtately rooms, to converſe together, or play at cards. At a very pretty theatre near the parades, plays are acted every other night; and there are balls twice a-week; for which and the rooms, and books at the libraries, the gentry generally ſubſcribe. The city is ſurrounded with hills on all ſides, except a little opening to the eaſt and weſt, through which the Avon runs. This river, which has been made navigable to Briſtol by act of parliament, waſhes the city on the eaſt and ſouth ſides, and there is an elegant bridge over it. This city has formerly had a ſlight wall, of which ſome part ſtill remains, as well as one or two of its gates; but almoſt all the new buildings, and much the greateſt and fineſt part of the city, is without the walls, particularly the fine ſquare called *Queen's-ſquare*, in the middle of which is a ſmall garden, with gravel walks, and an obeliſk in the centre. But the greateſt ornament at Bath is the circus: it is of a circular form, conſiſting of houſes built on an uniform plan, with three openings at equal diſtances to the ſouth, eaſt, and weſt, leading into as many ſtreets. The fronts of the houſes, which are all three ſtories high, are adorned with three rows of columns in pairs of the Doric, Ionic, and Corinthian orders, the frize embelliſhed with ſculpture. The whole has an air of magnificence which cannot fail to ſtrike the moſt indifferent ſpectator. In the centre of the area is a reſervoir or baſon, filled by two o

three ſprings riſing in the neighbouring hills; whence the ſtreets in this diſtrict are ſupplied with water. On the ſouth ſide of the town are the north and ſouth parades, two noble walks paved with hewn ſtone, raiſed upon arches, facing each an elegant row of houſes on one ſide, and having a ſtone baluſtrade on the other. Theſe, with the two ſtreets that join them, were planned and executed by a Mr. Wood, an able architect, who likewiſe built the ſquare and projected the circus. The two public rooms ſtand betwixt the north parade and orange-grove; which laſt is a ſquare planted with trees, having in the middle a ſtone obeliſk, inſcribed in Latin to the late prince of Orange, who recovered his health in conſequence of drinking the Bath waters, and gave his name to this part of the town. Several new ſtreets and rows have of late years been built on the north ſide of Bath, in the neighbourhood of the ſquare, ſuch as Gay-ſtreet, Milſom-ſtreet, Edgar-row, Harlequin-row, Bladud's-buildings, King's-mead-ſtreet, Brock-ſtreet, &c. Their advantages for building here are very great, having excellent free-ſtone, limeſtone, and ſlate, in the neighbourhood. One ſort of their lime is as white as ſnow. The guild-hall of Bath ſtands in the market-place, and is ſaid to be built on a plan of Inigo Jones, which however exhibits nothing worthy of that great architect: beſides, one end of it has been rebuilt in a different ſtyle. The hall is ornamented with ſome portraits of the late prince of Wales and other remarkable perſonages: but the greateſt curioſity of the place is a Minerva's head in bronze, a real antique, dug up in Stall-ſtreet, in the year 1725. Bath boaſts a noble infirmary, or general hoſpital, for the reception of the ſick and lame from all parts of the three kingdoms. It extends 100 feet in front, and 90 in depth, being capable of receiving 150 patients. Here was anciently a monaſtery, of which the preſent cathedral was the church. It is a venerable pile; the principal front of which is adorned with angels aſcending and deſcending. There are three other churches in Bath, and ſeveral chapels and meeting-houſes. Beſides the infirmary, there are ſeveral other hoſpitals, alms houſes, and charity ſchools. The corporation conſiſts of a mayor; eight aldermen, of whom two are juſtices of the peace; and 24 common-council men. The city is extremely well provided with ſtage-coaches, poſt-coaches, chaiſes, machines, and waggons. Bath is the general hoſpital of the nation, and a great number of invalids find benefit from the waters: but as the city lies in a bottom ſurrounded by very high hills, the air is conſtantly ſurcharged with damps; and indeed this place is more ſubject to rain than any other part in England. The markets are remarkably well ſupplied with proviſions of all kinds at reaſonable rates, particularly fiſh and poultry. They alſo afford excellent mutton fed upon Lanſdown, one of the higheſt hills that overlook the city. This down, remarkable for its pure air, extends about three miles; and at the extremity of it there is a ſtone monument, with an inſcription, erected to the memory of Sir Beville Granville, who was here killed in a battle which he fought with the parliament's army in the reign of Charles I. Bath ſends two members to parliament. The earldom of Bath was beſtowed on William Pulteney in the end of Sir Robert Walpole's adminiſtration as a reward for his patriotiſm, but is now extinct for want of heirs-male.

Bath is joined with Wells to form a biſhopric, called the dioceſe of Bath and Wells. The biſhop's ſeat is at Wells, whoſe cathedral church was built by Ina, king of the Weſt Saxons in 704, and by him dedicated to St. Andrew. Several other of the Weſt Saxon kings endowed it, and it was erected into a biſhopric in 905, during the reign of king Edward the Elder. The preſent church was begun by Robert the 18th biſhop of this ſee, and completed by his immediate ſucceſſor. John de Villula, the 16th biſhop, having purchaſed the city of Bath for 500 merks of king Henry I. transferred his ſeat to that city in 1088. From this, diſputes aroſe between the monks of Bath and the canons of Wells, about the election of a biſhop; but they were at laſt compromiſed by Robert the 18th biſhop, who decreed, that from henceforward the biſhop ſhould be ſtyled from both places, and that the precedency ſhould be given to Bath; that in the vacancy of the ſee, the biſhop ſhould be elected by a certain number of delegates from both churches; and that he ſhould be inſtalled in them both; both of them to conſtitute the biſhop's chapter; and all his grants and patents to be confirmed in both. So it ſtood till the reformation. But in the 35th of king Henry VIII. an act of Parliament paſſed for the dean and chapter of Wells to make one ſole chapter for the biſhop. This dioceſe hath yielded to the church of Rome one cardinal, and to the civil ſtate of England ſix lord chancellors, five lord treaſurers, one lord privy ſeal, one lord preſident of Wales, and principal ſecretary of ſtate. The dioceſe contains the whole county of Somerſet, except a few churches in the city of Briſtol; the number of pariſhes amounting to 388, and the churches and chapels to 503. Of the pariſhes 160 are impropriate. It is valued in the king's books at 535l. 1s. 3d. and computed to be worth annually 2200l. The clergy's tenth is 353l. 18s. $0\frac{3}{4}$d. To the cathedral belong a biſhop, a dean, three archdeacons, a chancellor, a treaſurer, a ſub-dean, fifty-nine prebendaries, four prieſt-vicars, eight lay vicars, an organiſt, ſix choriſters, and other dependents.

Knights of the Bath, a military order in England, concerning the origin of which antiquaries differ greatly in their accounts. The following ſeems the moſt probable deduction. The knighthood of the Bath it is probable was practiſed by the ancient Franks, the inhabitants of Lower Germany, with whom it is highly probable the Saxons, who invaded England, had the ſame common deſcent, and, with other cuſtoms, upon their ſettling here, introduced the ſame method of knighthood. Theſe ancient Franks, when they conferred knighthood, obſerved, amongſt other ſolemn rites, bathing before they performed their vigils; which cuſtom was once practiſed in England, but diſcontinued when the order became ſtatutable in the year 1725: thence, however, their denomination of *Knights of the Bath*.

In the reign of Henry IV. there was a degree of knighthood ſpecified under the expreſs appellation of *The Bath*. That king, on the day of his coronation in the tower of London, conferred the ſame upon 46 eſquires, who had watched all the night before, and had bathed themſelves. From that time it was cuſtomary with our kings to confer this dignity preceding their coronations, the coronations of their queens, the birth and marriage of the royal iſſue, and their firſt advancement to honours, upon their deſigned expeditions againſt their foreign enemies, upon inſtallations of knights of the garter, and when ſome grand anniverſary feſtivals were celebrated. The laſt knights of the Bath ſo made were at the coronation of King Charles II. in 1661; after which the order was neglected until the year 1725, when George I. was pleaſed to revive it, and to order a book of ſtatutes for the government of the order. By this the number of knights is fixed to 38, viz. the Sovereign, and 37 knights companions

The apparel of a knight of the Bath is a red furcoat, lined and edged with white, girded about with a white girdle, without any ornament thereon; the mantle is of the ſame colour and lining, made faſt about the neck with a lace of white ſilk having a pair of white gloves tied therein, with taſſels of ſilk and gold at the end; which mantles are adorned upon the left ſhoulders with the enſign of the order, being three imperial crowns *or*, ſurrounded with the ancient motto of this knighthood, *Tria juncta in uno*, wrought upon a circle

gules, with a glory or rays iſſuing from the centre, and under it the lace of white ſilk heretofore worn by the knights of the Bath. They have red breeches and ſtockings, and have white hats, with a plume of white feathers thereon. They are allowed to wear a ſtar on their ordinary dreſs upon the left breaſt, but only after the ceremony of inſtallation, or whilſt in a diplomatic character in a foreign country. The ribband of the order, which is red, is worn acroſs the ſhoulder from the time of the knights being inveſted. The king allowed the chapel of King Henry VII. to be the chapel of the order, and ordered that each knight's banner, with plates of his arms and ſtyles, ſhould be placed over their ſeveral ſtalls, in like manner as the knights of the Garter in St. George's Chapel in the caſtle of Windſor; and he allowed them ſupporters to their arms. His Royal Highneſs the Duke of York, ſecond ſon to his preſent Majeſty, is firſt and principal knight-companion, and acts as great maſter of the order. The dean of Weſtminſter for the time being is, agreeably to the ſtatutes, dean of the order; the other officers of which are, Bath king of arms, a genealogiſt, regiſter, ſecretary, gentleman uſher, and meſſenger.

Theſe ſeveral officers have their particular duties aſſigned them by the ſtatutes. The office of genealogiſt is a diſtinct office of record for the pedigrees of the knights of the order and their eſquires, which are entered in a regular ſeries from the year 1399, the period at which the order was originally inſtituted, to the preſent time. The office of genealogiſt has been ſucceſſively filled by John Anſtis, Eſq. John Suffield Browne, Eſq. and George Nayler, Eſq. York Herald, its preſent poſſeſſor.

Bath, *Balneum*, a convenient receptacle of water for perſons to waſh or plunge in, either for health or pleaſure.—Baths are diſtinguiſhed into *hot* and *cold*; and theſe again are either natural or artificial. The natural hot baths are formed of the water of hot ſprings, of which there are many in different parts of the world; eſpecially in thoſe countries where there are or have evidently been volcanoes. The artificial hot baths conſiſt either of water or of ſome other fluid made hot by art. The cold bath conſiſts of water, either freſh or ſalt, in its natural degree of heat; or it may be made colder by art, as by a mixture of nitre, ſal-ammoniac, &c. The chief hot baths in our country are thoſe of Bath and Briſtol, in Somerſetſhire; and thoſe alſo of Buxton and Matlock, in Derbyſhire; which latter, however, are rather warm or tepid than hot. The uſe of theſe baths is found beneficial in diſeaſes of the head, as palſies, &c. in cuticular diſeaſes, as leproſies, &c. obſtructions and conſtipations of the bowels, the ſcurvy and ſtone, and in many diſeaſes of women and children. The baths have performed many cures, and are commonly uſed as a laſt remedy in obſtinate chronic diſeaſes; in which they ſucceed well, if they happen to agree with the conſtitution of the patient: but whether they will agree or not, cannot be known but by making the experiment.

With regard to the origin of thoſe hot waters, of which the natural hot baths are formed, we are very much in the dark. All that can be affirmed with certainty is, that where there are volcanoes, there alſo are hot ſprings in very great abundance; but how the heat of the volcano ſhould be conſtantly communicated to the waters of a ſpring for many ages, during a great part of which the volcano itſelf has lain in a dormant ſtate, ſeems almoſt beyond the reach of inveſtigation. Another thing that creates a great difficulty is, that the fire of a volcano muſt certainly lie very deep in the earth, and moſt probably ſhifts from place to place; but the waters of a ſpring muſt always iſſue from a place ſituated lower than the origin of the ſpring itſelf. Beſides, though we ſhould ſuppoſe the water to come from the top of a volcano itſelf, and conſequently boiling hot, it could not be ſuppoſed to percolate far through cold earth, without loſing all the heat it acquired from the volcano. From ſome obſervations, however, it certainly does appear, that there are ſome ſpots on the earth which have a power of producing heat within themſelves, independent of any thing foreign; and that water is ſo far from being able to deſtroy this power, that it ſeems rather to promote and continue it. We know that water has this effect upon a mixture of iron filings and ſulphur; but whatever quantities of ſimilar ſubſtances we may ſuppoſe to be contained in the earth, we muſt alſo ſuppoſe to be deſtroyed by one great conflagration ſoon after they have begun to act upon each other, ſo that by their means no laſting heat in waters could be produced. Dr. Stukely indeed would ſolve this, and ſeveral other phænomena, by making the fire and ſmoke of volcanoes the effects of electricity: but here ſufficient proof is wanting; for electricity, even in its moſt powerful ſtate, is not very apt to ſet bodies on fire. The thought, however, deſerves attention; for if electricity is capable of ſetting a volcano on fire, it is undoubtedly capable of producing ſolfaterras where it meets with proper materials, and from them ſprings of any degree of heat.

The cold bath, though popularly eſteemed one of the moſt innocent remedies yet diſcovered, is not however to be adopted indiſcriminately. On the contrary, it is liable to do conſiderable miſchief in *all* caſes of *diſeaſed viſcera*, and is not in any caſe proper to be uſed during the exiſtence of coſtiveneſs. As a preventive remedy for the young, and as a general bracer for perſons of a relaxed fibre, eſpecially of the female ſex, it often proves highly advantageous; and in general the popular idea is a correct one, that the *glow* which ſucceeds the uſe of the cold or temperate baths is a teſt of their utility, while, on the other hand, their producing *chillneſs*, head ach, &c. is a proof of their being pernicious.

Baths *in vapour*: in theſe the ſteam of ſome decoction is received upon the body to promote a perſpiration, or to act medicinally by abſorption or otherwiſe. They are alſo by ſome called *Balnea Laconica*. *Vapour* baths are ſo called when the patient is not plunged into what is prepared for the bath, but only receives its ſteam upon thoſe parts of his body which require it: as in ſome diſeaſes of the anus and womb, where the patient ſits and receives the fumes of ſome proper fomentation, &c. To theſe may be added the bagnio; where people are made to ſweat by the heat of a room, or the affuſion of hot water; after which they generally go into a hot bath or bagnio.

A peculiar ſort of vapour bath was much uſed by the ancient Mexicans, and is ſtill in uſe among the preſent Indians their deſcendants. According to the Abbé Clavigero, theſe baths are built of raw bricks, and their form is ſimilar to that of ovens for baking bread: but with this difference, that the pavement of the bath is a little convex, and lower than the ſurface of the earth; whereas that of moſt ovens is plain, and a little elevated for the accommodation of the baker. The greateſt diameter of a bath is about eight feet, and its greateſt height ſix. The entrance, like the mouth of an oven, is wide enough to allow a man to creep eaſily in. In the place oppoſite to the entrance there is a furnace of ſtone or raw bricks, with its mouth outwards to receive the fire, and a hole above it to carry off the ſmoke. The part which unites the furnace to the bath, and which is about two feet and a half ſquare, is ſhut with a certain dry ſtone of a porous texture. In the upper part of the vault there is an air-hole, like that to the furnace. This is the uſual ſtructure of the temazcalli; but there are others that are without vault or furnace, mere little ſquare chambers, yet well covered and defended from the air. When any perſon goes to bathe, he firſt lays a mat within the temazcalli, a pitcher of water, and a bunch of herbs or leaves

of maize. He then cauſes a fire to be made in the furnace, which is kept burning until the ſtones which join the bath and furnace are quite hot. The perſon who is to uſe the bath enters commonly naked, and generally accompanied, for the ſake of convenience, or on account of infirmity, by one of his domeſtics. As ſoon as he enters, he ſhuts the entrance cloſe, but leaves the air-hole at top for a little time open, to let out any ſmoke which may have been introduced through the chinks of the ſtone; when it is all out, he likewiſe ſtops up the air-hole. He then throws water upon the hot ſtones, from which immediately ariſes a thick ſteam to the top of the temazcalli. While the ſick perſon lies upon the mat, the domeſtic drives the vapour downwards, and gently beats the ſick perſon, particularly on the ailing part, with the bunch of herbs, which are dipped for a little while in the water of the pitcher, which has then become pretty warm. The ſick perſon falls immediately into a ſoft and copious ſweat, which is increaſed or diminiſhed at pleaſure, according as the caſe requires. When the evacuation deſired is obtained, the vapour is let off, the entrance is cleared, and the ſick perſon clothes himſelf, or is tranſported on the mat to his chamber; as the entrance to the bath is uſually within ſome chamber of his habitation.—This ſort of bath, called *temazcalli* by the natives, has been regularly uſed in ſeveral diſorders, particularly in fevers. The Indian women uſe it commonly after childbirth, and alſo thoſe perſons who have been ſtung or wounded by any poiſonous animal. It is undoubtedly a powerful remedy for all diſeaſes which ariſe from ſuppreſſed perſpiration, as colds, catarrhs, &c. and certainly would be highly uſeful in Italy, and other countries where the rheumatiſm is ſo frequent and afflicting a diſeaſe. When a very copious ſweat is deſired, the ſick perſon is raiſed up and held in the vapour; as he ſweats the more the nearer he is placed to it. The temazcalli is ſo common, that in every place inhabited by the Indians there are many of them.

Baths *(Dry)*, are thoſe made of aſhes, ſalt, ſand, &c. &c. The ancients had many ways of exciting a ſweat, by means of a dry heat; as by the uſe of hot ſand, ſtove-rooms, or artificial bagnios, and even from certain natural hot ſteams of the earth, received under a proper arch, or hot-houſe, as we learn from Celſus. They alſo had another kind of bath by inſolation, where the body was expoſed to the ſun for ſome time, in order to draw forth the ſuperfluous moiſture from the inward parts; and to this day it is a practice in ſome nations to cover the body over with horſe-dung, eſpecially in painful chronic diſeaſes. In New England they make a kind of ſtove of turf, wherein the ſick are ſhut up to bathe or ſweat. It was probably from a knowledge of this practice, and of the exploded doctrines of Celſus, that the noted empiric Dr. Graham drew his notions of the ſalutary effects of what he called *earth-bathing*, a practice which, in the way he uſed it, conſigned ſome of his patients to a perpetual manſion under ground!

The like name of *dry* bath is ſometimes alſo given to another kind of bath, made of kindled coals, or burning ſpirit of wine; the patient being placed in a convenient cloſe chair for the reception of the fume, which riſes and provokes ſweat in a plentiful manner: care being here taken to keep the head out, and to ſecure reſpiration. This bath has been found very effectual in removing old obſtinate pains in the limbs.

Dry bathing of this latter kind is nearly ſimilar to a proceſs employed in medicine termed *fumigation*, in which the dry vapours of mineral and other ſubſtances being applied to the ſkin, the abſorbent veſſels take up and convey into the blood the ſubtle parts that come in contact with their mouths or oriſices. By the ſubtle fumes thus received, much benefit or prejudice may be produced, according to the nature of the caſe, and the conſtitution on which its effects are to be exerted; as is evident from the palſies produced among watergilders, workers in lead-mines, &c. and alſo from the benefits received in many caſes when the air is impregnated with ſalutary materials. Catarrhs and colds, for inſtance, are relieved by fumes received with the breath; and, by the ſame method, expectoration is aſſiſted in the aſthma; and even ulcers in the lungs are ſaid to have been relieved by this method. But this is ſtill more ſtrongly exemplified by the common practice of curing venereal ulcers, and exciting the general action of quickſilver in the ſyſtem, by incloſing the naked body of the patient in a box fitted to receive the fumes of quickſilver raiſed by ſprinkling cinnaber upon a red hot iron, or, what is ſtill better, the *Hydrargyrus præcipitatus cinereus* of the Pharmacopœia Chirurgica, which not emitting any ſulphureous vapours like the other, proves leſs inconvenient to the patient.

Some authors ſpeak of blood baths, *balnea ſanguinolenta*, prepared eſpecially of the blood of infants, anciently ſuppoſed to be a kind of ſpecific for the leproſy.

Baths (*Metalline*), thoſe made of water impregnated with the *ſcoriæ* of metals. It is thought the moſt common and uſeful of this kind are thoſe prepared with the *ſcoriæ* of iron, which are reputed excellent bracers for weak and decayed limbs; and alſo uſeful in ſtopping hemorrhages, and reſtoring the menſtrual flux when obſtructed; inſomuch, that they may even be ſubſtituted for the natural iron baths with great propriety.

Adjacent to the ſmelting huts where metals are run from their ore, are to be found large quantities of the ſlag of copper, antimony, and cobalt, which abound with ſuch principles as make ſerviceable baths for ſtrengthening the loſt tone of the muſcular fibres, or relaxing them when they are too rigid. Theſe baths have likewiſe a deterſive and cleanſing virtue; ſo that with a prudent regard to circumſtances, they may be uſed with advantage on many occaſions. The way of making theſe artificial baths is, either to take the ſlags as they come hot from the furnace, or elſe to heat them afreſh, and throw them into hot water; which is afterwards to be uſed either in the way of bath or fomentation, occaſionally. There are other artificial baths, prepared of alum and quick lime, by boiling them together in water. Such baths are ſuppoſed to be ſerviceable in paralytic diſorders and weakneſs of the limbs.

The pepper bath, or *peffer waſſer*, on the Alps, is one of the moſt celebrated in Europe, and has been the ſubject of expreſs treatiſes, beſides what has been ſaid of it occaſionally by Scheuchzer and others. It was firſt diſcovered in the year 1240, and is of the periodical kind. The water breaks forth in a dreadful chaſm of the earth, ſcarcely acceſſible to the ſunbeams, or indeed to men, unleſs of the greateſt fortitude and courage. Theſe ſtreams have this ſingularity above all others, that they commonly break forth in May, and that with a ſort of impetuoſity, bringing with them beech-leaves, crabs, or other wood-fruit; and that their courſe ceaſes in September or October. Scheuchzer profeſſes himſelf of opinion that theſe waters are not impregnated with any minerals, or if they do contain any, that their virtues in curing diſtempers and preſerving health do not proceed from them. They are exceedingly clear, and have neither colour, taſte, nor ſmell.

Baths (*Balnea*), in architecture, denote large and ſuperb buildings among the ancients, erected for the convenience of bathing, or waſhing the body. Baths made a part of the ancient *gymnaſia*, though they were frequented more for the ſake of pleaſure than health, as in our days. The moſt magnificent baths were thoſe of Titus, Paulus Æmilius, and Dioclefian, of which there are ſome ruins ſtill remaining. It is ſaid that at Rome there were 856 public baths. Fabricius adds, that the

exceſſive luxury of the Romans appeared in nothing more viſible than in their baths. Seneca complains, that the baths of plebeians were filled from ſilver pumps; and that the freedmen trod on gems. Macrobius tells us of one Sergius Oratus, a voluptuary, who had pendant baths hanging in the air.

According to Dion, Mæcenas was the firſt who made a bath at Rome. Yet there are inſtances of public baths prior to this; but they were of cold water, ſmall, and but poorly decorated. Agrippa, in his ædilate, built 160 places for bathing, where the citizens might be accommodated, either with hot or cold water *gratis*. After this example, Nero, Veſpaſian, Titus, Domitian, Severus, Gordian, Aurelian, Maximian, Dioclefian, and moſt of the emperors who ſtudied to gain the affections of the people, erected baths laid with the richeſt marble, and wrought according to the rules of the moſt delicate architecture. The rich had baths at home, and frequently very magnificent ones, eſpecially after the time that the practice of pillaging the provinces had begun; but they only uſed them on extraordinary occaſions. The great men, and even emperors themſelves, ſometimes bathed in public with the reſt of the people. Alexander Severus was the firſt who allowed the public baths to be opened in the night-time during the heats of ſummer.

The Greek baths were uſually annexed to *paleſtræ* or *gymnaſia*, of which they were conſidered as a part. Theſe baths conſiſted of ſeven different apartments, uſually ſeparated from each other, and intermixed with other buildings belonging to the other ſorts of exerciſes. Theſe were, firſt, the cold bath, *frigida lavatio*; 2dly, The *elæotheſium*, or room where they were anointed with oil; 3dly, The *frigidarium*, or cooling room; 4thly, The *propnigeum*, or entrance of the *hypocauſtum*, or ſtove; 5thly, The vaulted room for ſweating in, or vapour-bath, called *concamerata ſudatio*, or *tepidarium*; 6thly, The *laconicum*, or dry ſtove; 7thly, The hot bath, called *callida lavatio*. As for the baths ſeparate from the *paleſtræ*, they appear to have been uſually double, one for men, the other for women; but ſo near, that the ſame furnace heated both. The middle part was poſſeſſed by a large baſon that received water by ſeveral pipes, and was ſurrounded by a baluſtrade, behind which there was an area for the reception of thoſe who waited to uſe the bath. They were vaulted over, and only received light from the top.

In the Roman baths, the firſt part that appeared was a large baſon, called κολυμβηθρα in Greek, and *natatio* or *piſcina* in Latin. In the middle was the *hypocauſtum*, which had a row of four apartments on each ſide, called *balnearia*: theſe were the ſtove, the bath, cold bath, and *tepidarium*. The two ſtoves, called *laconicum* and *tepidarium*, were circular and joined together. Their floor was hollow and ſuſpended, in order to receive the heat of a large furnace, which was communicated to the ſtoves through the interpoſing vacuities. This furnace alſo heated another room called *vaſarium*, in which were three large brazen veſſels called *milliaria*, reſpectively containing hot, warm, and cold water; which were ſo diſpoſed, that the water might be made to paſs by ſyphons and pipes out of one or other of them into the bath, in order to adjuſt its temperature. The deſcription is given by Vitruvius. At three in the afternoon, which is what Pliny calls *hora octava et nona*, the Romans all repaired to the baths, either the public or the private ones: this was called the *bath hour*, *hora balnei*, which in winter was at nine, in ſummer at eight. The public baths were all opened by the ſound of a bell, and always at the ſame hour; and thoſe who came too late, of courſe ſtood the chance of bathing with little advantage or comfort to themſelves.

They began with hot water; after which, as the pores were opened, and might cauſe too plentiful a perſpiration, they thought it neceſſary for health to cloſe them again, either with the cold bath, or at leaſt with a ſprinkling of cold water. During the bath, the body was ſcraped with a kind of knives, or ſmall ſtrigils, ſuch as are ſtill found in the cabinets of the curious. After bathing ſucceeded unction and perfuming, from which they went freſh to ſupper. The Romans, when they found their ſtomachs overcharged with meat, went to the bath, as we learn from Juvenal, who inveighs againſt thoſe who, having gorged themſelves with eating, were forced to go into the baths, to give themſelves relief. They found alſo that a bath was good to refreſh themſelves after any conſiderable fatigue or travel, as Celſus tells us; which makes Plautus ſay, that all the baths in this world were not ſufficient to remove the wearineſs he felt. After Pompey's time the humour of bathing was carried to ſo great an exceſs that many were debilitated, and ſeveral brought themſelves to ſuch a pitch, that they could not bear food without bathing firſt. The emperor Titus is ſaid to have loſt his life by this. Hence it is that Pliny inveighs ſeverely againſt thoſe phyſicians who held, that hot baths digeſted the food. The emperor Hadrian firſt laid a reſtraint on the immoderate paſſion for bathing, by a public edict, prohibiting all perſons to bathe before the eighth hour.

Baths *of Agrippa (thermæ Agrippinæ)* were built of brick, but painted in enamel: thoſe of Nero, *thermæ Neronianæ*, were not only furniſhed with freſh water, but even had the ſea brought into them: thoſe of Caracalla were adorned with 200 marble columns, and furniſhed with 1600 ſeats of the ſame matter. Lipſius aſſures us they were ſo large, that 1800 perſons might conveniently bathe in them at the ſame time. But the baths of Dioclefian, *thermæ Dioclefianæ*, ſurpaſſed all the reſt in magnificence. One hundred and forty thouſand men were employed many years in building them. Great part of theſe, as well as thoſe of Caracalla, are ſtill ſtanding; and with the vaſt high arches, the beautiful and ſtately pillars, the extraordinary plenty of foreign marble, the curious vaulting of the roofs, the prodigious number of ſpacious apartments, and a thouſand other ornaments, conſtitute one of the greateſt curioſities of modern Rome.

Bath, in chemiſtry. Several matters employed to tranſmit heat are called baths; but the ſubſtances moſt frequently uſed by chemiſts for this purpoſe, are water and ſand. When water is employed, it is called *Balneum Mariæ*, or *water bath*; which is frequently uſed, very convenient for many operations, and may be employed ſucceſsfully for all degrees of heat inferior to that of boiling water. As water, when expoſed to fire in any veſſel from which it can evaporate, does only receive a determinate degree of heat, which always remains the ſame when once it has arrived to the boiling heat, it follows, that by the water bath, a degree of heat always equal may be tranſmitted with certainty. Farther, this degree of heat being incapable of burning, or of communicating an empyreumatic quality to matters ſuſceptible of it, the water bath has alſo the advantage of not expoſing ſubſtances to this inconvenience. When veſſels in which diſtillations and digeſtions are made, are placed in ſand, then is formed what is termed a *ſand bath*. This intermediate ſubſtance of ſand is very convenient to moderate the too great activity of the naked fire, and to tranſmit any degree of heat from the weakeſt to a red heat. As this bath is attended with leſs trouble, and requires a leſs conſiderable apparatus than the water bath, it is much uſed in laboratories. Nothing is requiſite for the ſand bath, but an earthen or iron pot filled with fine ſand, which is fitted into a furnace, and capable of containing the cucurbits, retorts, matraſſes, or other veſſels containing the matter to be operated upon.

Bath, in metallurgy, is uſed to ſignify the fuſion of metallic matter in certain operations. In refining or cupelling, for example, the metals are ſaid to be in bath when they are melted.

When gold is purified by antimony, this semi-metal melted, is called by some the *bath of gold;* alchemists, who considered gold as the king of metals, called antimony the *bath of the king only;* because in fact gold only can resist the action of antimony.

Bath, in Hebrew antiquity, a measure of capacity, containing the tenth part of an omar, or seven gallons and four pints, as a measure for liquid things; or three pecks and three pints, as a measure for dry goods.

Bath-*Kol*, the *daughter of a voice*. So the Jews call one of their oracles, which is frequently mentioned in their books, especially the Talmud; being a fantastical way of divination invented by the Jews themselves, though called by them a revelation from God's will, which he made to his chosen people, after all verbal prophecies had ceased in Israel. It was in fact a method of divination similar to the *sortes Virgilianæ* of the Heathens. For as, with them, the first words they happened to dip into, in the works of that poet, were a kind of oracle whereby they predicted future events; so, with the Jews, when they appealed to Bath-kol, the first words they heard from any man's mouth were looked upon as a voice from heaven, directing them in the matter they inquired about. The Christians were not quite free from this superstition, making the same use of the book of the Scriptures as the Pagans did of the works of Virgil. It was practised by Heraclius, emperor of the East, in the beginning of the seventh century: for, being at war with Chosroes king of Persia, and in doubt, after a successful campaign, where to take up his winter quarters, he consulted the book of the Scriptures in this way of divination, and was determined by it. In France, it was the practice for several ages to use this kind of divination at the consecration of a bishop, in order to discover his life, manners, and future behaviour. This usage came into England with the Norman conquest; for we are told, that at the consecration of William the second Norman bishop of the diocese of Norwich, the words which first occurred on dipping into the Bible were, *Not this man, but Barabbas:* soon after which, William died, and Herbert de Lozinga, chief simony-broker to King William Rufus, succeeded him; at whose consecration the words at which the Bible opened were the same which Jesus spoke to Judas the traitor; *Friend, wherefore art thou come?* This circumstance so affected Herbert, that it brought him to a thorough repentance of his crime; in expiation of which he built the cathedral church of Norwich, having laid the first stone of that edifice in the year 1096.

BATHA, Bath, or *Bachia*, a town of Hungary, and capital of a county of the same name, seated on the Danube. E. long. 20. 40. N. lat. 46. 40.

BATHING, the act of using or applying a bath; that is, of immerging the body, or part of it, in water or some other fluid. Bathing is a practice of great antiquity. The Greeks, as early as the heroic age, are said to have bathed themselves in the sea, in rivers, &c. We even find mention in Homer of hot baths in the Trojan times; but these seem to have been very rare, and only used on extraordinary occasions. Athenæus speaks of hot baths as unusual even in his age. In reality, public baths appear to have been discouraged, and even prohibited, by the ancient Greeks, who were contented to wash themselves at home in a sort of bathing-tubs. The method of bathing among the ancient Greeks was, by heating water in a large vessel with three feet, and thence pouring it on the head and shoulders of the person seated in a tub for that purpose, who was also anointed with oil on coming out.

The Romans were also long before they came into the use of baths; the very name of which, *thermæ*, shows they borrowed it from the Greeks. As the ancient Romans were chiefly employed in agriculture, their custom was, every evening after work, to wash their arms and legs, that they might sit down to supper with more decency: for it is to be observed, the use of linen was then unknown; and the people of that age went with their arms and legs bare, and consequently exposed to dust and filth. But this was not all; for every ninth day, when they repaired to the city, either to the nundinæ, or to attend at the assemblies of the people, they bathed all over in the Tiber, or some other river which happened to be nearest them. This seems to have been all the bathing known till the time of Pompey, when the custom began of bathing every day. See Bath. The Celtic nations were not without the use of bathing: the ancient Germans bathed every day in warm water in winter, and in cold in summer. In England, the famous bath which gives its own name to the city in which it exists, is said by some to have been in use 800 years before Christ. Of this, however, it must be owned, we have but very slender evidence; though Dr. Musgrave makes it probable that it was a place of considerable resort in Geta's time; there being still the remains of a statue erected to that general, in gratitude for some benefactions he had conferred upon it.

Yet although, among the ancients, bathing made as it were a part of diet, and was used as familiarly as eating or sleep, it was not altogether devoted to the purposes of luxury or even of cleanliness; for it was likewise in great esteem among their physicians for the cure of diseases, as appears from Strabo, Pliny, Hippocrates, and Oribasius; whence frequent exhortations to washing in the sea, and plunging into cold water. The first instance of cold bathing, as a medicine, is Melampus's bathing the daughters of the king of Argos; and the first instance of warm bathing is Medea's use of it, who was said to boil people alive, because Pelias king of Thessaly died in a warm bath under her hands. The cold bath was used with success by Antonius Musa, physician to the emperor Augustus, for the recovery of that prince; but fell into neglect after the death of Marcellus, who was thought to have been destroyed by the improper use of it. It was again brought into request towards the close of the reign of Nero, by means of a physician of Marseilles named *Charmis*; but during the ignorance of the succeeding ages, the practice was again banished for a long time. Both hot and cold bathing are now prescribed in many cases by the physicians, though they are not exactly agreed as to the manner in which these operate in the cure or relief of diseases.

Bathing among the Turks, as among the ancients, makes a part of diet and luxury; so that in every town, and even village, there is a public bath. Indeed, the necessity of cleanliness, in a climate where one perspires so copiously, has rendered bathing indispensable; the comfort it produces preserves the use of it; and Mahomet, who knew its utility, has reduced it to a precept. Of these baths, and the manner of bathing particularly at Cairo, the following account is given in the Letters on Egypt published by M. Savary.

"The first apartment one finds in going to the bath, is a large hall, which rises in the form of a rotunda. It is open at the top, to give a free circulation to the air. A spacious estrade, or raised floor, covered with a carpet, and divided into compartments, goes around it, on which one lays one's clothes. In the middle of the building, a jet-d'au spouts up from a bason, and agreeably entertains the eye. When you are undressed, you tie a napkin round your loins, take a pair of sandals, and enter into a narrow passage, where you begin to be sensible of the heat. The door shuts to; and, at 20 paces off, you open a second, and go along a passage, which forms a right angle with the former. Here the heat increases. They who are afraid of suddenly exposing themselves to a stronger degree of it, stop in a marble hall, in the way to the bath properly so called. The bath is a spacious and vaulted apart-

ment, paved and lined with marble, around which there are four cloſets. The vapour inceſſantly riſing from a fountain and ciſtern of hot water, mixes itſelf with the burning perfumes. Theſe, however, are never burnt except the perſons who are in the bath deſire it. They mix with the ſteam of the water, and produce a moſt agreeable effect.

" The bathers are not impriſoned here, as in Europe, in a ſort of tub, where one is never at one's eaſe. Extended on a cloth ſpread out, the head ſupported by a ſmall cuſhion, they ſtretch themſelves freely in every poſture, whilſt they are wrapped up in a cloud of odoriferous vapours, which penetrates into all their pores. After repoſing there ſome time, until there is a gentle moiſture over the whole body, a ſervant comes, preſſes you gently, turns you over, and, when the limbs are become ſupple and flexible, he makes all the joints crack without any difficulty. He maſſes and ſeems to knead the fleſh without making you feel the ſmalleſt pain. This operation finiſhed, he puts on a ſtuff glove, and rubs you a long time. During this operation, he detaches from the body of the patient, which is running with ſweat, a ſort of ſmall ſcales, and removes even the imperceptible dirt that ſtops the pores. The ſkin becomes ſoft and ſmooth like ſatin. He then conducts you into a cloſet, pours the lather of perfumed ſoap upon your head, and withdraws. The ancients did more honour to their gueſts, and treated them in a more voluptuous manner. Whilſt Telemachus was at the court of Neſtor, ' the beautiful Polycaſta, the handſomeſt of the daughters of the king of Pylos, led the ſon of Ulyſſes to the bath; waſhed him with her own hands; and, after anointing his body with precious oils, covered him with rich habits and a ſplendid cloak.' Piſiſtratus and Telemachus were not worſe treated in the palace of Menelaus. ' When they had admired its beauties, they were conducted to baſons of marble, where a bath was prepared: beautiful female ſlaves waſhed them; and, after anointing them with oil, covered them with rich tunics and ſuperb pellices.'

" The cloſet to which one is conducted is furniſhed with a ciſtern and two cocks; one for cold and the other for hot water. There you waſh yourſelf. Soon after the ſervant returns with a depilatory pomatum, which in an inſtant makes the hair fall off the places it is applied to. Both men and women make general uſe of it in Egypt. It is compoſed of a mineral called *ruſma*, which is of a deep brown. The Egyptians burn it lightly, knead it with water, mixing it with half the quantity of ſlaked lime. This greyiſh paſte applied to the hair, makes it fall off in two or three minutes, without giving the ſlighteſt pain.

" After being well waſhed and purified, you are wrapped up in hot linen, and follow the guide through the windings that lead to the outer apartment. This inſenſible tranſition from heat to cold prevents one from ſuffering any inconvenience from it. On arriving at the eſtrade, you find a bed prepared for you; and ſcarcely are you laid down before a child comes to preſs every part of your body with his delicate fingers, in order to dry you thoroughly. You change linen a ſecond time, and the child gently grates the calloſity of your feet with pumice ſtone. He then brings you a pipe and Moka coffee.

" Coming out of a ſtove where one was ſurrounded by a hot and moiſt fog, where the ſweat guſhed from every limb, and tranſported into a ſpacious apartment open to the external air, the breaſt dilates, and one breathes with voluptuouſneſs. Perfectly maſſed, and as it were regenerated, one experiences an univerſal comfort. The blood circulates with freedom; and one feels as if diſengaged from an enormous weight, together with a ſuppleneſs and lightneſs to which one has been hitherto a ſtranger. A lively ſentiment of exiſtence diffuſes itſelf to the very extremities of the body. Whilſt it is loſt in delicate ſenſations, the ſoul, ſympathiſing with the delight, enjoys the moſt agreeable ideas. The imagination, wandering over the univerſe, which it embelliſhes, ſees on every ſide the moſt enchanting pictures, every where the image of happineſs. If life be nothing but the ſucceſſion of our ideas, the rapidity with which they then recur to the memory, the vigour with which the mind runs over the extended chain of them, would induce a belief that in the two hours of that delicious calm that ſucceeds the bath, one has lived a number of years."

Such are the baths, the uſe of which were ſo ſtrongly recommended by the ancients, and which are ſtill the delight of the Egyptians. It is by means of them that they treat rheumatiſms, catarrhs, and ſuch cutaneous diſorders as are produced by want of perſpiration. Hence likewiſe it is ſaid they find a radical cure for that fatal malady which attacks the ſources of generation, the remedy for which is ſo dangerous in Europe. By the ſame reſource they get rid of that uncomfortable feeling ſo common to all nations who do not pay ſo much attention to the cleanlineſs of their bodies. Mr. Tournefort, indeed, who had uſed ſteam baths at Conſtantinople, where there is leſs refinement in them than at Cairo, is of opinion that they injure the breaſt. But, according to Mr. Savary, this is an error which further experience would have corrected. There are no people who make more frequent uſe of them than the Egyptians, and there is no country where there are fewer aſthmatic people, for in fact, there is no diſeaſe ſo ſeldom to be met with there as the aſthma.

The women are paſſionately fond of theſe baths, frequent them at leaſt once a week, and take with them ſlaves properly qualified to aſſiſt them. More luxurious than the men, after undergoing the uſual preparations, they waſh their bodies, and above all their heads, with roſe-water. It is there that female head-dreſſers form their long black hair into treſſes, which they mix with precious eſſences inſtead of powder and pomatum. It is there that they blacken the edge of their eye-lids, and lengthen their eye-brows with cohel, a preparation of tin burnt with gall-nuts; it is there they ſtain the finger and toe nails with the leaves of henne, a ſhrub common in Egypt, and which gives them a golden colour. The linen and clothing they make uſe of are paſſed through the ſweet ſteam of the wood of aloes; and when the work of the toilet is at an end, they remain in the outer apartment, and paſs the day in entertainments. On theſe occaſions their women entertain them with voluptuous ſongs and dances, or tell them tales of love to excite their libidinous inclinations.

BATHURST (Allen), Earl of Bathurſt, one of the laſt worthies of Queen Anne's reign, that ſhining period of triumphs, taſte, genius, and elegance, was born in the year 1684. His ſtudies and his education were equally conducive to the brilliant figure he was deſtined to make in ſocial life and in the ſenate, as a polite ſcholar, a patriot, and a ſtateſman. Theſe talents he had an opportunity to diſplay as early as the year 1705; when, at the requeſt of his father Sir Benjamin Bathurſt, and the ſolicitation of the conſtituents of Cirenceſter, he ſerved in parliament for that borough, his native ſoil, with reputation and integrity. He diſtinguiſhed himſelf particularly in the ſtruggles and debates relative to the union between the two kingdoms, firmly ſupporting this meaſure, calculated to ſtrengthen the vigour of government by uniting its force. Though he was contented to act a ſubordinate character in the great oppoſition planned by Mr. Harley and Mr. St. John, his intimate friends, to ſap the credit of the Duke of Marlborough and his adherents, he was of infinite ſervice to his party in arraigning, with ſpirit and eloquence, the conduct of the General and the Earl of Godolphin, who had long governed the Queen, and laviſhed the treaſures of the nation on conqueſts more ſplendid than ſerviceable. The loſs of the battle of Almanza ſeconded his efforts to diſpel the intoxication

of former ſucceſſes. His perſonal regard for Lord Somers, preſident of the council, was never altered, though they were of different opinions in politics; and when he was diveſted of his office, Mr. Bathurſt acted with ſuch tenderneſs and delicacy, as to preſerve the eſteem of Lord Somers in a private ſtation. In conſideration of his zeal and ſervices, the Queen advanced him, in 1711, to the dignity of a peer, by the title of Baron Bathurſt, of Battleſden, in Bedfordſhire.

His lordſhip continued to ſpeak his ſentiments with an undaunted freedom in the upper houſe; and ſtept forth as a formidable opponent to the court-meaſures in the reign of George I. and during Sir Robert Walpole's adminiſtration. The acrimony of the proſecution carried on againſt the Earl of Oxford, Lord Bolingbroke, and the Duke of Ormond, ſtimulated his indignation and his eloquence againſt ſuch vindictive proceedings; and he obſerved, "that the king of a faction was but the ſovereign of half his ſubjects." The ſouth-ſea ſcheme having infected the whole nation with a ſpirit of avaricious enterprize, the people awaked from their delirium, and an infinite number of families was involved in ruin. Lord Bathurſt publicly impeached the directors, whoſe arts had enabled them by theſe vain expectations to amaſs ſurpriſing fortunes: he repreſented that the national honour was concerned in ſtripping them of their ill-acquired wealth; and moved for having all the directors of the ſouth-ſea company puniſhed by a forfeiture of their eſtates, for ſuch a notorious act of ſordid knavery.

When the bill was brought into the Houſe of Lords againſt Dr. Atterbury biſhop of Rocheſter, that learned prelate, who joined to the graces of ſtyle and elocution all the elegance of a juſt delivery; among the many friends the biſhop's eloquence, politeneſs, and ingenuity had procured him, was Lord Bathurſt. He ſpoke againſt the bill with great vehemence and propriety; obſerving, "that if ſuch extraordinary proceedings were countenanced, he ſaw nothing remaining for him and others to do, but to retire to their country-houſes, and there, if poſſible, quietly enjoy their eſtates within their own families, ſince the leaſt correſpondence, or intercepted letter, might be made criminal." Then turning to the biſhops, he ſaid, he "could hardly account for the inveterate hatred and malice ſome perſons bore the ingenious biſhop of Rocheſter, unleſs it was that they were infatuated like the wild Americans, who fondly believe they inherit not only the ſpoils, but even the abilities, of the man they deſtroy." He was one of the Lords who entered his proteſt againſt the bill.

His lordſhip was entirely averſe to continental connections; and animadverted ſeverely upon the monarch whoſe thoughts were turned to foreign concerns and alliances which could never be uſeful; complaining of the immenſe ſums laviſhed in ſubſidies to needy and rapacious princes. The directors of the charitable corporation having embezzled 500,000l. of the proprietors' capital, Lord Bathurſt declared, in the Houſe of Lords, his abhorrence of this moſt iniquitous ſcene of fraud; aſſerting, that not one ſhilling of the money was ever applied to the proper ſervice, but became the reward of avarice and venality.

His lordſhip concurred, with all his power, in the oppoſition to Sir Robert Walpole, who now tottered on the brink of ruin. This miniſter, after obſtinate ſtruggles, having been forced to reſign all his employments, Lord Bathurſt was ſworn of the privy-council, and made captain of the gentlemen-penſioners, which poſt he reſigned in 1744. He was appointed treaſurer to the preſent king, then prince of Wales, in 1757, and continued in the liſt of privy-counſellors at his acceſſion to the throne; but, on account of his great age, he choſe to enjoy *otium cum dignitate*, by retiring from the great theatre of public life.

This nobleman's integrity gained him the eſteem even of his opponents; and his humanity and benevolence, the affection of all that knew him more intimately. He added to his public virtues all the good breeding, politeneſs, and elegance of ſocial intercourſe. Dr. Freind, Congreve, Vanbrugh, Swift, Prior, Rowe, Addiſon, Pope, Arbuthnot, Gay, and moſt men of genius in his own time, cultivated his friendſhip, and were proud of his favours.

The great Mr. Pope, in his Epiſtle on the Uſe of Riches; thus addreſſes him:

> The ſenſe to value riches, with the art
> T'enjoy them, and the virtue to impart;
> To balance fortune by a juſt expence,
> Join with œconomy magnificence;
> With ſplendor, charity; with plenty, health:
> O teach us, Bathurſt, yet unſpoil'd by wealth!
> That ſecret rare, between th' extremes to move,
> Of mad good-nature, and of mean ſelf-love.

Sterne, in his letters to Eliza, thus ſpeaks of Lord Bathurſt: "This nobleman is an old friend of mine: he was always the protector of men of wit and genius; and has had thoſe of the laſt century always at his table. The manner in which his notice began of me, was as ſingular as it was polite. He came up to me one day as I was at the Princeſs of Wales's court, 'I want to know you, Mr. Sterne; but it is fit you ſhould know alſo who it is that wiſhes this pleaſure: you have heard (continued he) of an old Lord Bathurſt, of whom your Popes and Swifts have ſung and ſpoken ſo much: I have lived my life with geniuſes of that caſt, but have ſurvived them; and, deſpairing ever to find their equals, it is ſome years ſince I have cloſed my accounts, and ſhut up my books, with thoughts of never opening them again: but you have kindled a deſire in me of opening them once more before I die, which I now do; ſo go home, and dine with me.' This nobleman, I ſay, is a prodigy: for at 85 he has all the wit and promptneſs of a man of 30; a diſpoſition to be pleaſed, and a power to pleaſe others beyond whatever I knew! added to which, a man of learning, courteſy, and feeling."

In the latter part of his life, this extraordinary nobleman preſerved his natural cheerfulneſs and vivacity; always acceſſible, hoſpitable, and beneficent. He delighted in rural amuſements; and enjoyed, with a philoſophical ſatisfaction, the ſhade of the lofty trees he had planted himſelf. Till within a month of his death he conſtantly rode out on horſeback two hours before dinner, and conſtantly drank his bottle of claret or Madeira after dinner. He uſed to declare, in a jocoſe manner, he never could think of adopting Dr. Cadogan's method, as Dr. Cheyne had aſſured him, 50 years ago, he would never live ſeven years longer unleſs he abridged himſelf of his wine. Purſuant to this maxim, his lordſhip having, ſome years ago, invited ſeveral of his friends to ſpend a few cheerful days with him at his ſeat at Cirenceſter, and being one evening very loth to part with them; on his ſon the late chancellor's objecting to their ſitting up any longer, and adding that health and long life were beſt ſecured by regularity, he ſuffered him to retire: but, as ſoon as he was gone, the cheerful father ſaid, "Come, my good friends, ſince the *old* gentleman is gone to bed, I think we may venture to crack another bottle."

His Lordſhip was advanced to the dignity of Earl in 1772; and lived to ſee the above nobleman, his eldeſt ſon, ſeveral years Lord High Chancellor of Great Britain, and promoted to the peerage in 1771 by the title of Baron Apſley. Lord Bathurſt married Catherine daughter of Sir Peter Apſley, by whom he had two other ſons, and five daughters. His death happened, after a few days illneſs, in which he was attended by Dr. Cheſton of Glouceſter, with whom he occaſionally

communicated on the ſtate of his health, at his ſeat near Cirenceſter, in the 91ſt year of his age, and on the 16th of September 1775.

BATHYCHRUS *colour*, in painting, a term uſed by the Greeks to expreſs what the Romans call *auſterus color*. Such a colour was coarſe and dull, and wanted the life of the florid colours.

BATHYLLUS *and* PYLADES, inventors of pantomime entertainments on the ſtage. Bathyllus ſucceeded in repreſenting comedy; Pylades, in tragedy. The art conſiſted in expreſſing the paſſions by geſtures, attitudes, and dumb ſhew; not, as in modern times, in machinery, and the fooleries of Harlequin. They flouriſhed at Rome, under Auguſtus, about A. D. 10. Each of them kept ſcholars, who perpetuated their maſter's name: for the followers of Bathyllus, who excelled in the comic part, called themſelves *Bathylli*; and thoſe of Pylades, who excelled in the tragic, called themſelves *Pyladæ*.

BATILLUS, a muſical inſtrument made of metal, in the form of a ſtaff, furniſhed with metalline rings, which being ſtruck, yielded a kind of harmonical ſounds. It is uſed by the Armenians in their church-ſervice.

BATIS; a genus of the tetrandria order, belonging to the dioecia claſs of plants, the characters of which are: Of the male, the amentum is four ways imbricated, and both the calyx and corolla are wanting: of the female, the amentum is ovate, the involucrum diphyllous; calyx and corolla wanting; the ſtigma is bilobate and ſeſſile; the berries condunate and four-ſeeded. There is but one ſpecies, viz. the *mantima*, a native of Jamaica.

BATISTE, in commerce, a fine white kind of linen cloth, manufactured in Flanders and Picardy. There are three kinds of batiſte; the firſt very thin; the ſecond leſs thin; and the third much thicker, called *Holland batiſte*, as coming very near the goodneſs of Hollands.

The chief uſe of Batiſte is for neck-cloths, head-cloths, ſurplices, &c.

BATMAN, in commerce, a kind of weight uſed at Smyrna, conſiſting of ſix okes. Forty of theſe batmans make a camel's load, and amount to about ſeven hundred and twenty pounds Engliſh weight. *Batman*, or *battament*, is a weight uſed in Turkey and Perſia. The Turkiſh *batman* is of two kinds; the larger containing ſix okes, or *ocquos*, at three pounds three quarters Paris weight the *ocquo*; ſo that the batman amounts to about twenty-two Paris pounds and an half; the ſmaller, compoſed likewiſe of ſix ocquos, at fifteen ounces the ocquo, amounting to five pounds ten ounces.

The Perſian batman is likewiſe of two kinds: one called the *king's weight*, *batman de chahi*, or *cheray*, uſed for weighing moſt of the neceſſaries of life, equivalent to about twelve pounds and an half Paris weight; the other called *batman of Tauris*, equal to ſix pounds four ounces Paris or Amſterdam weight. Theſe, at leaſt, are the proportions given by Tavernier. Chardin rates the Perſian batmans ſomewhat lower, viz. the former at twelve pounds twelve ounces; and the latter at five pounds fourteen ounces.

BATMANSON (John), prior of the Carthuſian monaſtery, or Charter-houſe in the ſuburbs of London. He was ſome time a ſtudent at Oxford, but it does not appear that he took any degree in that univerſity. He was intimately acquainted with Edward Lee archbiſhop of York, at whoſe requeſt he wrote againſt Eraſmus and Luther. He died in the year 1531, and was buried in the chapel belonging to the charter-houſe. According to Bale, he was a proud forward perſon: and he ſays that Eraſmus, in one of his letters to the biſhop of Wincheſter, calls him an ignorant fellow. Pits, on the contrary, gives him the character of a man of ſingular genius, zeal, piety, and learning. He wrote, 1. *Animadverſiones in Annotationes Eraſmi in Nov. Teſtamentum.* 2. *A treatiſe againſt ſome of Luther's works.* Theſe two he afterwards retracted. 3. *Commentaria in Proverbia Solomonis.* 4. *In Cantica Canticorum.* 5. *De unica Magdalena.* 6. *Inſtitutiones noviciorum.* 7. *De contemptu mundi.* 8. *De Chriſto duodenni.* 9. *On the words*, Miſſus eſt, &c.

BATON, or BASTON. See BASTON.

BATOONS *of St. Paul*, BASTONCINI *di Sans Paolo*, in natural hiſtory, a name given by ſome of the Italian writers, as Auguſtino Scilla, and others, to the *lapides Judaici*, or other ſpines of *echini*. Theſe are found in vaſt abundance in the iſland of Malta; and as every thing there is commemorated with ſome title, with St. Paul at the end of it, theſe are called *Baculi Sti. Pauli*, or *St. Paul's batoons*.

BATOS, in ichthyology, the name given by Ariſtotle, and all the old writers, to the ſkaite, or ſlaire. They have generally called the male BATOS, and the female BATIS. It is a ſpecies of the RAIA, and is diſtinguiſhed by Artedi by the name of the variegated ray, with the middle of the back ſmooth, and with one row of ſpines on the tail. Albertus calls it the *rayte*, and *rubus*.

BATRACHOMYOMACHIA, the battle of the frogs and the mice, the title of a fine burleſque poem generally aſcribed to Homer. The ſubject of the work is the death of Plycharpax, a mouſe, ſon to Toxartes, who, being mounted on the back of Phyſignathus, a frog, on a voyage to her palace, to which ſhe had invited him, was ſeized with fear when he ſaw himſelf in the middle of the pond, ſo that he tumbled off and was drowned. Phyſignathus being ſuſpected to have ſhaken him off with deſign, the mice demanded ſatisfaction, and unanimouſly declared war againſt the frogs.

BATRACHOSALIS, in ichthyology, a name given by many of the Greek authors to the LOPHIUS, or *rana piſcatrix* of authors.

BATRACHUS, a ſpecies of the SILURUS.

BATTABLE, *ground*, denotes land lying between England and Scotland, herctofore in queſtion to which it belonged, when they were two diſtinct kingdoms. The word imports as much as *litigious*, or *diſputable ground*; from *battre*, *to beat* or *fight*.

BATTÆ, a people of Germany, formerly inhabitants of what is now called *Heſſe*. Being diſſatisfied with their ſituation there, they ſettled on the iſland formed by the Vahalis and Rhine, which from them took the name of *Batavia*, or *Batavorum Inſula*. Their government was a mixture of monarchy, ariſtocracy, and democracy. Their chief was, properly ſpeaking, nothing more than a principal citizen, whoſe buſineſs was rather to adviſe than to command. The principal men who exercifed juriſdiction, and commanded the troops, in their reſpective diſtricts, were choſen, as well as the kings, in an aſſembly of the people. A hundred perſons ſelected from among the people preſided over every county, and acted as chiefs in the different hamlets. The whole nation was, in ſome meaſure, an army always in readineſs. Each family compoſed a body of militia, which ſerved under a captain of their own electing.

BATTALIA, an army ranged in order of battle, or ready for engagement. The word ſeems formed from the Latin *batualia*, ſometimes alſo written *batalia*, denoting a ſort of military or gladiatorial exerciſe, as fighting with foils, or tilting at a poſt. In this ſenſe, we meet with the depth of a battalia; to march in battalia, with the baggage in the middle; to break the battalia, &c. In the Roman battalia, the *haſtati* made the front.

BATTALION, a ſmall body of infantry, ranged in form of battle, and ready to engage.

A battalion uſually contains from 500 to 800 men; but the

number it consists of is not determined. They are armed commonly with firelocks, and bayonets; and divided into 13 companies, one of which is grenadiers. They are usually drawn up three men deep. Some regiments consist of but one battalion, others are divided into four or five, as is the regiment of Royal Artillery. M. de Folard decries the modern method of ranging battalions so shallow, which renders them weak, and unable to support each other; so that they are easily penetrated or broken: an essential fault in the modern tactics. The real strength of a corps, according to this author, consists in its thickness, or the depth of its files, and their connection and closeness. This depth renders the flanks almost as strong as the front. He adds, that it may be laid down as a maxim, that every battalion ranged deep, and with a small front, will beat another stronger than itself, ranged according to the usual method. Polyb. tom. i. p. 7. But this opinion of Folard has not been adopted in modern practice; and his theory has been vigorously attacked by two French officers in the service of the States-General. They admit the superior strength of his column to that of a modern battalion, if the action were to be decided with pikes and swords; but where firearms must be used, M. Folard's column is so very ill disposed for this purpose, that it must infallibly be destroyed.

BATTATAS, the Indian name of the potatoe. See Convolvulus.

BATTEL, a town of Sussex, five miles north-west of Hastings, situated in E. long. 0. 35. N. lat. 50. 55. It was formerly called *Epiton*; and is the place where William the Conqueror vanquished Harold king of England on October 14th 1066. William, in memory of this victory, erected an abbey, which he called *Battel Abbey*; and if a criminal could but reach this abbey, he was dismissed from thence, and was afterwards in no danger for his past faults. The abbey was a large and noble structure, as may be judged by the gateway which is still entire, as well as from the other remains. This place is noted for making gunpowder equal to that of Dantzick; and the best goes by the name of *Battel gunpowder*.

Battel, in law, or *Trial by wager of Battel*, a species of trial of great antiquity, but now quite disused. It seems to have owed its original to the military spirit of our ancestors, joined to a superstitious frame of mind; it being in the nature of an appeal to Providence, under an apprehension and hope (however presumptuous and unwarrantable), that heaven would give the victory to him who had the right. The decision of suits, by this appeal to the God of battels, is by some said to have been invented by the Burgundi, one of the northern or German clans that planted themselves in Gaul. And it is true, that the first written injunction of judiciary combats that we meet with, is in the laws of Gundebald, A. D. 501, which are preserved in the Burgundian code. Yet it does not seem to have been merely a local custom of this or that particular tribe, but to have been the common usage of all those warlike people from the earliest times. And it may also seem, from a passage in Velleius Paterculus, that the Germans, when first they became known to the Romans, were wont to decide all contests of right by the sword: for when Quintilius Varus endeavoured to introduce among them the Roman laws and method of trial, it was looked upon (says the historian) as a *novitas incognitæ disciplinæ, ut solita armis decerni jure terminarentur*. And among the ancient Goths in Sweden we find the practice of judiciary duels established upon much the same footing as they formerly were in Britain.

Among other Norman customs, this was introduced in England by William the Conqueror; but was only used in these three cases, viz. military, criminal, and civil. The first in the court-martial, or court of chivalry and honour; the second in appeals of felony; and the third upon issue joined in a writ of right, the last and most solemn decision of real property. For in writs of right the *jus proprietatis*, which is frequently a matter of difficulty, is in question; but other real actions being merely questions of the *jus possessionis*, which are usually more plain and obvious, our ancestors did not in them appeal to the decision of Providence. Another pretext for allowing it, upon these final writs of right, was also for the sake of such claimants as might have the true right, but yet by the death of witnesses or other defect of evidence be unable to prove it to a jury. But the most curious reason of all is given in the Mirror, that it is allowable upon warrant of the combat between David for the people of Israel of the one party, and Goliath for the Philistines of the other party: a reason which Pope Nicholas I. very seriously decides to be inconclusive. Of battel therefore on a writ of right we shall first speak: and although the writ of right itself, and of course this trial thereof, be at present disused; yet, as it is law at this day, it may be matter of curiosity, at least, to inquire into the forms of this proceeding, as ancient writers on this subject have related.

1. The last trial by battel that was waged in the court of common pleas at Westminster (though there was afterwards one in the court of chivalry in 1631, and another in the county palatine of Durham in 1638) was in the 13th year of Queen Elizabeth, A. D. 1571, as reported by Sir James Dyer; and was held in Tothill-fields, Westminster, "*non sine magna jurisconsultorum perturbatione*," saith Sir Henry Spelman, who was himself a witness of the ceremony. The form, as appears from the authors before cited, is as follows.—When the tenant in a writ of right pleads the general issue, viz. that he hath more right to hold than the demandant hath to recover; and offers to prove it by the body of his champion, which tender is accepted by the demandant; the tenant in the first place must produce his champion, who, by throwing down his glove as a gage or pledge, thus wages or stipulates battel with the champion of the demandant; who, by taking up the gage or glove, stipulates on his part to accept the challenge. The reason why it is waged by champions, and not by the parties themselves, in civil actions, is because, if any party to the suit dies, the suit must abate and be at an end for the present; and therefore no judgment could be given for the lands in question, if either of the parties were slain in battel: and also that no person might claim an exemption from this trial, as was allowed in criminal cases, where the battel was waged in propria persona.

A plot of ground is then in due time set out, of 60 feet square, inclosed with lists, and on one side a court erected for the judges of the court of common pleas, who attend there in their scarlet robes; and also a bar is prepared for the learned serjeants at law. When the court sits, which ought to be by sun-rising, proclamation is made for the parties and their champions; who are introduced by two knights, and are dressed in a coat of armour, with red sandals, barelegged from the knee downwards, bareheaded, and with bare arms to the elbows. The weapons allowed them are only batons, or staves, of an ell long, and a four-cornered leather target; so that death very seldom ensued this civil combat. In the court military, indeed, they fought with sword and lance, according to Spelman and Rushworth; as likewise in France, only villeins fought with the buckler and baton, gentlemen armed at all points. And upon this, and other circumstances, the president Montesquieu has with great ingenuity not only deduced the impious custom of private duels upon imaginary points of honour, but has also traced the heroic madness of knight-errantry from the same original of judicial combats. But to return to our subject: as soon as the champions, thus armed with batons, are arrived within the lists or place of combat, the champion of the tenant takes his adversary by the hand, and makes oath that the tenements in dispute are not the right of the demandant; and

the champion of the demandant then taking the other by the hand, ſwears in the ſame manner that they are; ſo that each champion is, or ought to be, thoroughly perſuaded of the truth of the cauſe he fights for. Next an oath againſt ſorcery and enchantment is to be taken by both the champions, in this or a ſimilar form: "Hear this, ye juſtices, that I have this day neither eat, drank, nor have upon me neither bone, ſtone, ne graſs; nor any inchantment, ſorcery, or witchcraft, whereby the law of God may be abaſed, or the law of the devil exalted. So help me God and his ſaints."

The battel having thus begun, the combatants are bound to fight till the ſtars appear in the evening: and, if the champion of the tenant can defend himſelf till the ſtars appear, the tenant ſhall prevail in his cauſe; for it is ſufficient for him to maintain his ground, and make it a drawn battel, he being already in poſſeſſion; but, if victory declares itſelf for either party, for him is judgment finally given. This victory may ariſe from the death of either of the champions: which indeed hath rarely happened; the whole ceremony, to ſay the truth, bearing a near reſemblance to certain rural athletic diverſions, which are probably derived from this original. Or victory is obtained if either champion proves *recreant*, that is, yields and pronounces the horrible word of *craven*; a word of diſgrace and obloquy, rather than of any determinate meaning. But a horrible word it indeed is to the vanquiſhed champion: ſince, as a puniſhment to him for forfeiting the land of his principal by pronouncing that ſhameful word, he is condemned as a recreant, *amittere liberam legem*, that is, to become infamous, and not to be accounted *liber et legalis homo*; being ſuppoſed by the event to be proved forſworn, and therefore never to be put upon a jury, or admitted as a witneſs in any trial or cauſe whatſoever.

This is the form of a trial by battel; a trial which the tenant, or defendant in a writ of right, has it in his election at this day to demand; and which was the only deciſion of ſuch writ of right after the conqueſt, till Henry II. by conſent of parliament introduced the *grand aſſiſe*, a pecular ſpecies of trial by jury, in concurrence therewith; giving the tenant his choice of either the one or the other. Which example, of diſcountenancing theſe judicial combats, was imitated about a century afterwards in France, by an edict of Louis the Pious, A. D. 1260, and ſoon after by the reſt of Europe. The eſtabliſhment of this alternative, Glanvil, chief juſtice to Henry II. and probably his adviſer herein, conſiders a moſt noble improvement, as in fact it was, of the law of the land.

2. In appeals of felony, the trial by battel may be demanded, at the election of the appellee, in either an appeal or an approvement; and it is carried on with equal ſolemnity as that on a writ of right; but with this difference, that there each party hires a champion, but here they muſt fight in their proper perſons. And therefore, if the appellant or approver be a woman, a prieſt, an infant, or of the age of 60, or lame, or blind, he or ſhe may counterplead and refuſe the wager of battel; and compel the appellee to put himſelf upon the country. Alſo peers of the realm, bringing an appeal, ſhall not be challenged to wage battel, on account of the dignity of their perſons; nor the citizens of London by ſpecial charter, becauſe fighting ſeems foreign to their education and employment. So likewiſe, if the crime be notorious; as if the thief be taken with the *mainour*, or the murderer in the room with a bloody knife, the appellant may refuſe the tender of battel from the appellee; and it is unreaſonable an innocent man ſhould ſtake his life againſt one who is already in a great degree convicted.

The ceremony of waging battel upon appeals is much the ſame as upon a writ of right; only the oaths of the two combatants are much more ſtriking and ſolemn. The appellee, when appealed of felony, pleads *not guilty*; and throws down his glove, and declares he will defend the ſame by his body: the appellant takes up the glove; and replies that he is ready to make good the appeal, body for body. And thereupon, the appellee taking the book in his right hand, and in his left the right hand of his antagoniſt, ſwears to this effect: *Hoc audi, homo, quem per manum teneo*, &c. "Hear this, O man, whom I hold by the hand, who calleſt thyſelf *John* by the name of baptiſm, that I, who call myſelf *Thomas* by the name of baptiſm, did not felonioufly murder thy father, *William* by name, nor am any way guilty of the ſaid felony. So help me God, and the ſaints! and this I will defend againſt thee by my body, as this court ſhall award." To which the appellant replies, holding the bible and his antagoniſt's hand in the ſame manner: "Hear this, O man, whom I hold by the hand, who calleſt thyſelf *Thomas* by the name of baptiſm, that thou art perjured; and therefore perjured, becauſe that thou felonioufly didſt murder my father, *William* by name. So help me God, and the ſaints! and this I will prove againſt thee by my body, as this court ſhall award." The battel is then to be fought, with the ſame weapons, *viz.* batons, the ſame ſolemnity, and the ſame oath againſt amulets and ſorcery, that are uſed in the civil combat: and if the appellee be ſo far vanquiſhed that he cannot or will not fight any longer, he ſhall be adjudged to be hanged immediately; and then, as well as if he be killed in battel, Providence is deemed to have determined in favour of the truth, and his blood ſhall be attainted. But if he kills the appellant, or can maintain the fight from ſun-riſing till the ſtars appear in the evening, he ſhall be acquitted. So alſo, if the appellant becomes recreant, and pronounces the horrible word *craven*, he ſhall loſe his *liberam legem*, and become infamous; and the appellee ſhall recover his damages, and alſo be for ever quit, not only of the appeal, but of all indictments likewiſe for the ſame offence that may be preferred againſt him.

BATTEN, a name that joiners give to a ſcantling of wooden ſtuff, from two to four inches broad, and about one inch thick: the length is undetermined. This term is chiefly uſed in ſpeaking of doors and windows of ſhops, &c. which are not framed of whole deal, &c. with ſtiles, rails, and pannels like wainſcot; but are made to appear as if they were by means of theſe battens bradded on the plain board round the edges, and ſometimes croſs them, and up and down.

BATTENS *of the hatches*, in ſea-language, are nailed along the tarpaulings, and ſerve to keep their edges cloſe down to hatches, in order to prevent the water which waſhes over the deck from penetrating into the lower apartments of the ſhip.

BATTENBURG, a town of Dutch Guelderland, ſeated on the north banks of the Meuſe, almoſt oppoſite to Ravenſtein. E. long. 5. 35. N. lat. 50. 55.

BATTERING, in the military art, is the attacking a fortified place or work with heavy artillery. To batter in breach, is to play furiouſly on a work, as the angle of a half-moon, in order to demoliſh and make a gap therein. In this they obſerve never to fire a piece at the top, but all at the bottom, from three to ſix feet from the ground. The battery of a camp is uſually ſurrounded with a trench and palliſadoes at the bottom, with two redoubts on the wings, or certain places of arms, capable of covering the troops which are appointed for their defence. See BATTERY.

BATTERING-*Ram*, in the ancient military art, an engine uſed to batter and beat down the walls of places beſieged. It is ſaid to have been invented by Artemanes of Clazomene, a Greek architect who flouriſhed 441 B. C.—The machine is thus deſcribed by Joſephus: It is a vaſt beam, like the maſt of a ſhip, ſtrengthened at the one end with a head of iron,

ſomething reſembling that of a ram, whence it took its name. This was hung by the middle with ropes to another beam, which lay acroſs two poſts; and hanging thus equally balanced, it was by a great number of men drawn backwards, and puſhed forwards, ſtriking the wall with its iron head. But this engine did moſt execution when it was mounted on wheels, which is ſaid to have been firſt done at the ſiege of Byzantium under Philip of Macedon.

Plutarch informs us, that Marc Anthony, in the Parthian war, made uſe of a ram fourſcore feet long: and Vitruvius tells us, that they were ſometimes 106, and ſometimes 120, feet in length; and to this, perhaps, the force and ſtrength of the engine was in a great meaſure owing. The ram was managed at one time by a whole century of ſoldiers; and they being tired were ſeconded by another century, ſo that it played continually without any intermiſſion.

In Plate 47 is a repreſentation of the battering-ram ſuſpended. Fig. 1. The ram. 2. Its head, faſtened to the beam by three or four bands of iron, four feet in breadth. At the extremity of each of theſe bands was a chain of the ſame metal, one end of which was faſtened to a hook (3), and at the other extremity of each of theſe chains was a cable firmly bound to the laſt link. Theſe cables ran the whole length of the beam to the end of the ram (4), where they were all bound together as faſt as poſſible with ſmall ropes. To the end of theſe cables another was fixed, compoſed of ſeveral ſtrong cords platted together to a certain length, and then running ſingle (5). At each of theſe, ſeveral men were placed, to balance and work the machine. 6. The chain or cable by which it hung to the croſs beam (7), fixed on the top of the frame. 8. The baſe of the machine.—The unſuſpended ram differed from this only in the manner of working it: for inſtead of being ſlung by a chain or cable, it moved on ſmall wheels on another lage beam.

Battering-*Rams*, in heraldry, a bearing or coat of arms reſembling the military engine deſcribed in the laſt article.

BATTERY, in the military art, is a parapet thrown up to cover the gunners, and men employed about the guns, from the enemy's ſhot. This parapet is cut into embraſures, for the guns to be fired through. The height of the embraſures on the inſide is about three feet; but they go ſloping lower to the outſide. Their width is two or three feet, but they open to ſix or ſeven on the outſide. The maſs of earth that is betwixt two embraſures, is called the *merlon*. The platform of a battery is a floor of planks and ſleepers, to keep the wheels of the guns from ſinking into the earth; and is always made ſloping towards the embraſures, both to hinder the reverſe, and to facilitate the bringing back of the gun.

Battery *of Mortars*, differs from a battery of guns; for it is ſunk into the ground, and has no embraſures, being deſigned to throw its charge up into the air.

Croſs-Batteries, are two batteries which play athwart one another upon the ſame object, forming there an angle, and beating with more violence and deſtruction; becauſe what one ball ſhakes, the other beats down.

Battery, *ſunk* or *buried*, is that whoſe platform is ſunk or let down into the ground, ſo that there muſt be trenches cut in the earth, before the muzzles of the guns, for them to fire out at, and to ſerve for embraſures.

Battery, *covered*, is when the guns and men are covered by a bank made of bruſh-wood, faggots and earth, of about eighteen or twenty feet thick, and ſeven or eight feet high. The guns uſed in ſuch *batteries* are generally from nine to eighteen pounders; ſometimes twenty-four pounders are uſed in them.

Battery *d' Enfilade*, is one that ſcours or ſweeps the whole length of a ſtraight line.

Battery *en Echarpe*, is that which plays obliquely.

Battery *de Reverſe*, that which plays upon the enemy's back.

Camerade Battery, is when ſeveral guns play at the ſame time upon one place.

Battery, in law, is the unlawful beating of another in breach of the peace. The leaſt touching of another's perſon wilfully, or in anger, is a battery; for the law cannot draw the line between different degrees of violence, and therefore totally prohibits the firſt and loweſt ſtage of it; every man's perſon being ſacred, and no other having a right to meddle with it, in any the ſlighteſt manner. And therefore, upon a ſimilar principle, the Cornelian law *de injuriis* prohibited *pulſation* as well as *verberation*; diſtinguiſhing verberation, which was accompanied with pain, from pulſation which was attended with none. But battery is in ſome caſes juſtifiable or lawful; as where one who hath authority, a parent or maſter, gives moderate correction to his child, his ſcholar, or his apprentice. So alſo on the principle of ſelf-defence: for if one ſtrikes me firſt, or even only aſſaults me, I may ſtrike in my own defence; and, if ſued for it, may plead *ſon aſſault demeſne*, or that it was the plaintiff's own original aſſault that occaſioned it. So likewiſe in defence of my goods or poſſeſſions, if a man endeavours to deprive me of them, I may juſtify laying hands upon him to prevent him; and in caſe he perſiſts with violence, I may proceed to beat him away. Thus too in the exerciſe of an office, as that of church-warden or beadle, a man may lay hands upon another to turn him out of church, and prevent his diſturbing the congregation. And if ſued for this or the like battery, he may ſet forth the whole caſe, and plead that he laid hands upon him gently, *molliter manus impoſuit*, for this purpoſe. On account of theſe cauſes of juſtification, battery is defined to be the unlawful beating of another: for which the remedy is, as for aſſault, by action of *treſpaſs vi et armis*: wherein the jury will give adequate ſatisfaction in damages.

BATTERSEA, a village of Surry, noted for its fine aſparagus. Here was the family ſeat of the St. Johns, where the famous Lord Bolingbroke was born, and died. On the ſite of it now ſtands a diſtillery, and a curious horizontal air-mill, viſible, with the church, at a great diſtance. The church was rebuilt about 16 years ago, and is a beautiful ſtructure, with a mean copper ſpire. Here Sir Walter St. John founded a free-ſchool; and here is a timber bride over the Thames to Chelſea. Batterſea is four miles W. S. W. of London.

BATTISTA (Franco), a celebrated painter, born at Venice, was one of the diſciples of Michael Angelo, whoſe manner he followed ſo cloſely, that, in the correctneſs of his outlines, he ſurpaſſed moſt of the maſters of his time. His paintings are pretty numerous, and diſperſed all over Italy and other parts of Europe; but his colouring being very dry, they are not much more eſteemed than the prints etched by his hand. He died in the year 1561.

BATTLE, a general engagement between two armies, in a country ſufficiently open for them to encounter in front and at the ſame time (ſee War). The word is alſo written *battel*, *battell*, and *battail*. It is formed from the French *bataille*, of the Latin verb *batuere*, to *fence* or *exerciſe with arms*: whence *batualia* and *batalia*, which properly denoted the action or exerciſe of thoſe who learned to fence, and who were hence alſo denominated *batuatores*.

The ancients never riſqued a battle without much ceremony and preparation; as taking auguries, offering ſacrifice, haranguing the ſoldiers, giving the word or a *teſſera*, &c. The ſignals of battle were, ſounding the *claſſicum* or general charge, and diſplaying a peculiar flag, called by Plutarch a *purple robe*. To which may be added, ſinging pæans, raiſing military

ſhouts, and the like. A Roman legion, ranged in order of battle, conſiſted of *haſtati*, placed in the front; of *principes*, who were all old experienced ſoldiers, placed behind the former; and of *triarii*, heavy armed with large bucklers, behind the *principes*. The *haſtati* were ranked cloſe; the ranks of the *principes* were much opener, ſo that they could receive the *haſtati*; and thoſe of the *triarii* opener ſtill, inſomuch that they could receive both the *principes* and the *haſtati* within them, without any diſorder, and ſtill facing the enemy. When therefore the *haſtati* found themſelves unable to ſtand the enemy's charge, they retired gently within the *principes*, where, joining with them, they renewed the combat. If theſe found themſelves too weak to ſuſtain the enemy, both retired among the *triarii*, where rallying, they formed a new corps, and charged with more vigour than ever. If theſe failed, the battle was loſt; the Romans had no farther reſource. The moderns are unacquainted with this method of inſerting or embattling one company into another; without which the former cannot be well ſuccoured or defended, and their places taken by others; which was a thing the Romans practiſed with great exactneſs. For the *velites*, and in later times the archers and ſlingers, were not drawn up in this regular manner, but either diſpoſed before the front of the *haſtati*, or ſcattered up and down among the void ſpaces of that body, or ſometimes placed in two corps in the wings. Theſe always began the combat, ſkirmiſhing in flying parties with the foremoſt troops of the enemy. If they were repulſed, which was uſually the caſe, they fell back to the flanks of the army, or retired again into the rear. When they retired, the *haſtati* advanced to the charge. As to the cavalry, it was poſted at the two corners of the army, like the wings on a body; and fought ſometimes on foot, ſometimes on horſeback. The auxiliary forces compoſed the two points of the battle, and covered the whole body of the Romans.—Other leſs uſual forms of battle among the Romans were the *cuneus*, or wedge; *globus*, or round form; *forfex*, or pair of ſheers; *turris*, or an oblong ſquare figure; *ſerra*, or ſaw. The Greeks were inferior to the Romans in marſhalling their armies for battle, as they drew up their whole army in one front, and truſted the ſucceſs of the day to a ſingle force. They had three forms of battle for the horſe, viz. the ſquare, the wedge, and the rhombus or diamond form. The firſt anſwered beſt for the defenſive; the latter for the offenſive; the wedge being preferred as bringing moſt hands into action againſt the enemy.

It was cuſtomary with the Greeks to notify the places of their battles and victories by adding the word Νικη; whence Nicomedia, Nicopolis, Theſſalonica, &c. The ancient Britons did the like, by adding the word *Mais*; whence Maiſſeveth, Malmaiſbury, &c. The Engliſh adopted the word *Field*.—The Romans had their particular days, called *præliares dies*, wherein alone it was lawful to join battle; and others wherein it was unlawful, called *dies atri*. The Athenians, by the ancient laws of their country, were not to draw out their forces for battle till after the ſeventh day of the month: And Lucian relates of the Lacedemonians, that by the laws of Lycurgus they were not to fight before full moon. Among the Germans, it was reputed an impiety to fight in the wane of the moon; and Cæſar tells us, that Arioviſtus was beaten by him, becauſe, contrary to the laws of his country, he had fought when the moon was in her wane. The German ſoldiers were intimidated with the apprehenſion, and afforded Cæſar an eaſy victory; *acie commiſſa, impeditos religione hoſtes vicit*. It is well known that Jeruſalem was taken by Pompey in an attack on the ſabbath-day, when by the Jewiſh ſuperſtitious notions, they were not allowed to fight, or even to defend themſelves. The Romans did not carry their ſuperſtition ſo far: their *atri dies* were only obſerved in reſpect of attacking; no day was too holy for them to defend themſelves in. Among the ancients, we find frequent inſtances of battles in the night; Pompey beat Mithridates, and Scipio Aſdrubal and Syphax, by the light of the moon.

The firſt regular and pitched battle of which we have any diſtinct account, was that between Crœſus and Cyrus, deſcribed by Xenophon, concerning which we have an expreſs diſſertation by M. Freret, wherein ſeveral points of the ancient tactics are well explained. In the modern art of war, we find few examples of pitched or ſet battles. The chief view of the great commanders of late days is rather to haraſs or ſtarve the enemy by frequent alarms, cutting off his proviſions, carrying off his baggage, ſeizing his poſts, &c. than to join iſſue with him, and put the whole on the event of one day; a battle generally deciding the fate of a campaign, ſometimes of a whole war. Hence it is a rule, never to venture a great battle, unleſs a general either fights to advantage, or is forced to it. Joining or giving battle ſhould always be by deſign: for a judicious commander never ſuffers himſelf to be forced to fight. All the meaſures, movements, and encampments he makes, are to lead to the execution of his great deſign, which is to fight to advantage, till by ſome miſtake of the enemy he at length finds the favourable opportunity he deſires. It is in this that a ſuperior genius will at length prevail over an inferior: in the courſe of a campaign, he will take a number of advantages over him, which together are equivalent to a battle, the event of which is not always decided by the courage of the parties.

The reaſons for giving battle are, ſuperiority in the number or quality of forces; neceſſity of putting a ſpeedy end to the war; different views or intereſts of the commanders of the enemy's army; their negligence in encamping or marching; neceſſity of relieving a place beſieged; the diſpoſition of an army, which muſt be ruined, unleſs prevented by the ſucceſs of a battle; the certainty of ſuccours coming to the enemy, which will render him ſuperior; ſome preceding advantage, which, though not deciſive, has given the enemy a conſiderable check. For avoiding it, the reaſons are, having leſs to hope for from a victory, than to fear from a defeat; expecting farther ſuccour, or the junction of a ſeparate corps; finding the enemy advantageouſly poſted, or a proſpect of diſſipating his army by temporizing, and avoiding battle. Means for execution are, to form the order of battle ſuitable to the quantity and quality of the forces whereof the army is compoſed, and the ground wherein it is expected to find the enemy; diſtributing the poſts to the general officers; giving copies of the order of battle to all thoſe who have command in it; diſtributing a ſufficient number of charges to the men, and having ammunition and arms ready behind thoſe who have a long fire to ſuſtain; letting the army have time to reſt and refreſh themſelves before the battle; being ſufficiently provided with medicines and ſurgeons; being abſolutely free from the incumbrance of the heavy baggage; inſpiring the army with the deſire of fighting, hopes of victory, and promiſes of plunder; and not neglecting the advantages of wind and ſun. The ſtratagem of the Arabs deſerves mention. They uſed to turn looſe a number of camels loaded with ſand and duſt-bags full of holes, to the windward of the enemy, who by this means were covered and ſuffocated with a cloud of duſt. Vide Phil. Tranſ. No. 219. p. 137.

On the day of battle, the means of execution are, taking the advantages of the ground, obſerving the order of battle before concerted, changing it where found neceſſary, and giving notice thereof to thoſe concerned; diſtributing the artillery in the line according to the ground; watching for all ad-

vantages to be taken, by opening and ſtrengthening the wings; giving the word before marching to the enemy; taking care to obſerve the right and left, and the diſtance between the lines: if the army march in front, to make frequent halts, to give time for the line to recover its order, and to the artillery to fire and load again; above all, reſtraining the ſoldiers from firing to receive the enemy's fire, and not to charge till after drawing their fire from them, is a capital point; it being certain, that when troops, who have parted with their fire, ſee others advance, and going to pour in their fire upon them, they will immediately give way. But when both ſides purſue the ſame maxim, the beſt expedient ſeems to be, to march up cloſe to the enemy, before they give their fire, and having fired, to prevent the enemy from giving theirs, by falling upon them with the bayonet on the muzzle of the muſkets the inſtant you have fired; which may be done under cover of the ſmoke, before they can perceive it.

If the army, by its march, cannot come at the enemy in front, it muſt approach in a ſufficient number of columns to be in order of battle, out of diſtance of being charged in columns. The artillery is ſtill to accompany the firſt line in the order wherein it was diſtributed, if the ground will allow; and the reſt of the army to follow this motion, ſtill obſerving the diſtance between the two lines as at firſt appointed, to prevent confuſion. If the victory continue to declare in his favour, and he has the good fortune to overthrow the ſecond line, more care ſtill is to be taken to prevent the troops from ſeparating, leſt they be charged and put into diſorder by the firſt line of the enemy, who may be rallied behind their ſecond line. The routed troops muſt ſtill be purſued in a body, and in lines. No battalion ought ever to advance before the line in purſuit, for fear of being flanked, till the diſorder be general: afterwards, the number of thoſe detached for the purſuit is to be increaſed, without ever ſuffering a man to quit his flag without being commanded. On this occaſion, the general is to make uſe of the reſerved body, and of freſh troops who have not engaged, to purſue the enemy, to prevent their rallying, and to take priſoners, which the troops muſt never be ſuffered to meddle with during the battle, not ſo much as to look on the plunder of the field, till the victory be abſolutely aſſured, and the enemy ſo broken, and at ſuch a diſtance, that there is no danger of his turning back on the bodies detached to purſue them: after which, during the reſt of the day, the victorious troops may be ſuffered to reap the plunder of the field of battle. If the firſt line give way, or be put into diſorder by the enemy, the battalions are to retire through the intervals left between thoſe of the ſecond line, behind which they are to ſtop and rally. Great care is to be here taken by the officers, that, inſtead of retiring through the intervals, they do not run directly into the battalions, and either carry them off with them, or put them into ſuch confuſion, that the enemy be upon them before they have proper time to repair the diſorder.

On the firſt line's giving way, the ſecond ſhould march up briſkly to their relief, and attack the enemy, before they have opportunity to repair the diſorder, which the action and the purſuit muſt of courſe have thrown them into; by doing which, they may eaſily retrieve what is loſt, and defeat and render uſeleſs the enemy's firſt line, which had been conſiderably weakened and diſordered by the former attack. This is the more eaſy to be effected, as the enemy's firſt fire is ſpent, which is that which does moſt execution; the other, from the great hurry of loading, being of little conſequence, in compariſon with the firſt. The great miſchief is, that the ſecond line, ſeeing the firſt give way, are uſually ſtruck with a panic, which magnifies the enemy; ſo that by the time they approach near, they either betake themſelves to flight, or make but a faint reſiſtance.

In caſe fortune declare on the enemy's ſide, the great buſineſs of the general is to prevent a total rout. His capacity and experience are to ſhew him the moment which precedes the loſs of a battle, that he may take the neceſſary precautions to diminiſh the diſorder of a flight, either by the vigorous efforts of a body of troops unſhattered, in order to give time to the reſt to rally, and thus ſecure a retreat; or by ſeizing ſome poſt behind, whither he may retire with ſafety; or a defile, behind which he may rally and re-aſſemble his ſcattered troops. As the loſs of the field of battle frequently carries with it that of the baggage and artillery, he is to remain no longer in this firſt place than while he can re-aſſemble his army; after which he is to lead it into ſome ſecure camp, where he may recover his loſſes, ſend for freſh cannon, troops, &c. If the loſs be conſiderable enough to hazard ſome conſiderable town, he is to throw into it the beſt of his infantry left, and endeavour ſtill to keep the field with the cavalry, to haraſs the enemy, in caſe he attempts a ſiege; or to oblige him to keep the army together, and prevent his dividing into ſeveral bodies, if his deſign be only to penetrate farther, and ravage the country.

Battle, in a *Naval* ſenſe, denotes an engagement between two fleets, ſquadrons, or even ſingle ſhips. This is more frequently diſtinguiſhed by the name of ſea-fight. Of late it has been the practice for fleets to be ranged in line of battle, like land armies, and fight much after the ſame order; to the expediency of which, ſome objections may be made.

The ancients had many forms in their naval order of battle; as the half-moon, circle, and forceps. In all theſe, not only the ſhips engaged each other, and by their beaks and prows, and ſometimes their ſterns, endeavoured to daſh in pieces, or overſet and ſink each other, but the ſoldiers alſo annoyed the enemy with darts and ſlings, and, on their nearer approach, with ſwords and ſpears, boarding each other by laying bridges between the ſhips. By way of preparation, they took down their ſails, lowered their maſts, and ſecured whatever might expoſe them to the wind, chooſing rather to be governed by their oars.

It is obſervable, that the ancient and uſual way of fighting in our fleets was board and board, yard-arm and yard-arm, through and through; and not at a diſtance in a line or half-moon, as is now done: which practice our old ſailors ſay they were ſtrangers to.—For this reaſon our guns are ſhorter, and of larger bore, than thoſe of the French, which are adapted to the method of fighting in line of battle; as being longer, and carrying farther. So that we engage with them in this way at a diſadvantage. And hence it has been often found, that their balls will fly over our ſhips, before ours can reach them.

Battle *royal*, in Cock-fighting, denotes a fight between three, five, or ſeven cocks all together; ſo as that the cock which ſtands longeſt gets the day.

Battle *Axe*, a military weapon uſed by the ancients. Axes were a principal part of the offenſive armour of the Celtæ. At the ſiege of the Roman Capitol by the Gauls under Brennus, we find one of the moſt diſtinguiſhed of their warriors armed with a battle-axe. And Ammianus Marcellinus, many centuries afterwards, deſcribing a body of Gauls, furniſhes them all with battle-axes and ſwords. Some of theſe weapons have been found in the ſepulchres of the Britons, on the downs of Wiltſhire, and in the north of Scotland. Within theſe four or five centuries the Iriſh went conſtantly armed with an axe. At the battle of Bannock-burn, king Robert Bruce clave an Engliſh champion down to the chine at one blow with a bat-

tle-axe. The axe of Lochaber hath remained a formidable implement of deſtruction in the hands of our Highlanders, even nearly to the preſent period; and it is ſtill uſed by the city-guard of Edinburgh in diſperſing mobs, quelling inſurrections, &c.

BATTLEMENTS, in architecture, are indentures or notches in the top of a wall or other building, in the form of embraſures, made for the ſake of looking through them.

BATTOLOGY, from *βατος*, *battus*, *babbler*, and *λεγω*, *I ſpeak*, in *Grammar*, a multiplying of words without occaſion, or a needleſs and ſuperfluous repetition of the ſame words, or expreſſions.

BATTON, in merchandiſe, a name given to certain pieces of wood or deal for flooring or other purpoſes.

BATTORY, a name given by the Hans Towns to their magazines or factories abroad. The chief of theſe battories are thoſe at Archangel, Novogrod, Berghmen, Liſbon, Venice, and Antwerp.

BATTUS, an order of penitents at Avignon and in Provence, whoſe piety carries them to exerciſe ſevere diſcipline upon themſelves both in public and private.

BATZ, a copper coin mixed with ſome ſilver, and current at different rates, according to the alloy, in Nuremberg, Baſil, Fribourg, Lucerne, and other cities of Germany and Switzerland.

BAVARIA, a duchy and formerly electorate of Germany. This duchy was once a kingdom, which extended from the mountains of Franconia to the frontiers of Hungary and the Adriatic Gulph. It comprehended the countries of Tirol, Carinthia, Carniola, Stiria, Auſtria, and other ſtates which are now fallen to different princes. At preſent it is bounded on the eaſt by Bohemia and Auſtria, on the weſt by Suabia, on the north by Franconia, and on the ſouth by Tirol. But the Duke of Bavaria is not abſolute maſter of all this country; for within its bounds are ſituated many free cities, among which is Ratiſbon, and ſeveral lordſhips both eccleſiaſtical and ſecular. It is divided into Upper and Lower Bavaria; and theſe two provinces conſiſt of 12 counties, which formerly ſufficed to make a duchy, according to the laws of Franconia. The country is watered by five navigable rivers, beſides ſeveral ſmaller ones, and 16 lakes.—It contains 35 cities, of which Munich is the capital; 94 towns; 720 caſtles; 4700 villages; eight great abbeys; and 75 cloiſters or monaſteries, beſides thoſe of the mendicants.—It is divided into four great bailliages called *governments*. Theſe are Munich, Landſhut, Straubing, and Burkhauſen. The principal cities are Ingolſtadt, Donawert, Landſberg, Freiberg, Straubingen, Wilſhauſen, Waſſerberg, Eling, Rain, &c. The inhabitants of this country are ſtrong and laborious, exerciſing themſelves in ſhooting with rifled muſkets at a mark, in order to render themſelves more expert when employed againſt an enemy.

The houſe of Bavaria is univerſally allowed to be one of the moſt ancient in Germany. The counts of Scheyren, whoſe caſtle at preſent is a cloiſter, gave them the name. At that place are ſhown the tombs of more than 26 lords of Scheyren. The Emperor Otho I. eſtabliſhed as counts-palatine of Bavaria and landgraves of Scheyren, Arnolph and Herman, ſons of Arnolph brother to the Duke Berchtold of Carinthia, marquis of the county upon the Ens. After the death of Berchtold, the ſame emperor, inſtead of giving Bavaria to his ſon, gave it to Duke Henry his brother, who had married Judith ſiſter to Arnolph and Herman. This Duke Henry of Bavaria had by his marriage Henry Hezillon, who was ſucceeded by his ſon Henry, afterwards choſen emperor by the name of Henry II. This emperor having no children by Saint Cunegond his wife, Bavaria paſſed again to the family of Franconia, and afterwards to that of Suabia under Henry IV. who poſſeſſed it till the year 1071, when this laſt emperor gave that county to Count Wolf, or Guelph, of Ravenſburg in Suabia. To this Guelph, who died in the iſland of Cyprus, ſucceeded Guelph II. and to him his brother Duke Henry IX. who was ſucceeded by his ſon Henry the Proud. This laſt had married the only daughter of the emperor Lotharius, and after the death of his father-in-law became alſo Duke of Saxony; but refuſing to deliver up the imperial ornaments of his father-in-law to the emperor Conrad III. Duke of Suabia, or to acknowledge him for emperor, he was put to the ban of the empire, and loſt his ſtates. After the death of Henry, Conrad made his brother Leopold Marquis of Auſtria and Duke of Bavaria; who, dying without iſſue, was ſucceeded by his brother Henry XI. whom the emperor Frederic I. made Duke of Auſtria, joining together the two counties above and below the Ens, and declaring them free and independent of the government of Bavaria. The ſame emperor gave Bavaria thus diſmembered, with Saxony, to Henry the Lion, ſon of Henry the Proud. But Henry the Lion afterwards loſing the favour of this emperor, was put to the ban of the empire; and loſt all his poſſeſſions except Brunſwick and Lunenburg, which ſtill remain to his deſcendants. In 1180, the duchy of Bavaria was given by the emperor to Otho the Landgrave of Wittelſbach, count-palatine of the houſe of Bavaria. In the time of this Otho, the caſtle of Scheyren was changed into a monaſtery, in which the Duke was buried. From him are deſcended the two great families that remain to this day in Germany; *viz.* the counts-palatine of the Rhine, and till lately electors of Bavaria. The elector of Bavaria is now extinct, and ſunk in the elector-palatine; ſo that in Germany there are now only eight electoral princes, inſtead of nine.

BAVAY, a little town of France, in the department of the North, and late province of Hainault, to which the French retired after the battle of Malplaquet, in 1709. It was taken by the Auſtrians in 1792, but recovered the ſame year. It is three miles S. W. of Malplaquet, and 12 S. W. of Mons. E. lon. 3. 52. N. lat. 50. 16.

BAUCIS, in fabulous hiſtory, an old woman who lived with Philemon her huſband in a cottage in Phrygia. Jupiter and Mercury, travelling over that country, were well received by them, after having been refuſed entertainment by every body elſe. To puniſh the people for their inhumanity, theſe gods laid the country waſte with water; but took Baucis and Philemon with them to the top of a mountain, where they ſaw the deluge, and their own little hut above the waters, turned into a temple. Having a wiſh granted them, they deſired to officiate in this temple as prieſt and prieſteſs, and alſo that they might die both together; which was granted them.

BAUDEKIN, Baldicum, and Baldakinum, in our old writers, is uſed for a cloth of *baudekin*, or gold; or tiſſue, upon which figures in ſilk, &c. were embroidered. But ſome writers account it only cloth of ſilk.

BAUDIUS (Dominic), profeſſor of hiſtory in the univerſity of Leyden, born at Liſle the 8th of Auguſt 1561. He began his ſtudies at Aix-la-Chapelle, and continued them at Leyden. He removed from thence to Geneva, where he ſtudied divinity. After reſiding here ſome time, he returned to Ghent, and from thence to Leyden, where he applied to the civil law, and was admitted doctor of law in June 1585. Soon after his admiſſion, he accompanied the ambaſſadors from the States to England; and during his reſidence here became acquainted with ſeveral perſons of diſtinction, particularly the famous Sir Philip Sidney. He was admitted advocate at the Hague the 5th of January 1587; but, being ſoon tired of the bar, went to travel in France, where he remained 10 years. He

was much eſteemed in that kingdom, and gained many friends there. Achilles de Harlai, firſt preſident of the parliament of Paris, got him to be admitted an advocate of the parliament in the year 1582. In 1602, he went to England with Chriſtopher de Harlai, the preſident's ſon, who was ſent ambaſſador to the court of London by Henry the Great. This ſame year Baudius having been named profeſſor of eloquence at Leyden, went and ſettled in that univerſity. He read lectures on hiſtory after the death of Morula, and was permitted alſo to do the ſame on the civil law. In 1611, the States conferred upon him the office of hiſtoriographer in conjunction with Meurſius; and in conſequence thereof he wrote The Hiſtory of the Truce. Baudius is an elegant proſe writer, as appears from his Letters, many of which were publiſhed after his death. He was alſo an excellent Latin poet. The firſt edition of his poems was printed in the year 1587: they conſiſt of verſes of all the different meaſures. He publiſhed ſeparately a book of iambics in 1591, dedicated to Cardinal Bourbon. Some of his poems he dedicated to the King of England; others to the Prince of Wales, in the edition of 1607; and went over to England to preſent them. He died at Leyden in the year 1613.

BAUGE, a drugget manufactured in Burgundy, with thread-ſpun thick and coarſe wool.

Bauge, a ſmall town of France, in the department of Maine and Loire and late province of Anjou, famous for the victory gained by Charles VII. over the Engliſh, in 1421. It is ſeated on the river Coeſnon, 8 miles E. of Angers. Long. 0. 1. W. Lat. 47. 30. N.

BAUGENCI, a town of France, in the department of Loiret and late province of Orleanois, ſeated on a hill, at the foot of which runs the Loire. It is famous for its wines, and is 6 miles W. of Orleans.

BAUHINIA, mountain ebony; a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is quinquefid and deciduous; the petals are oblong, expanded, and clawed, the ſuperior one more diſtant, all inſerted on the calyx; the capſule is a legumen.

The ſpecies are, 1. The aculeata, with a prickly ſtalk, is very common in Jamaica and other American ſugar-iſlands, where it riſes to the height of 16 or 18 feet, with a crooked ſtem, and divides into many irregular branches armed with ſtrong ſhort ſpines, garniſhed with compound winged leaves, each having two or three pair of lobes ending with an odd one, which are oblique, blunt, and indented at the top. The ſtalks are terminated by ſeveral long ſpikes of yellow flowers, which are ſucceeded by bordered pods about three inches long, containing two or three ſwelling ſeeds. Theſe pods are glutinous, and have a ſtrong balſamic ſcent, as have alſo the leaves when bruiſed. It is called in America the *ſavin-tree*, from its ſtrong odour ſomewhat reſembling the common ſavin. 2. The tomentoſa, with heart-ſhaped leaves, is a native of Campeachy; and riſes to the height of 12 or 14 feet, with a ſmooth ſtem dividing into many branches, garniſhed with heart-ſhaped leaves, having two ſmooth, pointed lobes. The extremity of every branch is terminated by a long ſpike of yellow flowers, ſo that when theſe trees are in flower they make a fine appearance. 3. The acuminata, with oval leaves, is a native of both the Indies; and riſes with ſeveral pretty ſtrong, upright, ſmooth ſtems, ſending out many ſlender branches, garniſhed with oval leaves deeply divided into two lobes. The flowers come out at the extremities of the branches, three or four in a looſe bunch; ſome of the petals are red, or ſtriped with white, but others are plain upon the ſame branch; the ſtamina and ſtyle are white, and ſtand out beyond the petals. Theſe flowers are ſucceeded by long pods of a dark brown colour, each containing five or ſix roundiſh compreſſed ſeeds. The wood of this tree is very hard, and veined with black; whence its name of *mountain ebony*. 4. The variegata, with heart-ſhaped leaves, and lobes joining together; this is likewiſe a native of both the Indies. It riſes with a ſtrong ſtem upwards of 20 feet high, dividing into many ſtrong branches, garniſhed with heart-ſhaped leaves having obtuſe lobes which cloſe together. The flowers are large, and grow in looſe panicles at the extremity of the branches. They are of a purpliſh red colour marked with white, and have a yellow bottom. The flowers have a very agreeable ſcent, and are ſucceeded by compreſſed pods about ſix inches long, and three quarters of an inch broad, containing three or four compreſſed ſeeds in each. 5. The divaricata, with oval leaves whoſe lobes ſpread different ways. This grows naturally in great plenty on the north ſide of the iſland of Jamaica. It is a low ſhrub, ſeldom riſing more than five or ſix feet high, but divides into ſeveral branches garniſhed with oval leaves dividing into two lobes that ſpread out from each other. The flowers grow in looſe panicles at the end of the branches, have a white colour, and a very agreeable ſcent. The flowers appearing the greateſt part of the ſummer, the plant is one of the greateſt beauties of the hot-houſe. The flowers are ſucceeded by taper pods about four inches long, each containing four or five roundiſh compreſſed ſeeds of a dark colour. Beſides theſe, five other ſpecies of bauhinia are enumerated, but the above are the moſt remarkable. All the ſpecies of this plant are propagated by ſeeds, which muſt be ſown on hot-beds, and the plants reared in a bark-ſtove, otherwiſe they will fail.

BAVINS, in war, bruſh faggots or faſcines, made with the bruſh at length. See the notes annexed to the deſcription of a Fire-ship, under the article Barrel.

BAUM, Melissa, in botany; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order *Verticillatæ*. The calyx is arid, a little plain above, with the upper lip having its dents nearly of equal height: the upper lip of the corolla is arched and bifid; the under one, with the middle lobe, cordated. There are ſeveral ſpecies; but the moſt remarkable are the following. 1. The officinalis, or common baum, has fibrous perennial roots; many upright, ſquare, branchy, annual ſtalks, riſing two or three feet high: garniſhed with oblong, indented, oppoſite leaves, by pairs, two or three inches long, and half as broad; and from the upper axillas verticillate cluſters of ſmall white flowers upon ſingle footſtalks. There is alſo a kind with variegated leaves. 2. The grandiflora, or Hetrurian calamint, hath fibrous perennial roots and annual ſtalks, riſing about a foot high, garniſhed with oblong, oval, indented, hairy, oppoſite leaves; and from the upper axillas verticillate cluſters of large purple flowers on forked footſtalks. 3. The calamintha, or common calamint of the ſhops, has fibrous perennial roots; upright, ſquare, branchy hairy ſtalks, riſing a foot high; roundiſh, indented, oppoſite leaves; and verticillate cluſters of ſmall blueiſh flowers, on forked footſtalks as long as the flowers. All theſe ſpecies are eaſily propagated by offsets.

We ſhall now ſpeak of its medicinal uſes. The firſt ſpecies, when in perfection, has a pleaſant ſmell, ſomewhat of the lemon kind; and a weak, roughiſh, aromatic taſte. The young ſhoots have the ſtrongeſt flavour; the flowers, and the herb itſelf when old or produced in very rich moiſt ſoils or rainy ſeaſons, are much weaker both in ſmell and taſte. Baum is pompouſly announced by ſome writers on the materia medica, as a grand remedy in complaints of the head, ſtomach, and uterus. So high an opinion indeed have ſome entertained of this plant,

that they have expected to find in it a medicine which ſhould prolong life beyond the uſual period. The preſent practice, however, holds it in no great eſteem; and ranks it, where it certainly deſerves to be, among the weaker corroborants. Infuſions of the leaves in water ſmell agreeably of the herb, but have not much taſte, though on being inſpiſſated they leave a conſiderable quantity of a bitteriſh auſtere extract. Infuſions of baum do not, like other aromatics, offend the head, as is complained of from ſage, &c. Cold infuſions in water or ſpirit are far better than the diſtilled water, and are the beſt preparations that the plant admits of. On diſtilling the freſh herb with water, it impregnates the firſt running pretty ſtrongly with its grateful flavour. When large quantities are ſubjected to the operation at once, there ſeparates and riſes to the ſurface of the aqueous fluid a ſmall portion of eſſential oil, which ſome have called *Ol. Syriæ*, and others *Ol. Germaniæ*. It is of a yellowiſh colour, and of a very fragrant ſmell.

BAUME (St.), a mountain in France, between Marſeilles and Toulon. Here Mary Magdalen is ſaid to have died; on which account it is much frequented.

Baume-*les-Nonnes*, a town of France in the department of Doubs and late province of Franche Comté. It once was remarkable for a rich nunnery, which was ſeated on the river Doux, in E. long. 6. 20. N. lat. 47. 12. Five miles from this town is a remarkable cavern, whoſe entrance is 20 paces wide; and after deſcending 300 paces, the gate of a grotto is ſeen, twice as large as that of a city. The grotto is 35 paces deep, 60 wide, and is covered with a kind of a vaulted roof, from which water continually drops. There is alſo a ſmall brook, ſaid to be frozen in ſummer, but not in winter; and at the bottom are ſtones that exactly reſemble candied citron-peel. When the peaſants perceive a miſt riſing out of this cave, they affirm that it will certainly rain the next day.

BAUMEN, or Bauman, a cave of Lower Saxony in Germany, about a mile from Wermigerode, and 18 from Goſlar. The entrance is through a rock; and ſo narrow, that not above one perſon can paſs at a time. There are ſeveral paths in it, which the peaſants have turned up, in ſearching for the bones of animals, which they ſell for unicorns horns. Some think this cave reaches as far as Goſlar; but be this as it will, the ſkeletons of men have been found in it, who are ſuppoſed to have been loſt in its labyrinths.

BAUR (William), an eminent Flemiſh painter, was born at Straſburg, and was the diſciple of Brendel. He was ſome time at Rome, where his ſtudies were wholly employed about architecture and landſcapes, which prevented his ſtudying the antique. He painted ſmall figures in diſtemper on vellum. He etched with great ſpirit. His largeſt works are in the hiſtorical way. He has given us many of the ſieges, and battles, which waſted Flanders in the 16th century. They may be exact, and probably they are: but they are rather plans than pictures; and have little to recommend them but hiſtoric truth, and the freedom of the execution. His beſt prints are ſome characters he has given us of different nations, in which the peculiarities of each are very well preſerved. His Ovid is a poor performance. He died at Vienna in the year 1640.

BAUSK or Bautko, a ſmall but important town in the duchy of Courland, on the frontiers of Poland, with a ſtrong caſtle built on a rock. It was taken by the Swedes in 1625, and by the Ruſſians in 1705, after a bloody battle between them and the Swedes. It is ſeated on the river Muſa, in E. long. 24. 44. N. lat. 56. 30.

BAUTRY, or Bawtry, a town in the weſt riding of Yorkſhire, on the road from London to York. It has long been noted for its trade in millſtones and grindſtones, which are brought hither by way of the river Idle, on which it is ſeated. W. long. 1. 0. N. lat. 53. 27.

BAUTZEN, or Budissen, a conſiderable town of Germany, and capital of Upper Luſatia, ſubject to the elector of Saxony, with a ſtrong citadel. The Proteſtants as well as Papiſts have here the free exerciſe of their religion. E. long. 14. 42. N. lat. 51. 10.

BAUX, a town of the ci-devant province of Provence in France. It is ſeated on a rock, at the top of which is a ſtrong caſtle. E. long. 5. 0. N. lat. 43. 42.

BAWD, a perſon who keeps a place of proſtitution, or makes a trade of debauching women, and procuring or conducting intrigues between the abandoned of both ſexes. Some think the word is derived from the old French *baude*, bold or impudent; though Verſtegan has a conjecture which would carry it higher, viz. from *bathe*, anciently written *bade*. In which ſenſe *bawd* originally imported no more than bath-holder, as if bagnios had anciently been the chief ſcenes of ſuch debauchery.

The Romans had their male as well as female bawds; the former denominated *lenones* and *proagogi*, among us *panders*; the latter, *lenæ*. Donatus, ſpeaking of the habits of the ancient characters in comedy, ſays, *Leno palliis varii coloris utitur*. But the ancient *lenones*, it is to be obſerved, were in the horrid practice of furniſhing boys as well as girls for venereal ſervice. Another ſort of theſe merchants or dealers in human fleſh were called *mangones*, by the Greeks ανδροκαπηλοι, who ſold eunuchs, ſlaves, &c. By a law of Conſtantine, bawds were to be puniſhed by pouring melted lead down their throats. See the next article.

Bawdy-*Houſe*, a houſe of ill fame, to which lewd perſons of both ſexes reſort, and there have criminal converſation together. The keeping a bawdy-houſe is a common nuiſance, not only on account that it endangers the public peace by drawing together debauched and idle perſons, and promoting quarrels, but likewiſe for its tendency to corrupt the manners of the people. And therefore perſons convicted of keeping bawdy-houſes are puniſhable by fine and impriſonment; alſo liable to ſtand in the pillory, and to ſuch other puniſhment as the court at their diſcretion ſhall inflict. Perſons reſorting to a bawdy-houſe are likewiſe puniſhable, and they may be bound to their good behaviour.

It was always held infamous to keep a bawdy-houſe; yet ſome of our hiſtorians mention bawdy-houſes publicly allowed here in former times till the reign of Henry VIII. and aſſign the number to be 18 thus allowed on the bank-ſide in Southwark. Mr. Pennant, in his work entitled London, ſpeaks of them; and in the notes of a Treatiſe on the Venereal Diſeaſe, by Mr. Houlſton, are quoted the following parts of an ancient record of the Court Leet in the borough of Southwark, when public ſtews or brothel-houſes were permitted within the manor, and under the juriſdiction of the Biſhop of Wincheſter.

Item—"That no ſtewholder keep any woman within his houſe that hath any *ſickneſs of brenning*, but that ſhe be put out, upon pain of making a fyne unto the Lord of C ſhillings."

Item—"The women that be at common bordel to be ſeen every day what they be; and a woman that liveth by her body to come and goe where ſhe liſt, only, according to ancient cuſtom, ſhe ſhall pay every week XIV pence for her chamber."

Item—"If any woman of the bordel *let* any man of his way, but ſit ſtill at the door, and let them go or come, and choſe wider they wol; or if they draw any man by his gown, or by his hood, or by any odir thing, ſhe ſhall make a fyne unto the Lord of XX ſhillings."

Item—" That if any woman living by her body take any moneys to lye with a man, and ſhall not lye with him till the morrow, ſhe ſhall make a fyne of VI ſhillings and VIII pence."

Bawdy-houſes are at this time licenſed in Holland, and pay a conſiderable tax towards the public revenue. See the articles STEWS and BROTHEL.

BAWLING, among ſportſmen, is ſaid of the dogs when they are too buſy before they find the ſcent good.

BAXTER (Richard), a very noted divine among the nonconformiſts, was born at Rowton in Shropſhire, November 12, 1615; and diſtinguiſhed himſelf by his exemplary life, his pacific and moderate principles, and his numerous writings. He was remarkable for his piety even when he was very young. Upon the opening of the long parliament, he was choſen vicar of Kidderminſter. In the heat of the civil wars he withdrew from that town to Coventry, and preached to the garriſon and inhabitants. When Oliver Cromwell was made protector, he would by no means comply with his meaſures, though he preached once before him. He came to London juſt before the depoſing of Richard Cromwell, and preached before the parliament the day before they voted the return of king Charles II. who upon his reſtoration appointed him one of his chaplains in ordinary. He aſſiſted at the conference in the Savoy, as one of the commiſſioners for ſtating the fundamentals in religion, and then drew up a reformed liturgy. He was offered the biſhopric of Hereford, which he refuſed, affecting no higher preferment than the liberty of continuing miniſter of Kidderminſter; which he could not obtain, for he was not permitted to preach there above twice or thrice after the reſtoration. Whereupon he returned to London, and preached occaſionally about the city, till the act of uniformity took place. In 1662, Mr. Baxter was married to Margaret Charleton, daughter to Francis Charleton, Eſq. of the county of Salop, who was eſteemed one of the beſt juſtices of the peace in that county. She was a woman of great piety, and entered thoroughly into her huſband's views concerning religion. During the plague in 1665 he retired into Buckinghamſhire; but he afterward returned to Acton, where he ſtaid till the act againſt conventicles expired; and then his audience was ſo large that he wanted room. Upon this he was committed to priſon; but procuring an habeas corpus, he was diſcharged. After the indulgence in 1672, he returned to London; and in 1682 he was ſeized for coming within five miles of a corporation. In 1684 he was ſeized again; and in the reign of king James II. was committed priſoner to the king's bench, and tried before the lord chief juſtice Jefferies for his Paraphraſe on the New Teſtament, which was called a *ſcandalous* and *ſeditious* book againſt the government. He continued in priſon two years; from whence he was at laſt diſcharged, and had his fine remitted by the king. He died December the 8th 1691; and was buried in Chriſt-Church.

Mr. Baxter's perſon is thus deſcribed by Mr. Sylveſter: "He was tall and ſlender, and ſtooped much: his countenance compoſed and grave, ſomewhat inclining to ſmile. He had a piercing eye, a very articulate ſpeech, and deportment rather plain than complimental." There is an original portrait of him at Dr. Williams's library, founded for the uſe of Proteſtant Diſſenting Miniſters, in Red-croſs-ſtreet. Mr. Sylveſter alſo ſays, that "he had a great command over his thoughts. He had that happy faculty, ſo as to anſwer the character that was given of him by a learned man diſſenting from him, after diſcourſe with him; which was, that *he could ſay what he would, and he could prove what he ſaid.* He was moſt intent upon the neceſſary things. Rational learning he moſt valued, and was a very extraordinary maſter of. And as to his expreſſive faculty, he ſpake properly, plainly, pertinently, and pathetically. He could ſpeak ſuitably, both to mens' capacities and to the things inſiſted on. He was a perſon wonderful at extemporate preaching." But his common practice appears to have been to preach with notes; though he ſaid, "That he thought it very needful for a miniſter to have a body of divinity in his head." He was honoured with the friendſhip of ſome of the greateſt and beſt men in the kingdom, as the Earl of Lauderdale, the Earl of Balcarras, Lord Chief Juſtice Hales, Dr. Tillotſon, &c. and held correſpondence with ſome of the moſt eminent foreign divines.—He wrote above 120 books, and had above 60 written againſt him. The former, however, it ſhould ſeem, were greatly preferable to the latter; ſince Dr. Barrow, an excellent judge, ſays, that "his practical writings were never mended, his controverſial ſeldom confuted."

The character given of him by Mr. Granger, is too ſtriking to be paſſed over. "Richard Baxter was a man famous for weakneſs of body and ſtrength of mind; for having the ſtrongeſt ſenſe of religion himſelf, and exciting a ſenſe of it in the thoughtleſs and profligate; for preaching more ſermons, engaging in more controverſies, and writing more books, than any other Nonconformiſt of his age. He ſpoke, diſputed, and wrote with eaſe; and diſcovered the ſame intrepidity when he reproved Cromwell and expoſtulated with Charles II. as when he preached to a congregation of mechanics. His zeal for religion was extraordinary; but it ſeems never to have prompted him to faction, or carried him to enthuſiaſm. This champion of the Preſbyterians was the common butt of men of every other religion, and of thoſe who were of no religion at all. But this had very little effect upon him: his preſence and his firmneſs of mind on no occaſion forſook him. He was juſt the ſame man before he went into a priſon, while he was in it, and when he came out of it; and he maintained an uniformity of character to the laſt period of life. His enemies have placed him in hell; but every man who has not ten times the bigotry that Mr. Baxter himſelf had, muſt conclude that he is in a better place. This is a very faint and imperfect ſketch of Mr. Baxter's character: men of his ſize are not to be drawn in miniature. His portrait, in full proportion, is in his *Narrative of his own Life and Times;* which, though a rhapſody, compoſed in the manner of a diary, contains a great variety of memorable things, and is itſelf, as far as it goes, a Hiſtory of Nonconformity."—Among his moſt famous works were, 1. The Saints' Everlaſting Reſt. 2. Call to the Unconverted, of which 20,000 were ſold in one year; and it was tranſlated not only into all the European languages, but into the Indian tongue. 3. Poor Man's Family Book. 4. Dying Thoughts; and, 5. A Paraphraſe on the New Teſtament. His practical works have been included in four folio volumes.

BAY, in geography, an arm of the ſea ſhooting up into the land, and terminating in a nook. It is a kind of leſſer gulph bigger than a creek, and is larger in its middle within than at its entrance. The largeſt and moſt noted bays in the world are thoſe of Biſcay, Bengal, Hudſon, Panama, &c.

BAY denotes likewiſe a pond-head, made to keep in ſtore of water for driving the wheels of the furnace or hammer belonging to an iron-mill, by the ſtream that comes thence through a flood-gate called the *pen-ſtock*.

BAY-*Colour* denotes a ſort of red inclining to cheſnut, chiefly uſed in deſcribing the colour of horſes. In this ſenſe, the word *bay* is formed from the Latin *baius*, or *badius*, and that from the Greek βαΐος, a *palm branch*; ſo that *badius* or *bay* properly denotes *color phœniceus*. Hence alſo, among the ancients, thoſe now called *bay* horſes, were denominated *equi palmati*. We have divers ſorts and degrees of bays; as a light bay, a brown bay, &c. All bay horſes are ſaid to have black manes; a

circumſtance which diſtinguiſhes them from ſorrels, which have red or white manes.

BAY, among huntſmen, is when the dogs have earthed a vermin, or brought a deer, boar, or the like, to turn head againſt them. In this caſe, not only the deer, but the dogs, are ſaid to be at bay. It is dangerous going in to a hart at bay, eſpecially at rutting time; for then the animal is fierce. There are bays at land, and others in the water.

BAY-*tree*, LAURUS, a genus of the monogynia order, belonging to the enneandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. There is no calyx; the corolla is calycine, or ſerving in place of the calyx, and ſex-partite; the nectarium with three glandules, each terminated by two briſtles ſurrounding the germen. The interior filaments furniſhed with glandules at the baſe; the fruit a monoſpermous plumb. See 2d Plate 45.

The Species are, 1. The *nobilis*, or evergreen bay-tree, is a native of Italy, and hath an upright trunk branching on every ſide from the bottom upward; with ſpear-ſhaped, nervous, ſtiff, evergreen leaves, three inches long and two broad; and ſmall, yelloviſh, quadrifid, dicœcious flowers, ſucceeded by red berries in autumn and winter. Of this ſpecies there are varieties, with broad, narrow, ſtriped, or waved leaves. 2. The *eſtivalis*, or deciduous bay, grows naturally in North America. It riſes with an upright ſtem, covered with a purpliſh bark; having oblong, oval, acuminated, veined, deciduous leaves, two or three inches long, and half as broad, growing oppoſite; with ſmall white flowers ſucceeded by red berries. 3. The *benzoin*, or benjamin tree, is alſo a native of North America; grows 15 or 20 feet high, divided into a very branchy head; with oval, acute, deciduous leaves, three or four inches long, and half as broad; and ſmall yelloviſh flowers, not ſucceeded by berries in this country. 4. The *ſaſafras* is a native of the ſame country. It hath a ſhrub-like ſtraight ſtem, garniſhed with both oval and three-lobed, ſhining, deciduous leaves, of different ſizes, from three to ſix inches long, and near as broad, with ſmall yelloviſh flowers ſucceeded by blackiſh berries, but not in this country. 5. The *indica*, or Indian bay-tree, riſes with an upright ſtraight trunk, branching regularly 20 or 30 feet high; adorned with very large, ſpear-ſhaped, plane, nervous, evergreen leaves on reddiſh footſtalks; and bunches of ſmall whitiſh-green flowers, ſucceeded by large oval black berries, which do not ripen in this country. 6. The *borbonia*, or Carolina red bay-tree, riſes with an upright ſtraight ſtem, branching 15 or 20 feet high; with large, ſpear-ſhaped evergreen leaves, tranſverſely veined; and long bunches of flowers on red footſtalks, ſucceeded by large blue berries ſitting in red cups. 7. The *camphora*, or camphor-tree, grows naturally in the woods of the weſtern parts of Japan, and in the adjacent iſlands. The root ſmells ſtronger of camphor than any of the other parts, and yields it in greater plenty. The bark of the ſtalk is outwardly ſomewhat rough; but in the inner ſurface ſmooth and mucous, and therefore eaſily ſeparated from the wood, which is dry and of a white colour. The leaves ſtand upon ſlender footſtalks, have an entire undulated margin, running out into a point; have the upper ſurface of a lively and ſhining green, the lower herbaceous and ſilky; and are furniſhed with a few lateral nerves, which ſtretch archwiſe to the circumference, and frequently terminate in ſmall warts; a circumſtance peculiar to this ſpecies of laurus. The flowers are produced on the tops of footſtalks, which proceed from the arm-pits of the leaves; but not till the tree has attained conſiderable age and ſize. The flower-ſtalks are ſlender, branched at the top, and divided into very ſhort pedicles, each ſupporting a ſingle flower. Theſe flowers are white, and conſiſt of ſix petals, which are ſucceeded by a purple and ſhining berry of the ſize of a pea, and in figure ſomewhat top-ſhaped. It is compoſed of a ſoft pulpy ſubſtance, that is purple, and has the taſte of cloves and camphor; and of a nucleus or kernel of the ſize of a pepper, that is covered with a black, ſhining, oily corticle, of an inſipid taſte. 8. The *cinnamomum*, or cinnamon-tree, is a native of Ceylon. It hath a large root, and divides into ſeveral branches, covered with a bark, which on the outer ſide is of a greyiſh brown, and on the inſide has a reddiſh caſt. The wood of the root is hard, white, and has no ſmell. The body of the tree, which grows to the height of 20 or 30 feet, is covered, as well as its numerous branches, with a bark which at firſt is green and afterwards red. The leaf is longer and narrower than the common bay-tree; and it is three-nerved, the nerves vaniſhing towards the top. When firſt unfolded, it is of a flame colour: but after it has been for ſome time expoſed to the air, and grows dry, it changes to a deep green on the upper ſurface, and to a lighter on the lower. The flowers are ſmall and white, and grow in large bunches at the extremity of the branches: they have an agreeable ſmell, ſomething like that of the lily of the valley. The fruit is ſhaped like an acorn, but is not ſo large. 9. The *caſſia*, or baſe cinnamon, has lanceolated leaves, tripple-nerved. 10. The *Perſea*, avocado pear tree, or alligator pear, riſes to a conſiderable height, with a ſtraight trunk, of which the bark and wood are of a greyiſh colour. The leaves are long, oval, pointed, of a ſubſtance like leather, and of a beautiful green colour. The flowers are produced in large knots or cluſters at the extremities of the branches, and conſiſt each of ſix petals diſpoſed in the form of a ſtar, and of a dirty white or yellow colour, with an agreeable odour, which diffuſes itſelf to a conſiderable diſtance. It is a native of the Weſt Indies. The Perſea begins to bear two years and a half, or at moſt three years after being planted; and, like moſt of the trees in warm climates, bears twice a year. There are two other ſpecies of this genus, but theſe being poſſeſſed of no remarkable properties, it is unneceſſary to deſcribe them.

In regard to the Culture of theſe plants, the firſt ſpecies is propagated by layers, or by the berries. 1. In order to raiſe a quantity of theſe trees by layers, ſome ſtools ſhould be planted for the purpoſe; and after theſe are ſhot about a yard high, the branches muſt be brought down to the ground in the winter, all the preceding ſummer's ſhoots laid on it, and pegged down (being firſt ſlit in the joint), and the leaves taken off, which would otherwiſe be under ground. In one year's time theſe layers will have taken root; and in the ſpring they ſhould be taken up, and planted in the nurſery a foot aſunder, in rows two feet diſtance. After they are planted out, if the weather ſhould prove dry, they muſt be conſtantly watered; for without ſuch care, it is difficult to make this tree grow. After they have taken well to the ground, they will require no farther trouble than keeping them clean from weeds, and digging between the rows each winter, till they are finally planted out. 2. In order to raiſe this tree from the berries, they ought to hang on the trees till about January before they are gathered. A well ſheltered ſpot of ground for the ſeminary muſt be made choice of; and having the mould ſmooth and fine, they ſhould be ſown ſoon after they are gathered, in beds or drills, rather more than half an inch deep. Towards the cloſe of the ſpring the plants will come up, and during ſummer muſt be duly attended, by watering and weeding. In the winter following, their ſheltered ſituation muſt not be truſted to, to defend them from the froſt: furze-buſhes, or ſome ſuch things, ought to be ſtuck in rows between the beds or drills, to guard them from the black froſts. Indeed, without this precaution, if the winter ſhould prove very froſty, few of the

young ſeedlings will be alive in the ſpring. During the following ſummer, weeding and watering muſt be obſerved, and the winter after that they ſhould be defended with covering as before; for they will be ſtill in danger of being deſtroyed by ſevere froſts. In the enſuing ſpring, the ſtrongeſt may be taken out of the ſeed-beds, and planted in the nurſery way; though, if they have not by that time made good ſhoots, it will be adviſable to let them remain in their beds till the third ſpring; for a ſmall plant of this kind is with more difficulty made to grow than one which is larger. When they are planted in the nurſery, the diſtance which ſhould be allowed them is the ſame as the layers, a foot aſunder and two feet diſtant in the rows; and this will not be found too cloſe; for notwithſtanding the greateſt care is exerted in planting them in the nurſery, even making choice of rainy and cloudy weather, which muſt always be obſerved in ſetting them out, many of them will be loſt by being tranſplanted. After they are thus planted out in the nurſery, whether layers or ſeedlings, they muſt be ſtill watered in dry weather, kept free from weeds, and the rows dug between every winter. You will even find, that thoſe plants which ſuffer leaſt by being tranſplanted will have met with a check, which they will not recover in two or three years; and till they have acquired new ſtrength they ſhould not be taken from the nurſery; but when they appear to be good ſtiff plants, having the year before made a vigorous ſhoot, they will be then proper plants for planting out where they are to remain. Holes ſhould be got ready for their reception; and as ſoon as the firſt autumnal rains fall, the work ſhould be ſet about, eſpecially if the land be gravelly or dry; but if it be moiſt, the ſpring will do as well. Being now planted at one yard diſtance, they will make a poor progreſs for two or three years more; but after this, when they have overcome all theſe difficulties, they will grow very faſt, and arrive to be good trees in a few years. Although this tree flouriſhes beſt in old gardens, where the ſoil has been made rich and deep, and loves the ſhade, Hanbury ſays, "it thrives nevertheleſs exceedingly well in our hotteſt gravels and ſands; and, after it has ſurmounted the hardſhips of tranſplanting, will grow in ſuch ſituations extremely faſt, and arrive to a large bulk."

The cultivation of the three next ſorts of trees may be attempted in two or three different ways. 1. By the ſeeds: and theſe we receive, from the places where the trees grow naturally, in the ſpring. They ſhould be preſerved in ſand; and, as ſoon as they arrive, ſhould be ſown in large pots an inch deep. The ſoil for their reception ſhould be taken from a rich paſture at leaſt a year before with the ſward. It ſhould alſo be laid on an heap, and frequently turned, until the ſward is grown rotten, and the whole appears well mixed and fine. If the paſture from whence it was taken near the ſurface is a ſandy loam, this is the beſt compoſt for theſe ſeeds; if not, a ſmall addition of drift or ſea ſand ſhould be added, and well mixed with the other mould. After filling the pots with this ſoil, the ſeeds ſhould be ſown an inch deep; and then they ſhould be plunged into common mould up to the rim. If the ſoil be naturally moiſt, it will keep them cooler, and be better; and if the place be well ſheltered and ſhaded, it will be better ſtill. Nothing more than weeding, which muſt be conſtantly obſerved during the ſummer, will be neceſſary; and in this ſtation they may remain until the March following: about the middle of which month, having prepared a good hot-bed, the pots ſhould be taken up and plunged therein. Soon after, the ſeeds will come up; and when the young plants have ſufficiently received the benefit of this bed, they ſhould be enured by degrees to the open air. Weeding and watering muſt be obſerved during the ſummer; and at the approach of the cold weather in the autumn, they ſhould be removed under an hot-bed frame, or ſome cover, to be protected from the froſts during the winter. In the ſpring, when this danger is over, they ſhould reſume their firſt ſtation; namely, the pots ſhould be plunged up to the rim, as when the ſeeds were firſt ſown; and if this place be well ſheltered, they may remain there all winter; if not, and ſevere froſts threaten, they ſhould be taken up and placed under cover as before. After they have been thus managed three years from the ſeeds, they ſhould be taken out of the pots with care, and planted in the nurſery-ground at ſmall diſtances, where they may remain until they are ſtrong enough to be finally ſet out. By ſowing the ſeeds in pots, and aſſiſting them by an hot-bed, a year at leaſt is ſaved; for they hardly ever come up, when ſown in a natural border, under two years from the ſeeds; nay, they have been known to remain three, and even ſome plants to come up the fourth year after ſowing; which at once ſhows the preference of the former practice, and ſhould caution all who have not ſuch a convenience, not to be too haſty in diſturbing the beds when the ſeeds are ſown in the natural ground; as, eſpecially if they are not well preſerved in mould or ſand, theſe may be ſome years before they appear. Indeed, it is the long time we are in obtaining theſe plants, either by ſeeds, layers, &c. that makes them at preſent ſo very ſcarce amongſt us. 2. Theſe plants may alſo be increaſed by layers; but very ſlowly: for they will be two, and ſometimes three, or even four years, before they have ſtruck out good roots; though the Benjamin tree is propagated moſt quickly by this method. The young twigs ſhould be laid in the ground in the autumn; and it will be found that twiſting the wire round the bud, ſo as in ſome degree to ſtop the progreſs of the ſap, and taking away with a knife a little of the bark, is a more effectual method of obtaining good roots ſoon than by the ſlit or twiſting, eſpecially when practiſed on the ſaſſafras tree. 3. Plants of theſe ſorts are likewiſe ſometimes obtained by ſuckers, which they will at all times throw out, and which may be often taken off with pretty good roots; but when they are weak, and with bad roots, they ſhould be planted in pots, and aſſiſted by a moderate heat in a bed: with ſuch management they will be good plants by the autumn, and in the ſpring may be planted out any where. 4. Cuttings of theſe trees, when planted in a good bark bed, and duly watered, will alſo oftentimes grow. When this method is practiſed, and plants obtained, they muſt be inured by degrees to the open air, till they are hardy enough to be finally planted out without ſuffering any injury.

As for the Indian bay, the camphor, the avocado, and the cinnamon tree, theſe require only the treatment common to green-houſe plants: the latter, however, is rather a ſtove plant in this country.—Of its culture or propagation in its native places, no particular account has been given by botanical writers; but it muſt now become an important conſideration with us, ſince this valuable tree has been acquired by our own colonies. Of the advantages promiſed by this acquiſition we are indebted for the firſt accounts to Dr. Wright in 1787; from whom alſo we learn that its propagation is very eaſy, and its culture requires little care, as more particularly noticed below. Since that time, ſome obſervations by Dr. Dancer, relative to its cultivation, have appeared in vol. viii. p. 214, of the Tranſactions of the Society for the Encouragement of Arts, &c. Theſe obſervations confirm, without adding any thing eſſential to the conciſe remarks of Dr. Wright. We are informed, that as the tree "puts out numerous ſide-branches, with a denſe foliage, from the very bottom of the trunk; this furniſhes an opportunity of obtaining plenty of layers, and facilitates the propagation of the tree, as it does not perfect its ſeeds in any quantity under ſix or ſeven years; when it becomes ſo plentifully loaded, that a ſingle tree is ſufficient almoſt for a colony. It ſeems to delight in a looſe moiſt ſoil,

and to require a ſouthern aſpect; the trees thus planted flouriſhing better than others growing in loam, and not ſo well expoſed to the ſun. When healthy, it is (from layers) of a pretty quick growth, reaching in *eight* years the height of fifteen or twenty feet, is very ſpreading, and furniſhed with numerous branches of a fit ſize for decortication. The ſeeds, however, are a long time in coming up, and the plants make ſmall progreſs for the firſt year or two." It is added, that "the birds appear to be very fond of the berries, and will probably propagate this tree in the ſame way they do many others every where over the iſland; ſo that in a ſhort time it will grow ſpontaneouſly, or without cultivation." The age for decortication, ſaid above to be eight years, it will be obſerved, is not ſimilar to that ſpecified below for the trees in Ceylon, which require a different management.

Uſes. Evelyn aſſerts that he has ſeen bay trees near 30 feet high, and almoſt two feet in diameter; and enumerates the bay amongſt the moſt uſeful trees. Hanbury catches at this idea, and tells us in general terms, "that it will grow to 30 feet in height, with a trunk of two feet in diameter; and accordingly he arranges it amongſt his foreſt trees: he acknowledges, however, at the ſame time, that the wood is of little value. The bay is nevertheleſs a fine aromatic and a beautiful evergreen: it is ſaid to be the true *laurus* or laurel of the ancients, with which they adorned the brows of their ſucceſsful generals. Like the holly, box, and laurel, the bay will bear the ſhade and drip of taller trees; and it is upon the whole a very deſirable evergreen, and very ornamental for gardens and ſhrubberies.

We perceive in the leaves and berries of this tree a moderately ſtrong aromatic ſmell, and a warm, bitteriſh, pungent taſte. The berries are ſtronger in both theſe reſpects than the leaves, and afford in diſtillation a larger quantity of eſſential aromatic oil; they yield alſo an almoſt inſipid oil to the preſs, in conſequence of which they prove unctuous in the mouth. They are warm and ſtimulating, and hence are ſometimes exhibited in caſes of flatulent colic, and likewiſe in hyſterical diſorders. Their principal uſe in the preſent practice is in clyſters, and ſome external applications. The deciduous bay, in a moiſt rich ſoil, in which it principally delights, will grow to be about 16 feet high; but in ſome ſoils, that are poſſeſſed of the oppoſite qualities, it will hardly arrive at half that height. The flowers are ſucceeded in May by large red berries, which never ripen in England: ſo that, notwithſtanding the leaves in ſummer are very pretty, and the colour of the bark makes a variety in winter, it is principally the ſcarcity of this plant which makes it eſteemed.

The *benzoin* tree will grow to a much larger ſize than the other, and its branches are more numerous. They are ſmooth, and of a fine light green colour. The leaves on their upper ſurface are ſmooth, and of a fine light-green colour; but their under ſurface is venoſe, and of a whitiſh caſt. When bruiſed, they emit a fine fragrance. This tree was formerly miſtaken for that which produces the drug called *benzoin;* which is now known to be obtained from a ſpecies of ſtyrax.

The *ſaſſafras*, though its branches are leſs conſiderable, will grow to nearly the height of the other kinds. Its bark is ſmooth, and of a red colour, which beautifully diſtinguiſhes it in winter; whilſt the fine ſhining green of its leaves conſtitutes its greateſt beauty in ſummer. In theſe, indeed, there is a variety, and a very extraordinary one. Some are large, and of an oval figure; others are ſmaller, and of the ſame ſhape; whilſt others again are ſo divided into three lobes, as to reſemble the leaves of ſome ſorts of the fig-tree. In America, the ſaſſafras generally ſtands ſingle in the woods, and along the fences round the fields. It flowers in May before the leaves come out; and being entirely covered with them, it is diſtinguiſhed at a great diſtance by their beautiful yellow colour.

The root of the ſaſſafras has a fragrant ſmell, and a ſweetiſh, aromatic, ſubacrid taſte; the bark taſtes much ſtronger than any other part, and the ſmall twigs ſtronger than the large pieces. It is a warm antiſcorbutic, and is frequently employed with good ſucceſs in cutaneous diſeaſes. For theſe purpoſes, infuſions made from the raſped root or bark are drunk as tea. A decoction of ſaſſafras, boiled down to the conſiſtence of an extract, proves ſimply bitteriſh and ſubaſtringent. Hoffman aſſures us, that he has frequently given this extract to the quantity of a ſcruple at a time, with remarkable ſucceſs, for ſtrengthening the tone of the viſcera; as alſo in the decline of intermittent fevers, and in hypochondriacal complaints. Saſſafras yields in diſtillation an extremely fragrant oil of a penetrating pungent taſte, ſo ponderous as to ſink in water. Rectified ſpirit extracts the whole taſte and ſmell of ſaſſafras; and elevates nothing in evaporation: hence the ſpirituous extract proves the moſt elegant and efficacious preparation, as wholly containing the virtues of the root.

It is ſaid in Profeſſor Kalm's Travels in America, that the bark of this tree is uſed by the women in Pennſylvania and other parts for dyeing worſted of a fine laſting orange-colour, which does not fade in the ſun. They uſe urine inſtead of alum in dyeing; and boil the dye in a braſs boiler, becauſe in an iron veſſel it does not yield ſo fine a colour. The wood is made uſe of for poſts belonging to the encloſures, for it is found to laſt a long time in the ground: but it is likewiſe ſaid, that there is hardly any kind of wood which is more attacked by worms than this when it is expoſed to the air without cover; and that in a ſhort time it becomes worm-eaten through and through. On cutting ſome part of the ſaſſafras tree, or its ſhoots, and holding it to the noſe, it has a ſtrong but pleaſant ſmell. Some people peel the root, and boil the peel with the beer which they are brewing, becauſe they believe it wholeſome. For the ſame reaſon, the peel is put into brandy, either whilſt it is diſtilling or after it is made. The ſame writer informs us, that a decoction of the root of ſaſſafras in water, drunk every morning, is uſed with ſucceſs in the dropſy.—When part of a wood is deſtined for cultivation, the ſaſſafras trees are commonly left upon it, becauſe they have a very thick foliage, and afford a cool ſhade to the cattle during the great heats. Some people get their bed-poſts made of ſaſſafras wood, in order to expel the bugs; for its ſtrong ſcent, it is ſaid, prevents thoſe vermin from ſettling in them. For two or three years together this has the deſired effect, or about as long as the wood keeps its ſtrong aromatic ſmell; but after that time it has been obſerved to loſe its effect. In Pennſylvania ſome people put chips of ſaſſafras into their cheſts, where they keep any ſort of woollen ſtuffs, in order to expel the moths (or larvæ or caterpillars of moths or tinies) which commonly ſettle in them in ſummer. The root keeps its ſmell for a long while: Profeſſor Kalm ſaw one which had lain five or ſix years in the drawer of a table, and ſtill preſerved the ſtrength of its ſcent. The people alſo gather its flowers, which they uſe as a kind of tea.

The *perſea*, or *alligator pear* tree, is cultivated univerſally in the Weſt Indies by all ranks of people. The fruit is pear-ſhaped, and from one to two pounds in weight. On removing a green ſkin or covering, we come to a yellow butyraceous ſubſtance; and in the heart find a large round ſeed or ſtone, which is unequal in the ſurface, and exceedingly hard and woody. This fruit is ripe in Auguſt and September, and conſtitutes one of the moſt agreeable articles of diet for ſix or eight weeks to the negroes. Theſe pears, with a little ſalt and a plantain or two, afford a hearty meal. They are alſo ſerved up at the tables of white people as a choice fruit. When the pear is ripe, the yellow or

eatable ſubſtance is firmer than butter, and taſtes ſomewhat ke butter or marrow: hence it is called by ſome the *vegetable marrow*. But however excellent this fruit is when ripe, it is very dangerous when pulled and eaten before maturity. Dr. Wright ſays, he has repeatedly known it to produce fever and dyſentery, which were removed with difficulty.—The leaves of this tree and thoſe of the bead-vine or wild liquorice are made into pectoral decoctions by the common people.—The large ſtone is uſed for marking linen, in which caſe the cloth is tied or held over the ſtone, and the letters are pricked out by a needle through the cloth and into the ſeed. The ſtain is a reddiſh brown, which never waſhes out.—The buds of the alligator tree are ſaid to aſſiſt in curing the venereal diſeaſe. "The wild boars in the Eaſt Indies (ſays Labat) eat greedily of the mammees and avocado pears, which give their fleſh a luſcious and moſt agreeable ſavour."

The bark of the ſpecies called *caſſia* is known in the ſhops by the name of *caſſia lignea*. This bark, which is imported from different parts of the Eaſt Indies and from China, has a very near reſemblance to the cinnamon; though diſtinguiſhable from it by being of a thicker and coarſer appearance, and by its breaking ſhort and ſmooth, while the cinnamon breaks fibrous and ſhivery.—It reſembles cinnamon ſtill more exactly in its aromatic flavour than in its external appearance; and ſeems only to differ from it in being ſomewhat weaker, in abounding more with a viſcid mucilaginous matter, and in being leſs aſtringent. Accordingly, it has not only a place in the Edinburgh pharmacopœia, but is alſo the baſis of a diſtilled water. It is, perhaps, ſurpriſing that the London college till of late have rejected it. But although it did not enter their pharmacopœia, yet we may venture to aſſert, that it was not neglected by the apothecaries. It has long been very common with many of them to ſubſtitute the caſſia in every caſe for the more expenſive article cinnamon: and indeed almoſt the whole of what is at preſent ſold under the title either of ſimple or ſpirituous cinnamon-water is entirely prepared from caſſia; and not even entirely from the bark, but from a mixture of the bark and buds, or from the latter ſolely.

The under bark of the *cinnamomum* is the well-known ſpice called *cinnamon*. The beſt ſeaſon for ſeparating it from the outer bark, which is grey and rugged, is the ſpring, when the ſap flows in the greateſt abundance. It is cut into thin ſlices, and expoſed to the ſun, and curls up in drying.—The old trees produce a coarſe kind of cinnamon; the ſpice is in perfection only when the trees are not older than three or four years. When the trunk has been ſtripped of its bark, it receives no further nouriſhment; but the root is ſtill alive, and continues to throw out freſh ſhoots. The fruit of the tree is ſhaped like an acorn, but is not ſo large. Its ſeed, when boiled in water, yields an oil which ſwims at top, and takes fire. If left to cool, it hardens into a white ſubſtance, of which candles are made, which have an agreeable ſmell, and are reſerved for the uſe of the king of Ceylon. The cinnamon is not reckoned excellent unleſs it be fine, ſmooth, brittle, thin, of a yellow colour inclining to red; fragrant, aromatic, and of a poignant yet agreeable taſte. The connoiſſeurs give the preference to that the pieces of which are long, but ſlender. That which comes to us is generally mixed with the caſſia bark; but this laſt is eaſily diſtinguiſhed. Cinnamon ſplinters in breaking, and has a roughneſs along with its aromatic flavour; while the caſſia breaks over ſmooth, and has a mucilaginous taſte. Cinnamon is a very elegant and uſeful aromatic, more grateful both to the palate and ſtomach than moſt other ſubſtances of this claſs. By its aſtringent quality it likewiſe is beneficial in diſeaſes of the ſtomach and other viſcera, and proves of great ſervice in ſeveral other complaints.

The cinnamon tree, with other valuable plants, was taken in a French ſhip by Admiral Rodney in the laſt war, and preſented by him to the Aſſembly of Jamaica. One of the trees was planted in the botanic garden in St. Thomas in the Eaſt; the other by Hinton Eaſt, Eſq. in his noble garden at the foot of the Blue Mountains. From theſe parent trees ſome hundreds of young trees are already produced from layers and cuttings, and diſperſed to different parts of the country, in all which it thrives luxuriantly with little trouble: we may therefore hope it will ſoon be a valuable addition to our commerce.. Upon comparing the parts of the tree with the deſcription and figure given by Burman and other botaniſts, it appears to be the real Ceylon cinnamon, and of the beſt kind, called by the natives *raſle coronde*: but the ſpecimens of bark taken put it out of all doubt, being, in the opinion of the beſt judges, of an equal, if not ſuperior, quality to any imported from India. The ſmalleſt bit of the bark, Dr. Wright aſſures us, is quite a cordial. The cinnamon we have from Holland, he obſerves, is often inert, and gives room to ſuſpect that it has been ſubjected to a ſlight diſtillation, in which ſome of its virtues are extracted.

With regard to the trees growing in Jamaica, Dr. Dancer ſays in the paper already quoted, "The beſt cinnamon bark, according to the different trials I have made, is taken from the ſmall branches, of about an inch diameter, the larger limbs not being ſo eaſily decorticated, and not yielding ſo good or ſo ſtrong a cinnamon. The ſmaller twigs, or thoſe that have not acquired a cineritious bark, are too full of ſap and mucilage, and have little *aroma*. It is the *liber*, or inner bark, that conſtitutes the cinnamon; from which the two external barks muſt be carefully and entirely ſeparated, or they vitiate the flavour of the cinnamon; to do which with dexterity, and to raiſe the bark from the wood, requires ſome practice. The bark being ſeparated, the ſmaller pieces are to be placed within the larger; which, by expoſure to the ſun or the air, preſently coil up, and require no further preparation. A dry ſeaſon is the proper one for taking the bark; as it is found to be weakened after long or heavy rains. Cinnamon, though more retentive of its virtues than any of the other ſpices, yet requires to be protected, when taken from the air and moiſture, by cloſe packing in cedar cheſts.—The leaves of this tree, whether recent or dried, are ſo ſtrongly impregnated with an *aroma*, as to afford a good ſuccedaneum for the bark both in cookery and medicine. Diſtilled, they give an excellent ſimple and ſpirituous water, and an eſſential oil. Powdered, they are a good aromatic ſpecies, or mareſchal perfume."

The well-known ſubſtance called *camphor*, or *camphire*, is the eſſential oil of the *laurus camphora*; and is obtained from it by diſtillation in the Eaſt Indies. (See the article CAMPHORA).—This tree is another of the captured plants given to the inhabitants of Jamaica; and, if cultivated with care, will alſo be an uſeful acquiſition. Abbe Groſier informs us, that in China ſome of theſe trees are found above 100 cubits in height, and ſo thick that 20 perſons cannot encloſe them. The tree is there called *tchang*; and it is ſaid that the trunk, when old, emits ſparks of fire, but of ſo ſubtle a nature as not even to injure the hair of thoſe who are near it. Common camphire coſts only a penny the ounce at Pe-king; but it is inferior to that of Borneo, in the judgment even of the Chineſe.

The extraordinary way in which ſome authors have ſpoken of camphire (the Abbé obſerves) gives us reaſon to conclude that they have been entirely ignorant of the proceſs employed to obtain this ſalutary gum. The camphire does not drop to the earth, like the gums of certain reſinous trees, which are preſerved by diſcharging that part of their ſubſtance which is too oily: neither does it diſtil from the top to the bottom of the tree through an inciſion made in it. The Chineſe would prac-

tiſe this method could it be employed with ſucceſs; for it is very common in China to make ſuch kind of inciſions in reſinous trees. The method uſed by the Chineſe for obtaining camphire is as follows:—They take ſome branches freſh from the *tchang*, chop them very ſmall, and lay them to ſteep in ſpring-water for three days and three nights. After they have been ſoaked in this manner, they are put into a kettle, where they are boiled for a certain time, during which they keep continually ſtirring them with a ſtick made of willow. When they perceive that the ſap of theſe ſmall chips adheres ſufficiently to the ſtick in the form of white froſt, they ſtrain the whole, taking care to throw away the dregs and refuſe. This juice is afterwards poured gently into a new earthen baſon well varniſhed, in which it is ſuffered to remain one night. Next morning it is found coagulated, and formed into a ſolid maſs. To purify this firſt preparation, they procure ſome earth from an old earthen wall, which, when pounded and reduced to a very fine powder, they put into the bottom of a baſon made of red copper; over this layer of earth they ſpread a layer of camphire, and continue thus until they have laid four ſtrata. The laſt, which is of very fine earth, they cover up with the leaves of the plant *po-ho*, or penny-royal; and over the whole they place another baſon, joining it very cloſely to the former by means of a kind of red earth that cements their brims together. The baſon thus prepared is put over a fire, which muſt be managed ſo as to keep up an equal heat: experience teaches them to obſerve the proper degree. But above all, they muſt be very attentive leſt the plaſter of fat earth which keeps the baſons together ſhould crack or fall of; otherwiſe the ſpirituous parts would evaporate, and ruin the whole proceſs. When the baſons have been expoſed to the neceſſary heat, they are taken off and left to cool; after which they are ſeparated, and the ſublimated camphire is found adhering to the cover. If this operation be repeated two or three times, the camphire is found purer and in larger pieces. Whenever it is neceſſary to uſe any quantity of this ſubſtance, it is put between two earthen veſſels, the edges of which are ſurrounded with ſeveral bands of wet paper. Theſe veſſels are kept for about an hour over an equal and moderate fire; and when they are cool, the camphire is found in its utmoſt perfection and ready for uſe. This method of procuring camphire, even from the heart of the tree, may be practiſed in all ſeaſons of the year; which would not be the caſe (our author obſerves), were it extracted like other reſinous ſubſtances that only flow during a certain ſhort ſpace of time. Beſides, by lopping the branches of the camphire-tree, leſs hurt is done to it than by making inciſions, which always hazard the exiſtence of the plant.

BAY-*Salt*, a kind of brown unpurified common ſalt, manufactured by the French after the following manner: The ſaline or marſh adjoining to the ſea being properly conſtructed, the ſaltmen, at the proper ſeaſon of the year, which is from the middle of May to the end of Auguſt, open the flood-gate when the tide is out, and drain off all the ſtagnating water: when this is done, they repair the bottom of the marſh in ſeveral places, where it is found neceſſary, and cleanſe the ſeveral receptacles from mud and dirt: after this they admit the ſea water at the next high tide, till it floats the whole marſh, and ſtands at about ten inches high in the reſervoir. In a day or two moſt of the water in the ſalt pits is exhaled, and what remains is a very ſtrong brine: they then let in more ſea water at the two or three following tides; and ſo take care to admit as much more water into the marſh, as has been waſted in vapour by the heat, conſtantly raiſing it to the height of ten inches in the reſervoir, and conſtantly to an inch and half in the ſalt pits; and when the weather is extremely hot, or there are ſharp drying winds, they fill them ſomething higher than this.

All the parts of the marſh are thus ſupplied with water out of the reſervoir: but the ſea water, which is let into the reſervoir, is not confuſedly let into the other water or brine of the ponds and ſalt-pits; for, as the ſeveral parts of the work communicate only by narrow channels, it is provided, that the ſalt water flowing out of the reſervoir never returns to it again, but gently flows along till it arrives at the ſecond brine pond, and from that to the third, being forced forward by the ſea water received from time to time in the reſervoir. During this flow courſe, the watery fluid always flies off in great quantity by exhalation, and the brine is continually preparing for cryſtallization as it flows along gently, growing all the way ſtronger and ſtronger, as it approaches the ſalt pits; ſo that when it at length enters theſe pits, it is fully ſaturated with ſalt; and particular care is taken to guard the entrance of the ſalt pits by a long and narrow channel, by which means the ſtrong brine contained in theſe pits is prevented from returning back, and mixing with the weaker brine in the brine ponds. Care is alſo taken, that the ſtrong brine in the ſalt pits is ſpread out very thin, and expoſed to the ſun and air with a large ſurface; by which means the water more quickly exhales from it, and the ſalt is left concreted into cryſtals. Theſe cryſtals, or ſalt, the workmen in France draw out every day, and diſpoſe them at length together in a pyramidal heap, which they cover over at the top with thatch or ſtraw, and ſo preſerve them from the injuries of weather. Thus at a ſmall expence and trouble a ſalt is prepared, which is found very fit for all domeſtic uſes; and France is furniſhed with a very profitable article for exportation into other countries.

The ſalt thus made is of different colours, according to the colour of the clay employed in making the pits. That of the French is brown, whence the denomination of *bay ſalt*, and it is uſually ſold without farther preparation; though in ſome places they make it into white ſalt by refining it in large flat cauldrons. In a favourable ſeaſon, the French are ſaid to be able to make enough of bay ſalt in a fortnight, to ſupply their home conſumption for a year, and the wants of other nations, who purchaſe from them much more than is conſumed in France. The greateſt difficulty which attends the making of bay ſalt in Great Britain ariſes from the heat of our ſummer not being ſufficiently ſtrong to evaporate a great quantity of ſea water in a ſmall portion of time. But Dr. Brownrigg has ſufficiently evinced the practicability of our imitating the French in their manner of procuring bay ſalt. It is well known, that in Hampſhire, and ſome other counties, they have a method of heightening the ſea water into a ſtrong brine, by expoſing it to the ſun in large pits, much after the manner in which bay ſalt is made; and ſo much of the ſea water is, by this means, naturally evaporated, that though they boil the remainder with Newcaſtle coal, yet they can afford their ſalt at a leſs price than the Newcaſtle ſalt-boilers can afford theirs; though the ſea water is, probably, equally impregnated with ſalt at both places. For farther particulars on the manufacture of ſea ſalt, ſee the article SALT.

BAYA, or BAJA, a town of Lower Hungary, in the county of Bath, ſituated near the Danube. E. long. 19. 30. N. lat. 46. 25.

BAYARD (Peter du Terrail de), eſteemed by his contemporaries the model of ſoldiers and men of honour, and denominated *The knight without fear and without reproach*, was deſcended from an ancient and noble family in Dauphiné. He was with Charles VIII. at the conqueſt of the kingdom of Naples; where he gave remarkable proofs of his valour, eſpecially at the battle of Fornoue. He was dangerouſly wounded at the taking of the city of Breſcia; and there reſtored to the daughters of his hoſt 2000 piſtoles, which their mother had directed them to give him in order to prevent the houſe from being plundered; an action that has been celebrated by many

hiſtorians. At his return to France, he was made lieutenant-general of Dauphiné. He fought by the ſide of Francis I. at the battle of Marignan; and that prince afterwards inſiſted on being knighted by his hand, after the manner of the ancient knights. The chevalier Bayard defended Meziers during ſix weeks, againſt Charles V.'s army. In 1524, at the retreat of Rebec, the general Bonivet having been wounded and obliged to quit the field, the conduct of the rear was committed to the chevalier Bayard, who, though ſo much a ſtranger to the arts of a court that he never roſe to the chief command, was always called, in times of real danger, to poſts of the greateſt difficulty and importance. He put himſelf at the head of the men at arms; and animating them by his preſence and example to ſuſtain the whole ſhock of the enemy's troops, he gained time for the reſt of his countrymen to make good their retreat. But in this ſervice he received a wound which he immediately perceived to be mortal; and being unable to continue any longer on horſeback, he ordered one of his attendants to place him under a tree, with his face towards the enemy; then fixing his eyes on the guard of his ſword, which he held up inſtead of a croſs, he addreſſed his prayers to God; and in this poſture, which became his character both as a Soldier and as a Chriſtian, he calmly waited the approach of death. Bourbon, who led the foremoſt of the enemy's troops, found him in this ſituation, and expreſſed regret and pity at the ſight. "Pity not me," cried the high-ſpirited chevalier, "I die as "a man of honour ought, in the diſcharge of my duty: they "indeed are objects of pity, who fight againſt their king, their "country, and their oath." The marquis de Peſcara, paſſing ſoon after, manifeſted his admiration of Bayard's virtue, as well as his ſorrow for his fate, with the generoſity of a gallant enemy; and finding that he could not be removed with ſafety from that ſpot, ordered a tent to be pitched there, and appointed proper perſons to attend him. He died, notwithſtanding their care, as his anceſtors for ſeveral generations had done, in the field of battle. Peſcara ordered his body to be embalmed, and ſent to his relations; and ſuch was the reſpect paid to military merit in that age, that the duke of Savoy commanded it to be received with royal honours in all the cities of his dominions: in Dauphiné, Bayard's native country, the people of all ranks came out in a ſolemn manner to meet the proceſſion.

BAYEUX, a conſiderable town of France in the department of Calvados and late province of Normandy. It was formerly the capital of Beſſin, and had a rich biſhop's ſee. The cathedral church is accounted the fineſt in that province; and its front and three high ſteeples are ſaid to be the beſt in France. W. long. 0. 33. N. lat. 49. 16.

BAYLE (Peter), the celebrated author of the Hiſtorical and Critical Dictionary, was born November 18, 1657, at Carla, a village in the county of Foix, in France, where his father John Bayle was a Proteſtant miniſter. In 1666, he went to the Proteſtant univerſity at Puylaureus, where he ſtudied with the greateſt application; and in 1669, removed to the univerſity of Toulouſe, whither the Proteſtants at that time frequently ſent their children to ſtudy under the Jeſuits: but here, to the great grief of his father, he embraced the Romiſh religion; however, being ſoon ſenſible of his error, he left that univerſity, and went to ſtudy at Geneva. After which he was choſen profeſſor of philoſophy at Sedan: but that Proteſtant univerſity being ſuppreſſed by Lewis XIV. in 1681, he was obliged to leave the city; and was ſoon after choſen profeſſor of philoſophy and hiſtory at Rotterdam, with a ſalary of about 45l. a-year. The year following he publiſhed his Letter concerning Comets, &c. and Father Maimbourg having publiſhed about this time his Hiſtory of Calviniſm, wherein he endeavours to draw upon the Proteſtants the contempt and reſentment of the Catholics, Mr. Bayle wrote a piece to confute his hiſtory. The reputation which he had now acquired, induced the States of Friezland, in 1684, to offer him a profeſſorſhip in their univerſity; but he wrote them a letter of thanks, and declined the offer. This ſame year he began to publiſh his *Nouvelles de la Republique des Lettres*, a very able and ingenious work.

In the year 1686, he was drawn into a diſpute in relation to the famous Chriſtina queen of Sweden. In his Journal for April, he took notice of a printed letter, ſuppoſed to have been written by her Swediſh majeſty to the chevalier de Terlon, wherein ſhe condemns the perſecution of the Proteſtants in France. He inſerted the letter itſelf in his Journal for May; and in that of June following he ſays, "What we hinted at in our laſt month, is confirmed to us from day to day, that Chriſtina is the real author of the letter concerning the perſecutions in France, which is aſcribed to her: it is a remainder of Proteſtantiſm." Mr. Bayle received an anonymous letter; the author of which ſays, that he wrote to him of his own accord, being in duty bound to it as a ſervant of the queen. He complains that Mr. Bayle, ſpeaking of her majeſty, called her only *Chriſtina*, without any title; he finds alſo great fault with his calling the letter "a remainder of Proteſtantiſm." He blames him likewiſe for inſerting the words "I am," in the concluſion of the letter. "Theſe words (ſays this anonymous writer) are not her majeſty's; a queen, as ſhe is, cannot employ theſe words but with regard to a very few perſons, and Mr. de Terlon is not of that number." Mr. Bayle wrote a vindication of himſelf as to theſe particulars, with which the author of the anonymous letter declared himſelf ſatisfied, excepting what related to "the remainder of Proteſtantiſm." He would not admit of the defence with regard to that language; and in another letter, adviſed him to retract the aſſertion. He adds in a poſtſcript, "You mention, in your Journal of Auguſt, a ſecond letter of the queen, which you ſcruple to publiſh. Her majeſty would be glad to ſee that letter; and you will do a thing agreeable to her if you would ſend it to her. You might take this opportunity of writing to her majeſty. This council may be of ſome uſe to you; do not neglect it." Mr. Bayle took the hint, and wrote a letter to her majeſty, dated the 14th of November 1686; to which the queen, on the 14th of December, wrote the following anſwer, ſigned with her own hand:—"Mr. Bayle, I have received your excuſes; and am willing you ſhould know by this letter, that I am ſatisfied with them. I am obliged to the zeal of the perſon who gave you occaſion of writing to me: for I am very glad to know you. You expreſs ſo much reſpect and affection for me, that I pardon you ſincerely; and I would have you know, that nothing gave me offence but that *remainder of Proteſtantiſm*, of which you accuſed me. I am very delicate on that head, becauſe nobody can ſuſpect me of it, without leſſening my glory, and injuring me in the moſt ſenſible manner. You would do well if you ſhould even acquaint the public with the miſtake you have made, and with your regret for it. This is all that remains to be done by you, in order to deſerve my being entirely ſatisfied with you. As to the letter which you have ſent me, it is mine without doubt; and ſince you tell me that it is printed, you will do me a pleaſure if you ſend me ſome copies of it. As I fear nothing in France, ſo neither do I fear any thing at Rome. My fortune, my blood, and even my life, are entirely devoted to the ſervice of the church; but I flatter nobody, and will never ſpeak any thing but the truth. I am obliged to thoſe who have been pleaſed to publiſh my letter, for I do not at all diſguiſe my ſentiments. I thank God, they are too noble and too honourable to be diſowned. However, it is not true that this letter was written to one of my miniſters. As I have every where enemies and

perſons who envy me, ſo in all places I have friends and ſervants; and I have poſſibly as many in France, notwithſtanding of the court, as any where in the world. This is purely the truth, and you may regulate yourſelf accordingly. But you ſhall not get off ſo cheap as you imagine. I will enjoin you a penance; which is, that you will henceforth take the trouble of ſending me all curious books that ſhall be publiſhed in Latin, French, Spaniſh, or Italian, on whatever ſubject or ſcience, provided they are worthy of being looked into; I do not even except romances or ſatires; and above all, if there are any books of chemiſtry, I deſire you may ſend them to me as ſoon as poſſible. Do not forget likewiſe to ſend me your Journal. I ſhall order that you be paid for whatever you lay out, do but ſend me an account of it. This will be the moſt agreeable and moſt important ſervice that can be done me. May God proſper you!"

Mr. Bayle now only found it neceſſary to acquaint the public with the miſtake he had made, in order to merit that princeſs's entire ſatisfaction; and this he did in the month of January 1687, at the commencement of his Journal.

The perſecution which the Proteſtants at this time ſuffered in France affected Mr. Bayle extremely. He made occaſionally ſome reflections on their ſufferings in his Journal; and he wrote a pamphlet alſo on the ſubject. Some time afterwards he publiſhed his *Commentaire Philoſophique* upon theſe words, "Compel them to come in:" but the great application he gave to this and his other works, threw him into a fit of ſickneſs, which obliged him to diſcontinue his Literary Journal. Being adviſed to try a change of air, he left Rotterdam on the 8th of Auguſt, and went to Cleves; whence, after having continued ſome time, he removed to Aix la Chapelle, and from thence returned to Rotterdam on the 18th of October. In the year 1690, the famous book, intitled, *Avis aux Refugiez*, &c. made its appearance. Mr. Jurieu, who took Mr. Bayle for the author thereof, wrote a piece againſt it; and he prefixed an advice to the public, wherein he calls Mr. Bayle a profane perſon, and a traitor engaged in a conſpiracy againſt the ſtate. As ſoon as Mr. Bayle had read this libel againſt him, he went to the Grand Schout of Rotterdam, and offered to go to priſon, provided his accuſer would accompany him, and undergo the puniſhment he deſerved if the accuſation was found unjuſt. He publiſhed alſo an anſwer to Mr. Jurieu's charge; and as his reputation, nay his very life, was at ſtake in caſe the accuſation of treaſon was proved, he therefore thought himſelf not obliged to keep any terms with his accuſer, and attacked him with the utmoſt ſeverity. Mr. Jurieu loſt all patience: he applied himſelf to the magiſtrates of Amſterdam; who adviſed him to a reconciliation with Mr. Bayle, and enjoined them not to publiſh any thing againſt each other till it was examined by Mr. Boyer, the penſioner of Rotterdam. But notwithſtanding this prohibition, Mr. Jurieu attacked Mr. Bayle again with ſo much warmth, that he forced him to write a new vindication of his conduct.

In the year 1690, Mr. de Beauval advertiſed in his Journal, *A Scheme for a Critical Dictionary*: this was the work of Mr. Bayle. The articles of the three firſt letters of the alphabet were already prepared; but a diſpute happening betwixt him and Mr. de Beauval, obliged him for ſome time to lay aſide the work. Nor did he reſume it till May 1692, when he publiſhed his ſcheme: but the public not approving of his plan, he threw it into a different form; and the firſt volume was publiſhed in Auguſt 1695, and the ſecond in October following. The work was extremely well received by the public; but it engaged him in freſh diſputes, particularly with Mr. Jurieu and the abbé Renaudot. Mr. Jurieu publiſhed a piece, wherein he endeavoured to engage the eccleſiaſtical aſſemblies to condemn the dictionary; he preſented it to the ſenate ſitting at Delft, but they took no notice of the affair. The conſiſtory of Rotterdam granted Mr. Bayle a hearing; and after having heard his anſwers to their remarks on his dictionary, declared themſelves ſatisfied, and adviſed him to communicate this to the public. Mr. Jurieu made another attempt with the conſiſtory in 1698; and ſo far he prevailed with them, that they exhorted Mr. Bayle to be more cautious with regard to his principles in the ſecond edition of his dictionary; which was publiſhed in 1702, with many important additions.

As a writer, Mr. Bayle was moſt laborious and indefatigable. In one of his letters to Maizeux, he ſays, that ſince his 20th year he hardly remembers to have had any leiſure. His intenſe application contributed perhaps to impair his conſtitution, for it ſoon began to decline. He had a decay of the lungs, which weakened him conſiderably; and as this was a diſtemper which had cut off ſeveral of his family, he judged it to be mortal, and would take no remedies. He died the 28th of December 1706, after he had been writing the greateſt part of the day. He wrote ſeveral books beſides what we have mentioned, many of which were in his own defence againſt attacks he had received from the abbé Renaudot, Mr. Clerk, M. Jaquelot, and others. Among the productions which do honour to the age of Louis XIV. Mr. Voltaire has not omitted the Critical Dictionary of our author: "It is the firſt work of the kind (he ſays) in which a man may learn to think." He cenſures indeed thoſe articles which contain only a detail of minute facts, as unworthy either of Bayle, an underſtanding reader, or poſterity. "In placing him (continues the ſame author) amongſt the writers who do honour to the age of Louis XIV. notwithſtanding his being a refugee in Holland, I only conform to the decree of the parliament of Tholouſe, which, when it declared his will valid in France, notwithſtanding the rigour of the laws, expreſsly ſaid, *that ſuch a man could not be conſidered as a foreigner.*"

BAYON, a town of France, in the department of Meurthe, and late province of Lorrain, ſeated on the river Moſelle, twelve miles South of Nanci. Long. 6. 22. E. Lat. 49. 38. N.

Bayon, or *Bayona*, a town of Galicia, in Spain, ſeated on a ſmall gulph of the Atlantic ocean, about 12 miles from Tuy. It has a very commodious harbour, and the country about it is fertile. W. long. 9. 30. N. lat. 43. 3.

BAYONET, in the military art, a ſhort broad dagger, formerly with a round handle fitted for the bore of a firelock, to be fixed there after the ſoldier had fired; but they are now made with iron handles and rings, that go over the muzzle of the firelock, and remain faſt, ſo that the ſoldier fires with his bayonet on the muzzle of his piece, and is ready to act againſt the horſe. This uſe of the bayonet faſtened on the muzzle of the firelock was a great improvement in the art of war, firſt introduced by the French, and to which, according to M. Folard, they owed a great number of their victories in the laſt century; and to the neglect of this in the next ſucceeding war, and truſting to their fire, the ſame author attributes moſt of the loſſes they ſuſtained. At the ſiege of Malta, a weapon called *pila ignea* was contrived to oppoſe the bayonets, being in ſome meaſure the converſe of that weapon: as the latter conſiſts of a dagger added to a fire-lock, the former conſiſted of a fire-lock added to a pilum or pike. Of late the bayonet has come into very general uſe; and conqueſts have been made by it without firing a ſhot. This way of fighting was chiefly reſtored by the late king of Pruſſia, who made his troops ruſh forward at once with bayonets on the enemy.

BAYONNE, a ſmall, but compact, rich, populous, and flouriſhing commercial city of France, in the department of the Lower Pyrenees and late province of Gaſcony. It is ſeated near the mouth of the river Adour, which forms a good

harbour. The city is divided into three parts. The great town is on this ſide the river Nive: the little town is between the Nive and the Adour; and the ſuburb of Saint Eſprit is beyond this laſt river. Both the former are ſurrounded with an old wall and a dry ditch, and there is a ſmall caſtle in each. That of Great Bayonne is flanked with four round towers, and is the place where the governor reſides. The new caſtle is flanked with four towers, in the form of baſtions. The firſt incloſure is covered with another, compoſed of eight baſtions, with a great horn-work, and a half-moon; all which are encompaſſed with a ditch, and a covered way. There is a communication between the city and the ſuburbs by a bridge, and the ſuburbs are well fortified. The citadel is ſeated beyond the Adour, on the ſide of the ſuburbs abovementioned. It is one of the ſtrongeſt in France, and was moſtly conſtructed by Vauban. Bayonne was lately a biſhop's ſee; and the ancient cathedral is remarkable for the height of the nef, and the delicacy of the pillars which ſupport it. A bank of ſand, at the mouth of the Adour, renders the entrance of the harbour difficult; but veſſels, when they have entered, find it a ſafe one. The military weapon, the *bayonet*, bears the name of this city, in which it was invented, as the *piſtol*, for the ſame reaſon, is ſo called from Piſtoia, a town in Tuſcany. The hams and chocolate of Bayonne are famous. It is 25 miles S. W. of Doy, and 425 S. by W. of Paris. This is the only city in the kingdom that has the advantage of two rivers, wherein the tide ebbs and flows. The river Nive is deeper than the Adour, but leſs rapid, by which means ſhips come up into the middle of the city. There are two bridges over this river, by which the old and new town communicate with each other. The trade of this place is the more conſiderable, on account of its neighbourhood to Spain, and the great quantity of wines which are brought hither from the adjacent country. The Dutch carry off a great number of pipes in exchange for ſpices and other commodities, which they bring. W. long. 1. 20. N. lat. 43. 20.

BAYS, in commerce, a kind of woollen ſtuff, looſe in its texture, and having a long nap, ſometimes friſed, and ſometimes not. This ſtuff is without wale; and is wrought in a loom with two treddles, like flannel. It is chiefly manufactured at Colcheſter and Bockin in Eſſex, where there is a hall called the *Dutch-bay hall* or *raw-hall*. This manufacture was firſt introduced into England, with that of ſays, ſarges, &c. by the Flemings; who being perſecuted by the duke of Alva for their religion, fled thither about the fifth of Queen Elizabeth's reign; and had afterwards peculiar privileges granted them by act of parliament 12 Charles II. 1660, which the bays-makers in the above places ſtill enjoy. The exportation of bays was formerly much more conſiderable than at preſent, as the French have been pretty ſucceſsful in imitating them. However, the Engliſh bays are ſtill ſent in great quantities to Spain and Portugal, and even to Italy. Their chief uſe is for dreſſing the monks and nuns, and for linings for clothing, eſpecially in the army. The looking-glaſs makers alſo uſe them behind their glaſſes, to preſerve the tin or quickſilver; and the caſemakers, to line their caſes. The breadth of bays is commonly a yard and a half, a yard and three quarters, or two yards, by 42 to 48 in length. Thoſe of a yard and three quarters are moſt proper for the Spaniſh trade.

BAZAR, or Basar, a denomination among the Turks and Perſians, given to a kind of exchange, or market, where their fineſt ſtuffs and other wares are ſold. Theſe are alſo called *bezeſtins*. The word *bazar* ſeems of Arabic origin, where it denotes ſale, or exchange of goods. Some of the eaſtern bazars are open, like the market-places in Europe, and ſerve for the ſame uſes, more particularly for the ſale of the bulky and leſs valuable commodities. Others are covered with lofty ceilings, or even domes, pierced to give light; and it is in theſe the jewellers, goldſmiths, and other dealers in the richer wares, have their ſhops. The bazar or maidan of Iſpahan is one of the fineſt places in Perſia, and even ſurpaſſes all the exchanges in Europe; yet, notwithſtanding its magnificence, it is excelled by the bazar of Tauris, which is the largeſt that is known, having ſeveral times held 30,000 men ranged in order of battle. At Conſtantinople, there is the old and the new bazar, which are large ſquare buildings, covered with domes, and ſuſtained by arches and pilaſtres; the former chiefly for arms, harneſſes, and the like; the latter for goldſmiths, jewellers, furriers, and manufacturers of the ſame deſcription.

BAZAS, a town of France, in the department of Gironde, and late province of Guienne. Long. 0. 2. W. Lat. 44. 22. N.

BAZAT, or Baza, in commerce, a long, fine, ſpun cotton, which comes from Jeruſalem, whence it is alſo called *Jeruſalem-cotton*.

BAZGENDGES, in natural hiſtory, the name of a ſubſtance uſed by the Turks and other eaſtern nations in their ſcarlet-dyeing. They mix it for this purpoſe with cochineal and tartar; the proportions being two ounces of the bazgendges to one ounce of cochineal. Theſe are generally eſteemed a ſort of fruit, and are produced on certain trees in Syria and other places; and it is uſually ſuppoſed, that the ſcarcity and dearneſs of them is the only thing that makes them not uſed in Europe. But the bazgendges ſeem to be no other than the horns of the turpentine tree in the eaſtern parts of the world; and it is not only in Syria that they are found, but China alſo affords them. Many things of this kind were ſent over to Mr. Geoffroy at Paris from China as the ſubſtances uſed in the ſcarlet-dyeing of that country, and they all proved wholly the ſame with the Syrian and Turkiſh bazgendges, and with the common turpentine horns. The lentiſk, or maſtic-tree, is alſo frequently found producing many horns of a like kind with theſe, and of the ſame origin, all being owing to the pucerons, which make their way into the leaves, in order to breed their young.

BAZOCHE, or Basoche, a royal kind of juriſdiction formerly exerciſed among the clerks of the palais, or courts of juſtice at Paris. It was adminiſtered in the name and by the authority of the king of Bazoche, roi de la Bazoche, by virtue of an ancient grant of the kings of France. The elder among the clerks were the officers; and he who preſided was the chancellor. This court only took cognizance of cauſes among the clerks, or between clerks and artificers for goods bought, or work done. However, the freedom they took with private characters in their inquiſition and remonſtrances, occaſioned ſeveral *arrêts* to reſtrain their power, and prohibit their holding pleas without leave. A collection of ſtatutes, ordonnances, regulations, monuments, and prerogatives of the kingdom of Bazoche, were publiſhed at Paris in 1654.

BDELLIUM, βδέλλιον, a gummy reſinous juice, produced by a tree in the Eaſt Indies, of which we have no ſatisfactory account. It is brought into Europe both from the Eaſt Indies and Arabia. It is in pieces of different ſizes and figures, externally of a dark reddiſh brown, ſomewhat like myrrh; internally it is clear, and not unlike to glue; to the taſte it is ſlightly bitter and pungent; its odour is very agreeable. If held in the mouth, it ſoon becomes ſoft and tenacious, ſticking to the teeth. Laid on a red-hot iron, it readily catches flame, and burns with a crackling noiſe, and in proportion to its goodneſs it is more or leſs fragrant. Near half of its ſubſtance diſſolves either in water or in ſpirit of wine; but the tincture made with ſpirit is ſomewhat ſtronger, and by much more agreeable. Vinegar, or verjuice, diſſolves it wholly. The ſimple gum is a better medicine than any preparation from it.

Though one of the weakeſt of the deobſtruent gums, it is ſometimes uſed as a pectoral and an emmenagogue with advantage. The College, however, have rejected it.

BEACHY-HEAD, a promontory on the coaſt of Suſſex, between Haſtings and Shoreham, where the French defeated the Engliſh and Dutch fleet in 1690. Long. 0. 20. E. Lat. 50. 54. N.

BEACON, a ſignal for the better ſecuring the kingdom from foreign invaſions. See SIGNAL. On certain eminent places of the country are placed long poles erect, whereon are faſtened pitch-barrels to be fired by night, and ſmoke made by day, to give notice in a few hours to the whole kingdom of an approaching invaſion. Theſe are commonly called *beacons*; whence alſo comes *beaconage*.—We find beacons familiarly in uſe among the primitive Britons and Weſtern Highlanders. The beſieged capital of one of our northern iſles in the third century actually lighted up a fire upon a tower; and Fingal inſtantly knew "the green flame edged with ſmoke" to be a token of attack and diſtreſs. And there are to this day ſeveral cairns or heaps of ſtones upon the heights along the coaſts of the Harries, on which the inhabitants uſed to burn heath as a ſignal of the approach of an enemy.

BEACONS are alſo marks and ſigns erected on the coaſts, for guiding and preſerving veſſels at ſea by night as well as by day. The erection of beacons, light-houſes, and ſea-marks, is a branch of the royal prerogative. The king has the excluſive power, by commiſſion under his great ſeal, to cauſe them to be erected in fit and convenient places, as well upon the lands of the ſubject as upon the demeſnes of the crown: which power is uſually veſted by letters patent in the office of lord high admiral. And by ſtatute 8 Eliz. c. 13. the corporation of the Trinity-houſe are empowered to ſet up any beacons or ſea-marks wherever they ſhall think them neceſſary; and if the owner of the land or any other perſon ſhall deſtroy them, or ſhall take down any ſteeple, tree, or other known ſea-mark, he ſhall forfeit 100l. or, in caſe of inability to pay it, ſhall be *ipſo facto* outlawed.

BEACONAGE, money paid towards the maintenance of a beacon. The word is derived from the Saxon *beacnian*, to nod, or ſhow by a ſign; hence alſo the word *beckon*.

BEACONSFIELD, a town of Buckinghamſhire in England, ſeated on a hill in the road between London and Oxford. It has ſeveral good inns, though not above 100 houſes in the whole. W. long. 0. 25. N. lat. 51. 36.

BEAD, a ſmall globule or ball uſed in necklaces; and made of different materials, as pearl, ſteel, garnet, coral, diamond, amber, cryſtal, paſtes, glaſs, &c.—The Roman Catholics make great uſe of beads in rehearſing their *Ave-Marias* and *Pater-noſters*; and the like uſage is found among the derviſes and other religious throughout the Eaſt, as well Mahometan as Heathen. The ancient Druids appear alſo to have had their beads, many of which are ſtill found; at leaſt, if the conjecture of an ingenious author may be admitted, who takes thoſe antique glaſs globules, having a ſnake painted round them, and called *adder-beads*, or *ſnake-buttons*, to have been the beads of our ancient Druids. See ANGUIS.

BEADS are alſo thoſe glaſs globules vended to the ſavages on the coaſt of Africa; and thus denominated, becauſe they are ſtrung together for the convenience of traffic. The common black glaſs of which beads are made for necklaces, &c. is coloured with manganeſe only: one part of manganeſe is ſufficient to give a black colour to near twenty parts of glaſs.

BEAD, in architecture, a round moulding commonly made upon the edge of a piece of ſtuff; in the Corinthian and Roman orders, cut or carved in ſhort emboſſments, like the beads of a necklace.

BEAD-*Makers*, called by the French *paternoſtriers*, are thoſe employed in the making, ſtringing, and ſelling of beads. At Paris, before the religious orders were ſuppreſſed, there were three companies of paternoſtriers, or bead-makers; one who made them of glaſs or cryſtal; another in wood and horn; and the third in amber, coral, jet, &c.

BEAD-*Proof*, a phraſe uſed by the diſtillers to expreſs that ſort of proof of the ſtandard ſtrength of ſpirituous liquors which conſiſts in their having, when ſhaken in a phial, or poured from on high into a glaſs, a crown of bubbles, which ſtand on the ſurface ſome time after. This is eſteemed a proof that the ſpirit conſiſts of equal parts of rectified ſpirits and phlegm. This is a fallacious rule as to the degree of ſtrength in the liquor; becauſe any thing that will increaſe the tenacity of the ſpirit will give it this proof, though it be under the due ſtrength. Our malt-diſtillers ſpoil the greater part of their goods, by leaving too much of the tainted oil of the malt in their ſpirit, in order to give it this proof when ſomewhat under the ſtandard ſtrength. But this is a great deceit on the purchaſers of malt ſpirits, as they have them by this means not only weaker than they ought to be, but tainted with an oil that they are not eaſily cleared of afterwards. On the other hand, the dealers in brandy, who uſually have the art of ſophiſticating it to a great nicety, are in the right when they buy it by the ſtrongeſt bead-proof, as the grand mark of the beſt; for being a proof of the brandy containing a large quantity of its oil, it is, at the ſame time, a token of its high flavour, and of its being capable of bearing a very large addition of the common ſpirits of our own produce, without betraying their flavour, or loſing its own. We value the French brandy for the quantity of this eſſential oil of the grape which it contains; and that with good reaſon, as it is with us principally uſed for drinking as an agreeably flavoured cordial: but the French themſelves, when they want it for any curious purpoſes, are as careful in the rectifications of it, and take as much pains to clear it from this oil, as we do to free our malt ſpirit from that nauſeous and fetid oil which it originally contains, and which renders it ſo inferior to brandy.

BEAD-*Roll*, among the Roman Catholics, a liſt of ſuch perſons, for the reſt of whoſe ſouls they are obliged to repeat a certain number of prayers, which they count by means of their beads, in order that none may be omitted.

BEAD-*tree*, *azederach*, or *melia*, in botany, a genus of the *decandria monogynia* claſs. Its characters are theſe: the flower has five ſpear-ſhaped petals which ſpread open, and a cylindrical *nectarium* of one leaf, indented at the brim in ten parts. It has ten ſmall ſtamina inſerted in the top of the *nectarium*; with a conical *germen*, which turns to a ſoft globular fruit, including a roundiſh nut, having five rough furrows and five cells, each containing one oblong ſeed. There are two ſpecies.

BEADLE (from the Saxon *bidel*, a *meſſenger*), a crier or meſſenger of a court, who cites perſons to appear and anſwer. Called alſo a *ſummoner* or *apparitor*.—*Beadle* is alſo an officer at an univerſity, or public company, whoſe chief buſineſs is to walk before the maſters with a mace, at all their proceſſions, attend at the door, &c.—There are alſo *church-beadles*, whoſe office is well underſtood. Spelman, Voſſius, and Somner derive *beadle* from the Saxon *bidel*, *a public crier*; in which ſenſe biſhops, in ſome ancient Saxon manuſcripts, are called *beadles of God*, *Dei bidelli*. The tranſlator of the Saxon New Teſtament renders *exactor* by *bidele*; and the word is uſed in the ſame ſenſe in the laws of Scotland.

BEAGLES, a ſmall ſort of hounds or hunting dogs. Beagles are of many kinds; as the *ſouthern beagle*, ſomething leſs and ſhorter, but thicker, than the deep mouthed hound; the *fleet northern*, or *cat beagle*, ſmaller, and of a finer ſhape than the ſouthern, and a harder runner. From the two, by

croſſing the ſtrains, is bred a third ſort held preferable to either. To theſe may be added a ſtill ſmaller ſort of beagles, ſcarce bigger than lap-dogs, which make pretty diverſion in hunting the coney, or even ſmall hare in dry weather; but otherwiſe unſerviceable, on account of their ſize.

BEAK, the bill or nib of a bird. See the Treatiſe on ORNITHOLOGY.

BEAK, or *Beak-head*, of a ſhip, that part without the ſhip before the fore-caſtle, which is faſtened to the ſtem, and is ſupported by the main knee. The beak, called by the Greeks εμβολον, by the Latins *roſtrum*, was an important part in the ancient ſhips of war, which were hence denominated *naves roſtratæ*. The beak was made of wood; but fortified with braſs, and faſtened to the prow, ſerving to annoy the enemy's veſſels. Its invention is attributed to Piſæus an Italian. The firſt beaks were made long and high; but afterwards a Corinthian, named *Ariſto*, contrived to make them ſhort and ſtrong, and placed ſo low, as to pierce the enemy's veſſels under water. By the help of theſe, great havock was made by the Syracuſans in the Athenian fleet.

BEAKED, in heraldry, a term uſed to expreſs the beak or bill of a bird. When the beak and legs of a fowl are of a different tincture from the body, we ſay *beaked and membered of ſuch a tincture*.

BEALE (Mary), particularly diſtinguiſhed by her ſkill in painting, was the daughter of Mr. Craddock, miniſter of Walton upon Thames, and learned the rudiments of her art from Sir Peter Lely. She painted in oil, water-colours, and crayons, and had much employ; her portraits were in the Italian ſtyle, which ſhe acquired by copying pictures and drawings from Sir Peter Lely's and the royal collections. Her maſter, ſays Mr. Walpole, was ſuppoſed to have had a tender attachment to her; but as he was reſerved in communicating to her all the reſources of his pencil, it probably was a gallant rather than a ſucceſsful one. Dr. Woodfall wrote ſeveral pieces to her honour, under the name of *Beleſia*. Mrs. Beale died in Pall-mall, on the 28th of Dec. 1697, aged 65. Her paintings have much nature, but the colouring is ſtiff and heavy.

BEALT, BEALTH, or *Builth*, a town of Brecknockſhire in South Wales, pleaſantly ſeated on the river Wye. It conſiſts of about 100 houſes, whoſe inhabitants have a trade in ſtockings. W. long 4. 10. N. lat. 52. 4.

BEAM, in architecture, the largeſt piece of wood in a building; being laid acroſs the walls, and ſerving to ſupport the principal rafters of the roof. No houſe has leſs than two of theſe beams, viz. one at each head. Into theſe the girders of the garret floor are alſo framed; and, if the building be of timber, the teazle-tenons of the poſts.

The proportions of beams near London are fixed by ſtatute, as follows: a beam fifteen feet long muſt be ſeven inches on one ſide its ſquare, and five on the other; if it be ſixteen feet long, one ſide muſt be eight inches, the other ſix; if 17 feet long, one ſide muſt be 10 inches, the other ſix: in the country they uſually make them ſtronger. Sir H. Wotton adviſes theſe to be of the ſtrongeſt and moſt durable timber. Some of the beſt authors have conſidered the force or ſtrength of beams, and brought their reſiſtance to a preciſe calculation; particularly M. Varignon and M. Parent; the ſyſtem of the the latter is as follows.

When, in a beam breaking parallel to its baſe, which is ſuppoſed to be a parallelogram, two plans of fibres, which were before contiguous, are ſeparated, there is nothing to be conſidered in thoſe fibres, but their number, bigneſs, tenſion before they broke, and the lever by which they act: all theſe together make the ſtrength or reſiſtance of the beam to be broke. Suppoſe then another beam of the ſame wood, where the baſe is likewiſe a parallelogram, and of any bigneſs, with regard to the other, at pleaſure; the height or thickneſs of each being when laid horizontal, being divided into an indefinite number of equal parts, and their breadth into the ſame number, in each of their baſes will be found an equal number of little quadrangular cells, proportional to the baſes whereof they are parts. Theſe then will repreſent little baſes, or, which is the ſame thing, the thickneſſes of the fibres to be ſeparated by the fracture of each beam: and, ſince the number of cells is equal in each, the ratio of the baſes of both beams will be that of the reſiſtance of their fibres, both with regard to number and thickneſs.

Now the two beams being ſuppoſed of the ſame wood, the fibres moſt remote from the points of ſupport, which are thoſe which break the firſt, muſt be equally ſtretched when they break. Thus the fibres, e. gr. of the tenth diviſion, are equally ſtretched in each caſe, when the firſt breaks; and in whatever proportion the tenſion be ſuppoſed, it will ſtill be the ſame in both caſes; ſo that the doctrine is entirely free, and unembarraſſed with any phyſical ſyſtem.

Laſtly, it is evident, the levers whereby the fibres of the two beams act, are repreſented by the height or depth of their baſes; and of conſequence, the whole reſiſtance of each beam is the product of its baſe by its height; or, which is the ſame thing, it is the ſquare of the height multiplied by the breadth: which holds, not only in caſe of parallelogrammatic, but alſo of elliptic baſes. Hence, if the baſes of two beams be equal, though both their heights and breadths be unequal, their reſiſtance will be as their heights alone; and, by conſequence, one and the ſame beam laid on the ſmalleſt ſide of its baſe will reſiſt more than when laid flat, in proportion as the firſt ſituation gives it a greater height than the ſecond: and thus an elliptic baſe will reſiſt more when laid on its greateſt axis, than when on its ſmalleſt.

Since, in beams equally long, it is the baſes that determine the proportion of their weights or ſolidities; and ſince, their baſes being equal, their heights may be different; two beams of the ſame weight may have reſiſtances differing to infinity: thus, if in the one the height of the baſe be conceived infinitely great, and the breadth infinitely ſmall, while in the other the dimenſions of the baſe are infinite; the reſiſtance of the firſt will be infinitely greater than that of the ſecond, though their ſolidity and weight be the ſame. If, therefore, all required in architecture were to have beams capable of ſupporting vaſt loads, and at the ſame time to be of the leaſt weights poſſible, it is plain they muſt be cut thin as laths, and laid edgewiſe.

If the baſes of two beams be ſuppoſed unequal, but the ſum of the ſides of the two baſes equal, e. gr. if they be either 12 and 12, or 11 and 13, or 10 and 14, &c. ſo that they always make 24; and farther, if they be ſuppoſed to be laid edgewiſe; purſuing the ſeries, it will appear, that in the beam of 12 and 12, the reſiſtance will be 1728, and the ſolidity or weight 144; and that in the laſt, or 1 and 23, the reſiſtance will be 529, and the weight 23: the firſt, therefore, which is ſquare, will have leſs than half the ſtrength of the laſt, with regard to its weight. Hence M. Parent remarks, that the common practice of cutting the beams out of trees as ſquare as poſſible is reprehenſible: he hence takes occaſion to determine geometrically, what dimenſions the baſe of a beam to be cut out of any tree propoſed ſhall have, in order to its being of the greateſt poſſible ſtrength; or, which is the ſame thing, a circular baſe being given, he determines the rectangle of the greateſt reſiſtance that can be inſcribed; and finds, that the ſides muſt be nearly as 7 to 5, which agrees with obſervation.

Hitherto the length of the beams has been ſuppoſed equal; if it be unequal, the baſes will reſiſt ſo much the leſs, as the beams are longer. To this it may be added, that a beam ſuſ-

tained at each end, breaking by a weight ſuſpended from its middle, does not only break at the middle, but alſo at each extreme; or, if it does not actually break there, at leaſt immediately before the moment of the fracture, which is that of the equilibrium between the reſiſtance and the weight, its fibres are as much ſtretched at the extremes as in the middle. So that of the weight ſuſtained by the middle, there is but one third part which acts at the middle to make the fracture; the other two only acting to induce a fracture in the two extremes.

A beam may either be ſuppoſed only loaden with its own weight, or with other foreign weights applied at any diſtance, or elſe only with thoſe foreign weights. Since, according to M. Parent, the weight of a beam is not ordinarily above $\frac{1}{10}$ part of the load given it to ſuſtain, it is evident, that in conſidering ſeveral weights, they muſt all be reduced by the common rules to one common centre of gravity. M. Parent has calculated tables of the weights that will be ſuſtained by the middle in beams of various baſes and lengths, fitted at each end into walls, on a ſuppoſition that a piece of oak of an inch ſquare, and a foot long, retained horizontally by the two extremes, will ſuſtain 315 lb. in its middle before it breaks, which it is found by experience it will. Mem. Acad. R. Scien. an. 1708.

Beams *of a Ship* are the great main croſs timbers which hold the ſides of the ſhip from falling together, and which alſo ſupport the decks and orlops: the main beam is next the main-maſt, and from it they are reckoned by firſt, ſecond, third beam, &c. the greateſt beam of all is called the *midſhip beam*.

Beam-*Compaſs*, an inſtrument conſiſting of a ſquare wooden or braſs beam, having ſliding ſockets, that carry ſteel or pencil points; they are uſed for deſcribing large circles, where the common compaſſes are uſeleſs.

Beam-*Bird* or *Petty-chaps*. See Motacilla.

Beam alſo denotes the lath, or iron of a pair of ſcales; ſometimes the whole apparatus for weighing of goods is ſo called: Thus we ſay, it weighs ſo much at the king's beam.

Beam *of a* Plough, a name given by our farmers to the great timber of the plough, into which all the other parts of the plough tail are fixed. This is uſually made of aſh, and is ſtraight, and eight feet long in the common plough: but in the four-coultered plough, it is ten feet long, and its upper part arched. The head of this beam lies on the pillow of the plough, and is raiſed higher, or ſunk lower, as that pillow is elevated or depreſſed by being ſlipped along the crow-ſtaves. Near the middle, it has an iron-collar, which receives the tow-chain from the box, and the bridle-chain from the ſtake or gallows of the plough is fixed in it a little below the collar. Some inches below this, there is a hole, which lets through the coulter; and below that there are two other ſmall ones, through which the heads of the retches paſs. Theſe are the irons which ſupport the ſheet, and with it the ſhare. Farther backward ſtill is a larger perforation, through which the body of the ſheet paſſes; and behind that, very near the extremity, is another hole through which the piece called the hinder-ſheet paſſes. See Husbandry.

Beam or *Roller*, among weavers, a long and thick wooden cylinder, placed lengthwiſe on the back-part of the loom of thoſe who work with a ſhuttle. That cylinder, on which the ſtuff is rolled as it is weaved, is alſo called the *beam* or *roller*, and is placed on the fore-part of the loom.

BEAMINSTER, a town of Dorſetſhire in England, ſeated on the river Bert, in W. long. 2. 50. N. lat. 52. 45.

BEAN, in botany. Linnæus comprehends this genus of plants under *vicia*. For the characters, ſee that article.

Four ſorts of beans are commonly ſowed in our gardens. 1. The ſmall Liſbon or Mazagan. 2. The Spaniſh. 3. The Sandwich. 4. The Windſor beans. The firſt and ſecond ſorts are to be planted in October and November, under warm walls and hedges, where, if they ſtand through the winter, they produce beans early in the ſpring. They may alſo be raiſed very cloſe in beds, and covered with hoops and mats in the winter, and in ſpring planted out: but there is ſome hazard in the tranſplanting, and they will be a fortnight or more later than thoſe which have ſtood the winter abroad.

The Liſbon bean is preferred to the Spaniſh: and the curious ought to have freſh ſeed every two years from abroad, for they are apt to degenerate, though not in goodneſs, yet in their earlineſs. The Spaniſh and Windſor beans are not to be planted till after Chriſtmas; but eſpecially the Windſor, which are ſubject, more than any other kind, to be hurt by the cold. Theſe beans ſhould have an open ground, and be planted at the diſtance of three feet and a half row from row, and five or ſix inches from one another in the rows. The Sandwich beans are hardier than the Windſor, and may be planted to come in between the early crops and them: and though not much regarded at preſent, they are a very good bean. The firſt plantation of Windſor beans ſhould be made in the middle of January; and after that, a new plantation ſhould be made every three weeks till the middle of May, that there may be a ſucceſſion of crops. The Toker bean comes about the ſame time with the Sandwich, and is a great bearer; therefore it is now much planted. The white and black bloſſom beans are alſo much eſteemed; but, unleſs their ſeeds are preſerved with care, Miller tells us they are apt to degenerate.

There is ſcarcely any plant, whoſe ſeed ſo well anſwers the purpoſe of the inquirer into the nature and ſtructure of ſeeds in general, as the bean. Trials have been made in France, and alſo in this country, to raiſe garden beans in open fields, on the principles of the new huſbandry; and the reſult ſufficiently indicated, that with proper care large crops might be raiſed in this way. Beans are ſaid to be nutritive, but flatulent. Some have uſed the horſe-bean as a ſuccedaneum for coffee; which in principles it much reſembles; only that it contains but half the quantity of oil. Mr. Boyle deſcribes ſeveral experiments of beans treated pneumatically to ſhew the great plenty of air they afford, on which their flatulency is ſuppoſed to depend. The expanſion of beans in growing, the ſame author found ſo conſiderable, that it would raiſe a plug clogged with above an hundred pounds weight.

Beans, with proper management, make one of the fineſt of all baits for fiſh. The method of preparing them for that purpoſe is this: take a new earthen pot glazed on the inſide; boil ſome beans in it, ſuppoſe a quarter of a peck: they muſt be boiled in river water, and ſhould be previouſly ſteeped in ſome warm water for ſix or ſeven hours. When they are about half boiled, put in three or four ounces of honey, and two or three grains of muſk: let them boil a little on, then take them off the fire. They are to be uſed in this manner: ſeek out a clean place, where there are no weeds, that the fiſh may ſee and take the beans at the bottom of the water. Throw ſome in at five or ſix in the morning, and in the evening for ſome days. This will draw them together, and they may be taken in a caſting net in great numbers.

The ancients made uſe of beans in gathering the votes of the people, and for the election of magiſtrates. A white bean ſignified *abſolution*, and a black one *condemnation*. Beans had a myſterious uſe in the *lemuralia* and *parentalia*; where the maſter of the family, after waſhing, was to throw a ſort of black beans over his head, ſtill repeating the words, "I redeem myſelf and family by theſe beans." Ovid gives a lively

deſcription of the whole ceremony in verſe.—Abſtinence from beans was enjoined by Pythagoras, one of whoſe ſymbols is, κυαμων απεχεσθαι, *abſtine a fabis*. The Egyptian prieſts held it a crime to look at beans, judging the very ſight unclean. The *flamen dialis* was not permitted even to mention the name. The precept of Pythagoras has been variouſly interpreted: ſome underſtand it of forbearing to meddle in trials and verdicts, which were then by throwing beans into an urn: others, building on the equivoque of the word κυαμος, which equally ſignifies a *bean* and a human *teſticle*, explain it by abſtaining from venery. Clemens Alexandrinus grounds the abſtinence from beans on this, that they render women barren; which is repeated by Theophraſtus, who extends the effect even to plants. Cicero ſuggeſts another reaſon for this abſtinence, viz. that beans are great enemies to tranquillity of mind. For a reaſon of this kind it is, that Amphiaraus is ſaid to have abſtained from beans, even before Pythagoras, that he might enjoy a clearer divination by dreams.

Buck-*Bean*, or *Marſh-Trefoil*, Menyanthes; a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Precie*. The corolla is hairy; the ſtigma bifid; the capſule unilocular. This plant grows wild in moiſt marſhy places in many parts of Britain. It has three oval leaves ſtanding together upon one pedicle, which iſſues from the root; their taſte is very bitter, and ſomewhat nauſeous. According to Mr. Lightfoot, the flowers of this plant are ſo extremely beautiful, that nothing but their native ſoil could exclude it from a place in every garden. They grow in an elegant ſpike; are white, daſhed with pink, and fringed internally with hairs. The Highlanders eſteem an infuſion or tea of the leaves as good to ſtrengthen the ſtomach. According to Dr. Withering, an infuſion of the leaves is of ſervice in rheumatiſms and dropſies; a dram of them in powder purges and vomits, and is ſometimes given to deſtroy worms. In a ſcarcity of hops, this plant is uſed in the north of England to bitter the ale. The powdered roots are ſometimes uſed in Lapland inſtead of bread, but they are unpalatable. Some people ſay, that ſheep will eat it, and that it cures them of the rot; but from the Upſal Experiments it appears, that though goats eat it, ſheep ſometimes will not. Cows, horſes, and ſwine, refuſe it. According to medical writers, it poſſeſſes ſome valuable qualities. It once had great reputation in ſcorbutic and ſcrophulous diſorders; and its good effects in thoſe caſes have been highly ſpoken of. Inveterate cutaneous diſeaſes have been removed by an infuſion of the leaves, drank to the quantity of a pint a-day, at proper intervals, and continued for ſome weeks. Boerhaave relates, that he was relieved of the gout by drinking the juice mixed with whey.

Horſe Bean. This is the only kind of bean propagated by the plough. It delights chiefly in a ſtiff and moiſt clay; three buſhels will ſow an acre, and this is to be done in February. The common produce is about twenty buſhels from an acre. They muſt lie ſome time upon the ground after they are cut, before they are carried in. Some farmers ſow tares and horſe beans together, which is a very good way, for the ſeeds are eaſily ſeparated by a riddle.—By the new huſbandry, leſs than one buſhel of ſeed will plant an acre of land; and the produce has exceeded that of the old, by more than ten buſhels an acre.

Bean-*Caper*. See Zygophyllum.

Bean-*Cod*, a ſmall fiſhing veſſel, or pilot-boat, common on the ſea-coaſts and in the rivers of Portugal. It is extremely ſharp forward, having its ſtem bent inward above into a great curve: the ſtem is alſo plated on the fore-ſide with iron, into which a number of bolts are driven, to fortify it, and reſiſt the ſtroke of another veſſel, which may fall athwart-hauſe. It is commonly navigated with a large lateen ſail, which extends over the whole length of the deck, and is accordingly well fitted to ply to windward.

Bean-*Flour*, called by the Romans *lomentum*, was of ſome repute among the ancient ladies as a coſmetic, wherewith to ſmooth the ſkin, and take away wrinkles.

Bean-*Fly*, in natural hiſtory, the name given by authors to a very beautiful fly, of a pale purple colour, frequently found on bean-flowers. It is produced from the worm or maggot called by authors *mida*.

Kidney-Bean, Phaseolus, a genus of the decandria order, belonging to the diadelphia claſs of plants. There is only one ſpecies; but of this there are many varieties. Thoſe principally cultivated for the table are, 1. The common white, or Dutch kidney-bean. 2. The ſmaller kidney bean, commonly called the *Batterſea kidney-bean*. And, 3. The upright ſort called the *tree kidney-bean*.

1. The firſt ſort was ſome time ago propagated in England, and is ſtill in Holland; it grows very tall, and requires long ſtakes and poles to climb on, and its beans are conſiderably broad: this makes them leſs ſaleable in the markets, people ſuppoſing them to be old, becauſe they are broad; and they are hence grown into diſuſe, though a much more valuable kind for eating than any other.

2. The ſecond ſort, or Batterſea bean, is what is more univerſally cultivated: it never grows very tall, nor rambles far, and the air can eaſily paſs between the rows, becauſe of its moderate growth; and this makes it bear plentifully, and ripen well for the table. It is the beſt taſted bean except the Dutch kind.

3. The third, or tree kidney bean, is alſo a plentiful bearer, and never rambles, but grows up in form of a ſhrub; but its beans are broader than the Batterſea kind, and are not ſo well taſted.

All theſe are propagated from ſeeds, which are to be put into the ground in the latter end of March or beginning of April for an early crop: but theſe ſhould have a warm ſituation and a dry ſoil; they muſt alſo be planted in a dry ſeaſon. The manner of planting them is, to draw lines with a bough over the bed, at two feet and a half diſtance, into which the ſeeds are to be dropped at about two inches aſunder; and the earth is to be drawn over them with the head of a rake, to cover them about an inch deep. In a week after ſowing, the plants will appear, and the earth ſhould be drawn up about their ſtalks as they riſe up: for a few days after this they will require no further care, except to be kept clear from weeds, and, when the beans appear, to have them gathered twice a-week; for if the beans are ſuffered to hang on too long, they not only become of no value, but they weaken the plant. The firſt crop of kidney-beans will continue a month in good order; and, to ſupply the table afterwards, there ſhould be freſh ſowings in March, April, May, and June; the laſt of which will continue till the froſts come to deſtroy them. Some raiſe their early crops on hot beds; and this is to be done exactly in the ſame manner as the raiſing early cucumbers is performed.

A very uſeful and new ſpecies of phaſeolus has been diſcovered by M. Moraney, "an inhabitant of Morne Ronge, dependant on the Cape;" we ſuppoſe Cape François of the iſland of St. Domingo. In his ſearch for plants, ſubſervient to his collection of inſects for the late unfortunate king's cabinet, he was overtaken by night, and he paſſed it in a cave, to which he had recourſe for ſhelter. At its extremity he found beds of foſſils, broken pieces of burnt earthen ware, ſome tools and other things which ſhowed that this cave had formerly been the habitation of the natives. Near it he ſaw a climbing plant attached to ſome trees, with cluſters of dry

pods hanging from it. Theſe he gathered, and on his return ſowed the ſeed. Some months after, the plants grew tall and ſtrong: they appeared to reſemble a phaſeolus known at Perpignan by the name of *curaquoela*, and in the ſuperb portfolios of the king, by that of *phaſeolus Indicus, cochleato flore*, which produced many roots, not unlike the manioc. On examining the root after the pods were ripe, he found from three to eight roots of this kind. The force of the vegetation was wonderful; but dreading the deleterious effects of recent manioc, he did not taſte them, but ſubjected them to a chemical analyſis, which proved nothing. After boiling them in water a little ſalted, he ventured to taſte them, and found them moiſt, unctuous, and ſaccharine, not unlike potatoes. He made, after ſome hours trial, very good caſſava with them, without being incommoded by the diſagreeable fibres which are met with in the manioc during this operation. Since that time, biſcuit and bread have been made from theſe roots by M. Lombart counſellor at the Cape. The plant has been found to be very common in the woods. It requires no peculiar management: its roots are in ſeaſon when the pods blacken, and its fibres run in every direction, ſearching for nouriſhment through the clefts of rocks, and receiving the impreſſion of the ſtrata without injury. If the principal root is left, the plant ſhoots again and flouriſhes as before; but it is not yet aſcertained whether it puts forth any new roots. The ſeeds are not alimentary when dreſſed, as if nature deſigned them only for propagating other plants. Every uſe which a farinaceous plant can ſupply, this new phaſeolus has ſucceſsfully furniſhed.

Malacca-Beans, or *Anacardia*, the fruit of a tree growing in Malabar and other parts of the Eaſt Indies, ſuppoſed by ſome to be the Avicennia *tomentoſa*; by others, the Bontia *germinans*. The fruit is of a ſhining black colour, of the ſhape of a heart flattened, about an inch long, terminating at one end in an obtuſe point, and adhering by the other to a wrinkled ſtalk. It contains within two ſhells a kernel of a ſweetiſh taſte: betwixt the ſhells is lodged a thick and acrid juice or oil. The medicinal virtues of anacardia have been greatly diſputed. Many have attributed to them the faculty of ſtrengthening the nerves, fortifying the memory, and quickening the intellect. Hence a confection made from them was once dignified with the title of *confectio ſapientum*; but which others have thought better deſerving the name of *confectio ſtultorum*, as inſtances are ſaid to have occurred of its having rendered people maniacal. But the kernel of anacardium is not different in quality from that of almonds. The ill effects attributed to this fruit belong only to the oil contained betwixt the kernels, whoſe acrimony is ſo great, that it is ſaid to be employed by the Indians as a canſtic. This oil is of ſervice externally for tetters, freckles, and other cutaneous deformities; which it removes only by exulcerating or excoriating the part, ſo that a new ſkin comes underneath. See Anacardium.

BEAR, in zoology. See Ursus.

Sea-Bear, a ſpecies of *Phoca*. Phoca, in zoology, are a genus of quadrupeds of the order of feræ. There are ſix parallel fore-teeth in the upper jaw, the outermoſt being larger; and four blunt, parallel, diſtinct, equal fore-teeth in the under jaw. There is but one dog-tooth, and five or ſix three-pointed grinders; and the hind feet are united ſo as to reſemble a ſheep's tail. There are a variety of ſpecies, the principal of which are the following:

1. The *urſina*, ſea-bear, or urſine ſeal, has external ears. The male is greatly ſuperior in ſize to the female. The bodies of each are of a conic form, very thick before, and taper to the tail. The length of a large one is eight feet; the greateſt circumference, five feet; near the tail, 20 inches; and the weight is about 800 lb. The noſe projects like that of a pug-dog, but the head riſes ſuddenly; the teeth lock into one another when the mouth is ſhut; the tongue is large; the eyes are large and prominent, and may be covered at pleaſure by a fleſhy membrane. The length of the fore-legs is 24 inches; they are like thoſe of other quadrupeds, not immerſed in the body like thoſe of ſeals; the feet are formed with toes like thoſe of other animals, but are covered with a naked ſkin, ſo that externally they ſeem to be a ſhapeleſs maſs; the hind-legs are fixed to the body quite behind, like thoſe of common ſeals; but are capable of being brought forward, ſo that the animal can make uſe of them to ſcratch its head occaſionally.

Mr. Pennant tells us, in his Arctic Zoology, that theſe animals are found in the northern ſeas. They are found alſo in amazing quantities between Kamtſchatka and America; but are ſcarcely known to land on the Aſiatic ſhore: nor are they ever taken except in the three Kurilian iſlands, and from thence in the Bobrowoie More, or Beaver Sea, as far as the Kronoſki headland, off the river Kamtſchatka, which comprehends only from 50 to 56 north latitude. It is obſervable that they never double the ſouthern cape of the peninſula, or are found on the weſtern ſide in the Penſchinſka ſea: but their great reſort has been obſerved to be to Bering's iſlands. They are as regularly migratory as birds of paſſage. They firſt appear off the three Kurili iſlands and Kamtſchatka in the earlieſt ſpring. There is not one female which does not come pregnant. Such as are then taken are opened, the young taken out and ſkinned. They are found in Bering's iſland only on the weſtern ſhore, being the part oppoſite to Aſia, where they firſt appear on their migration from the ſouthward.

Urſine ſeals are alſo found in the ſouthern hemiſphere, even from under the line, in the iſle of Gallipagos, to New Georgia, in ſouth latitude 54. 15. and weſt longitude 37. 15. In the intermediate parts, they are met with in New Zealand, in the iſle of Juan Fernandez, and its neighbour Maſſa Fuera, and probably along the coaſts of Chili to Terra del Fuego and Staten Land. In Juan Fernandez, Staten Land, and New Georgia, they ſwarm; as they do at the northern extremity of this vaſt ocean. Thoſe of the ſouthern hemiſphere have alſo their ſeaſons of migration.—Alexander Selkirk, who paſſed three lonely years on the iſle of Juan Fernandez, remarks that they come aſhore in June, and ſtay till September. Captain Cook found them again in their place of remigration in equal abundance, on Staten Land and New Georgia in the months of December and January; and Don Pernety found them on the Falkland iſlands in the month of February. According to the Greenlanders, this ſpecies inhabits the ſouthern parts of their country; and they call it *Auvekæjak*. It is very fierce, and tears to pieces whatſoever it meets; and that it lives on land as well as in water, and is greatly dreaded by the hunters, are facts alſo very well aſcertained.

For about three months during the ſummer they lead a moſt indolent life. They arrive at the iſlands vaſtly fat; but during that time they are ſcarce ever in motion, confine themſelves for whole weeks to one ſpot, ſleep a great part of the time, eat nothing, and, except the employment the females have in ſuckling their young, are totally inactive. They live in families: each male has from 8 to 50 females, whom he guards with the jealouſy of an eaſtern monarch; and though they lie by thouſands on the ſhores, each family keeps itſelf ſeparate from the reſt, and ſometimes, with the young and unmarried ones, amount to 120. The old animals, which are deſtitute of females, or deſerted by them, live apart, and are exceſſively ſplenetic, peeviſh, and quarrelſome: are exceeding fierce, and ſo attached to their old haunts, that they would die ſooner than quit them. They are monſtrouſly fat, and have a moſt hircine ſmell. If another approaches their ſtation, they are rouſed from their indolence, and inſtantly ſnap at it, and a battle enſues: in the conflict, they perhaps intrude on the ſeat of another; this gives new cauſe of offence, ſo in the end the

diſcord becomes univerſal, and is ſpread along the ſhore to ſome extent.

Nor are the other males leſs iraſcible; and the cauſes of their diſputes are generally theſe. The firſt and moſt terrible is, when an attempt is made by another to ſeduce one of their miſtreſſes, or a young female of the family. This inſult produces a combat; and the conqueror is immediately followed by the whole ſeraglio, who are ſure of deſerting the unhappy vanquiſhed. The ſecond reaſon of a quarrel is, when one invades the ſeat of another. The third ariſes from their interfering in the diſputes of others. Theſe battles are very violent; the wounds they inflict are very deep, and reſemble the cuts of a ſabre. At the end of a fight they fling themſelves into the ſea, to waſh away the blood from their bodies.

The males of this ſpecies are very fond of their young, but very tyrannical towards the females. If any body attempts to take their cub, the male ſtands on the defenſive, while the female makes off with the young in her mouth; but ſhould ſhe drop it, the former inſtantly quits his enemy, falls on her, and beats her againſt the ſtones, till he leaves her for dead. As ſoon as ſhe recovers, ſhe comes in the moſt ſuppliant manner to the male, crawls to his feet, and waſhes them with her tears: he, in the mean time, ſtalks about in the moſt inſulting manner; but in caſe the young one is carried off, he melts into the deepeſt affliction, and ſhows all ſigns of extreme concern. It is probable that he feels his misfortunes the more ſenſibly, as the female generally brings but one at a time; ſhe produces ſometimes two indeed, but never more.

The animals ſwim very ſwiftly, at the rate perhaps of ſeven miles an hour. If wounded, they will ſeize on the boat, and carry it along with vaſt impetuoſity, and oftentimes ſink it. They can continue a long time under water. When they want to climb the rocks, they faſten with the fore-paws, and ſo draw themſelves up. They are very tenacious of life, and will live for a fortnight after receiving ſuch wounds as would immediately deſtroy any other animal. The Kamtſchatkans take them by harpooning, for they never land on their ſhore. To the harpoon is faſtened a long line, by which they draw the animal to the boat after it is ſpent with fatigue; but in the chaſe, the hunters are very fearful of too near an approach, leſt the animal ſhould faſten on, and ſink their veſſel.

The uſes to which theſe animals are capable of being applied, are not great. The fleſh of the old males is rank and nauſeous; that of the females is ſaid to reſemble lamb; of the young ones roaſted, a ſucking pig. The ſkins of the young, cut out of the bellies of the dams, are eſteemed for clothing, and are ſold for about three ſhillings and four-pence each; thoſe of the old for only four ſhillings a piece.

Their remigration is in the month of September, when they depart exceſſively lean, and take their young with them. On their return, they again paſs near the ſame parts of Kamtſchatka which they did in the ſpring. Their winter retreats are quite unknown; it is probable that they are the iſlands between Kurili and Japan, of which we have ſome brief accounts, under the name of *Compagnie Land*, *States Land*, and *Jeſo Gaſima*, which were diſcovered by Martin Uriel in 1642. It is certain, that by his account the natives employed themſelves in the capture of ſeals. Sailors do not give themſelves the trouble of obſerving the nice diſtinction of ſpecific marks; we are therefore at liberty to conjecture thoſe which he ſaw to be our animals, eſpecially as we can fix on no more convenient place for their winter quarters. They arrive along the ſhores of the Kurili iſlands, and part of thoſe of Kamtſchatka, from the ſouth. They land and inhabit only the weſtern ſide of Bering's iſle, which faces Kamtſchatka; and when they return in September, their route is due ſouth, pointing towards the diſcoveries of Uriel. Had they migrated from the ſouth-eaſt as well as the ſouth-weſt, every iſle, and every ſide of every iſle, would have been filled with them; nor ſhould we have found, as we do, ſuch a conſtant and local reſidence of them.

2. The *leonina*, ſea-lion, or bottlenoſe, is found near the ſouth pole. One variety of this ſpecies is deſcribed at ſome length by the publiſher of Anſon's voyage. However, according to others who have written on this ſubject, the name of *ſea-lion* belongs not ſo properly to this as to another, which has a mane like a true lion. Of theſe we have the following account from Pernety's Hiſtorical Journal. "The hair that covers the back part of the head, neck, and ſhoulders, is at leaſt as long as the hair of a goat. It gives this amphibious animal an air of reſemblance to the common lion of the foreſt, excepting the difference of ſize. The ſea-lions of the kind I ſpeak of are 25 feet in length, and from 19 to 20 in their greateſt circumference. In other reſpects they reſemble the common ſea-lions. Thoſe of the ſmall kind have a head reſembling a maſtiff's, with the ears cropt cloſe.

"The teeth of the ſea-lions which have manes, are much larger and more ſolid than thoſe of the reſt. In theſe, all the teeth which are inſerted into the jaw-bone are hollow. They have only four large ones, two in the lower and two in the upper jaw. The reſt are not even ſo large as thoſe of a horſe. I brought home one belonging to the true ſea-lion, which is at leaſt three inches in diameter, and ſeven in length, though not one of the largeſt. We counted 22 of the ſame ſort in the jaw-bone of one of theſe lions, where five or ſix were wanting. They were entirely ſolid, and projected ſcarce more than an inch, or an inch and a half beyond their ſockets. They are nearly equal in ſolidity to flint, and are of a dazzling white. Several of our ſeamen took them for white flints when they found them upon the ſhore. I could not even perſuade them that they were not real flints, except by rubbing them againſt each other, or breaking ſome pieces off, to make them ſenſible that they exhaled the ſame ſmell as bones and ivory do when they are rubbed or ſcraped.

"Theſe ſea-lions that have manes are not more miſchievous or formidable than the others. They are equally unwieldy and heavy in their motions; and are rather diſpoſed to avoid than to fall upon thoſe who attack them. Both kinds live upon fiſh and water-fowl, which they catch by ſurpriſe. They bring forth and ſuckle their young ones among the corn-flags, where they retire at night, and continue to give them ſuck till they are large enough to go to ſea. In the evening you ſee them aſſembling in herds upon the ſhore, and calling their dams in cries ſo much like lambs, calves, and goats, that unleſs appriſed of it, you would eaſily be deceived. The tongue in theſe animals is very good eating: we preferred it to that of an ox or calf. For a trial we cut off the tip of the tongue hanging out of the mouth of one of theſe lions which was juſt killed. About 16 or 18 of us eat each a pretty large piece, and we all thought it ſo good, that we regretted we could not cut more of it.

"It is ſaid that their fleſh is not abſolutely diſagreeable. I have not taſted it: but the oil which is extracted from their greaſe is of great uſe. This oil is extracted two ways; either by cutting the fat in pieces, and melting it in large cauldrons upon the fire; or by cutting it in the ſame manner upon hurdles, or pieces of board, and expoſing them to the ſun, or only to the air: this greaſe diſſolves of itſelf, and runs into veſſels placed underneath to receive it.—Some of our ſeamen pretended, that this laſt ſort of oil, when it is freſh, is very good for kitchen uſes: this, as well as the other, is commonly uſed for dreſſing leather for veſſels, and for lamps. It is preferred to that of the whale: it is always clear, and leaves no ſediment.

"The ſkins of the ſea-lions are uſed chiefly in making

portmanteaus, and in covering trunks. When they are tanned, they have a grain almoſt like Morocco. They are not ſo fine, but are leſs liable to tear, and keep freſh a longer time. They make good ſhoes and boots, which, when well ſeaſoned, are water-proof.

"One day Mr. Guyot and ſome others brought on board five ſea lioneſſes. They were about ſeven feet long, and three and a half in circumference, though their inteſtines were drawn. Theſe gentlemen had landed on a ſmall iſland, where they found a prodigious number of theſe animals, and killed eight or nine hundred of them with ſticks. No other weapon is neceſſary on theſe occaſions. A ſingle blow with a bludgeon, three feet or three feet and a half long, almoſt full at the noſe of theſe animals, knocks them down, and kills them on the ſpot.

"This is not altogether the caſe with the males: their ſize is prodigious. Our gentlemen encountered two of them for a long time, with the ſame weapons, without being able to overcome them. They lodged three balls in the throat of one while he opened his mouth to defend himſelf, and three muſket-ſhot in his body. The blood guſhed from his wounds like wine from a tap. However, he crawled into the water and diſappeared. A ſailor attacked the other, and engaged him for a long time, ſtriking him on the head with a bludgeon, without being able to knock him down; the ſailor fell down very near his antagoniſt, but had the dexterity to recover himſelf at the inſtant the lion was going to gorge him. Had he once ſeized him, the man would infallibly have been loſt: the animal would have carried him into the water as they uſually do their prey, and there feaſted upon him. In his retreat to the ſea this animal ſeized a penguin, and devoured him inſtantaneouſly."

Mr. Pennant deſcribes three ſeals of different ſpecies, which are called *ſea-lions*, viz. the *phoca leonina*, or hooded ſeal; the *phoca leonina*, or bottle noſe; and the *beſtia marina*, or leonine ſeal. He differs in ſome particulars from the author juſt quoted; and ſuch of our readers as deſire to know theſe differences, we refer to his publications on the ſubject.

3. The *vitulina*, ſea-calf, or common ſeal, inhabits the European ocean. It has a ſmooth head without external ears; and the common length is from five to ſix feet. The fore-legs are deeply immerſed in the ſkin of the body: the hind-legs are placed in ſuch a manner as to point directly backwards: every foot is divided into five toes; and each of thoſe connected by a ſtrong and broad web, covered on both ſides with ſhort hair. The toes are furniſhed with ſtrong claws well adapted to aſſiſt the animal in climbing the rocks it baſks on: the claws on the hind-feet are ſlender and ſtraight; except at the ends, which are a little incurvated. The head and noſe are broad and flat, like thoſe of the otter; the neck ſhort and thick; the eyes large and black: in lieu of external ears, it has two ſmall orifices: the noſtrils are oblong: on each ſide the noſe are ſeveral long ſtiff hairs: and above each eye are a few of the ſame kind. The form of the tongue is ſo ſingular, that were other marks wanting, that alone would diſtinguiſh it from all other quadrupeds: being forked, or ſlit at the end. The cutting teeth are ſingular in reſpect to their number, being ſix in the upper jaw, and only four in the lower. It has two canine teeth above and below, and on each ſide of the jaw five grinders: the total 34. The whole animal is covered with ſhort hair, very cloſely ſet together: the colour of that on the body is generally duſky, ſpotted irregularly with white; and on the belly white. But ſeals vary greatly in their marks and colours, and ſome have been found white, without any mixture of colours.

The ſeal is common on moſt of the rocky ſhores of Great Britain and Ireland, eſpecially on the northern coaſts: in Wales, it frequents the coaſts of Caernarvonſhire and Angleſey. They inhabit all the European ſeas, even to the extreme north; are found far within the arctic circle, in the ſeas both of Europe and Aſia, and are even continued to thoſe of Kamtſchatka. It preys entirely on fiſh, and never moleſts the ſea-fowl; for numbers of each are often ſeen floating on the waves, as if in company. Seals eat their prey beneath the water; and in caſe they are devouring any very oily fiſh, the place is known by a certain ſmoothneſs of the waves immediately above. This ariſes from the thin pellicle of oil that covers the ſurface. The power of oil in ſtilling the waves excited by a ſtorm is mentioned by Pliny; and the moderns have made the experiment with ſucceſs.

Theſe animals are excellent ſwimmers, and ready divers; and are very bold when in the ſea, ſwimming careleſsly enough about boats. Their dens or lodgments are in hollow rocks or caverns near the ſea, but out of the reach of the tide: in the ſummer they will come out of the water, to baſk or ſleep in the ſun on the top of large ſtones or ſhivers of rocks; and that is the opportunity our countrymen take of ſhooting them: if they chance to eſcape, they haſten towards their proper element, flinging ſtones and dirt behind them as they ſcramble along; at the ſame time expreſſing their fears by piteous moans: but if they happen to be overtaken, they will make a vigorous defence with their feet and teeth till they are killed. They are taken for the ſake of their ſkins, and for the oil their fat yields: the former ſell for 4s. or 4s. 6d. a-piece; which, when dreſſed, are very uſeful in covering trunks, making waiſtcoats, ſhot-pouches, and ſeveral other articles. We remember ſome years ago to have ſeen a young ſeal in ſome degree domeſticated. It was taken at a little diſtance from the ſea, and was generally kept in a veſſel full of ſalt water; but ſometimes it was allowed to crawl about the houſe, and even to approach the fire. Its natural food was regularly procured for it, and it was taken to the ſea every day and thrown in from a boat. It uſed to ſwim after the boat, and always allowed itſelf to be taken back. It lived thus for ſeveral weeks; and probably would have lived much longer had it not been ſometimes too roughly uſed.

The fleſh of ſeals, and even of porpoiſes, formerly found a place at the tables of the great; as appears from the bill of fare of that vaſt feaſt that Archbiſhop Nevill gave in the reign of Edward IV. in which is ſeen that ſeveral were provided on the occaſion. They couple about April, on large rocks or ſmall iſlands not remote from the ſhore; and bring forth in thoſe vaſt caverns that are frequent on our coaſts. They commonly bring two young ones at a time, which in their infant ſtate are covered with a whitiſh down or woolly ſubſtance. The ſeal-hunters in Caithneſs ſay, that their growth is ſo ſudden, that in nine tides from their birth (108 hours) they will become as active as their parents. On the coaſt of that country are immenſe caverns opening into the ſea, and running ſome hundreds of yards beneath the land. Theſe are the reſort of ſeals in the breeding time, where they continue till their young are old enough to go to ſea, which is in about ſix or ſeven weeks. The firſt of theſe caves is near the Ord, the laſt near Thrumſter: their entrance is ſo narrow as only to admit a boat; their inſide very ſpacious and lofty. In the month of October, or the beginning of November, the ſeal-hunters enter the mouth of the caverns about midnight, and rowing up as far as they can, they land; each of them being provided with a bludgeon, and properly ſtationed, they light their torches, and make a great noiſe, which brings down the ſeals from the farther end in a confuſed body with fearful ſhrieks and cries: at firſt the men are obliged to give way for fear of being overborne; but when the firſt crowd is paſt, they kill as many as ſtraggle behind, chiefly the young, by ſtriking them on the

noſe; a very ſlight blow on that part diſpatches them. When the work is over, they drag the ſeals to the boat, which two men are left to guard. This is a moſt hazardous employment; for ſhould their torches go out, or the wind blow hard from ſea during their continuance in the cave, their lives are loſt. The young ſeals of ſix weeks old yield more oil than their emaciated dams: above eight gallons have been got from a ſingle whelp, which ſells from 6d. to 9d. per gallon or more; and the ſkins from 6d. to 1s. each.

In giving the natural hiſtory of this animal, the ſubject may be farther elucidated by the following extracts from a letter of the reverend Dr. Borlaſe, dated in 1763. "The ſeals are ſeen in the greateſt plenty on the ſhores of Cornwall in the months of May, June, and July. They are of different ſizes; ſome as large as a cow, and from that downwards to a ſmall calf. They feed on moſt ſorts of fiſh which they can maſter; and are ſeen ſearching for their prey near ſhore, where the whiſtling fiſh, wraws, and polacks, reſort. They are very ſwift in their proper depth of water, dive like a ſhot, and in a trice riſe at 50 yards diſtance; ſo that weaker fiſhes cannot avoid their tyranny except in ſhallow water. A perſon of the pariſh of Senuan ſaw not long ſince a ſeal in purſuit of a mullet (that ſtrong and ſwift fiſh): the ſeal turned it to and fro in deep water, as a grey-hound does a hare: the mullet at laſt found it had no way to eſcape, but by running into ſhoal water: the ſeal purſued; and the former, to get more ſurely out of danger, threw itſelf on its ſide, by which means it darted into ſhoaler water than it could have ſwam in with the depth of its paunch and fins, and ſo eſcaped. The ſeal brings her young about the beginning of autumn; our fiſhermen have ſeen two ſucking their dam at the ſame time, as ſhe ſtood in the ſea in a perpendicular poſition. Their head in ſwimming is always above water, more ſo than that of a dog. They ſleep on rocks ſurrounded by the ſea, or on the leſs acceſſible parts of our cliffs left dry by the ebb of the tide; and if diſturbed by any thing, take care to tumble over the rocks into the ſea. They are extremely watchful, and never ſleep long without moving; ſeldom longer than a minute; then raiſe their heads, and if they hear or ſee nothing more than ordinary, lie down again, and ſo on, raiſing their heads a little and reclining them alternately in about a minute's time. Nature ſeems to have given them this precaution, as being unprovided with auricles or external ears; and conſequently not hearing very quick, nor from any great diſtance."

Of ſo much value are theſe animals to the inhabitants of Greenland and other arctic ſituations, that they may be called their flocks. We cannot give a better account of theſe uſes than in the words of Mr. Crantz, who was long reſident in thoſe northern regions. "Seals (ſays he) are more needful to them than ſheep are to us, though they furniſh us with food and raiment; or than the cocoa-tree is to the Indians, although that preſents them not only with meat to eat, and covering for their bodies, but alſo houſes to dwell in, and boats to ſail in, ſo that in caſe of neceſſity they could live ſolely from it. The ſeals fleſh (together with the rein-deer, which is already grown pretty ſcarce) ſupplies the natives with their moſt palatable and ſubſtantial food. Their fat furniſhes them with oil for lamp-light, chamber and kitchen fire; and whoever ſees their habitations, preſently finds, that if they even had a ſuperfluity of wood, it would not do, they can uſe nothing but train in them. They alſo mollify their dry food, moſtly fiſh, in the train; and finally, they barter it for all kinds of neceſſaries with the factor. They can ſew better with fibres of the ſeals ſinews than with thread or ſilk. Of the ſkins of the entrails they make their windows, curtains for their tents, ſhirts, and part of the bladders they uſe at their harpoons; and they make train bottles of the maw. Formerly, for want of iron, they made all manner of inſtruments and working tools of their bones. Neither is the blood waſted, but boiled with other ingredients, and eaten as ſoup. Of the ſkin of the ſeal they ſtand in the greateſt need; for, ſuppoſing the ſkins of rein-deer and birds would furniſh them with competent clothing for their bodies, and coverings for their beds; and their fleſh together with fiſh, with ſufficient food; and provided they could dreſs their meat with wood, and alſo new-model their houſe-keeping, ſo as to have light, and keep themſelves warm with it too; yet without the ſeals ſkins they would not be in a capacity of acquiring theſe ſame rein deer, fowls, fiſhes, and wood; becauſe they muſt cover over with ſeal-ſkin both their large and ſmall boats in which they travel and ſeek their proviſion. They muſt alſo cut their thongs or ſtraps out of them, make the bladders for their harpoons, and cover their tents with them; without which they could not ſubſiſt in ſummer.

"Therefore no man can paſs for a right Greenlander who cannot catch ſeals. This is the ultimate end they aſpire at, in all their device and labour from their childhood up. It is the only art (and in truth a difficult and dangerous one it is) to which they are trained from their infancy; by which they maintain themſelves, make themſelves agreeable to others, and become beneficial members of the community.

"The Greenlanders have three ways of catching ſeals: either ſingly, with the bladder; or in company, by the clapper-hunt; or in the winter on the ice; whereto may be added the ſhooting them with a gun.

"The principal and moſt common way is the taking them with the bladder. When the Greenlander ſets out equipped, and ſpies a ſeal, he tries to ſurpriſe it unawares, with the wind and ſun in his back, that he may not be heard or ſeen by it. He tries to conceal himſelf behind a wave, and makes haſtily but ſoftly up to it, till he comes within four, five, or ſix fathom of it; meanwhile he takes the utmoſt care that the harpoon, line, and bladder, lie in proper order. Then he takes hold of the oar with his left hand, and the harpoon with his right by the hand-board, and ſo away he throws it at the ſeal, in ſuch a manner that the whole dart flies from the hand-board and leaves that in his hand. If the harpoon hits the mark, and buries itſelf deeper than the barbs, it will directly diſengage itſelf from the bone-joint, and that from the ſhaft; and alſo unwind the ſtring from its lodge on the kajak. The moment the ſeal is pierced, the Greenlander muſt throw the bladder, tied to the end of the ſtring, into the water, on the ſame ſide as the ſeal runs and dives; for that he does inſtantly like a dart. Then the Greenlander goes and takes up the ſhaft ſwimming on the water, and lays it in its place. The ſeal often drags the bladder with it under water, though it is a conſiderable impediment, on account of its great bigneſs; but it ſo wearies itſelf out with it, that it muſt come up again in about a quarter of an hour to take breath. The Greenlander haſtens to the ſpot where he ſees the bladder riſe up, and ſmites the ſeal as ſoon as it appears with a great lance. This lance always comes out of its body again; but he throws it at the creature afreſh every time he comes up till it is quite ſpent. Then he runs the little lance into it, and kills it outright, but ſtops up the wound directly to preſerve the blood; and laſtly, he blows it up, like a bladder, betwixt ſkin and fleſh, to put it into a better capacity of ſwimming after him; for which purpoſe he faſtens it to the left ſide of his kajak or boat.

"In this exerciſe the Greenlander is expoſed to the moſt and greateſt danger of his life; which is probably the reaſon that they call this hunt or fiſhery *kamavock*, i. e. "the extinction," *viz.* of life. For if the line ſhould entangle itſelf, as it eaſily may, in its ſudden and violent motion; or if it ſhould catch hold of the kajak, or ſhould wind itſelf round the oar,

or the hand, or even the neck, as it ſometimes does in windy weather; or if the ſeal ſhould turn ſuddenly to the other ſide of the boat, it cannot be otherwiſe than that the kajak muſt be overturned by the ſtring, and drawn down under water. On ſuch deſperate occaſions the poor Greenlander ſtands in need of every poſſible art to diſentangle himſelf from the ſtring, and to raiſe himſelf up from under the water ſeveral times ſucceſſively; for he will continually be overturning till he has quite diſengaged himſelf from the line. Nay, when he imagines himſelf to be out of all danger, and comes too near the dying ſeal, it may ſtill bite him in the face or hand: and a female ſeal that has young, inſtead of flying the field, will ſometimes fly at the Greenlander in the moſt vehement rage, and do him a miſchief, or bite a hole in his kajak, ſo that he muſt ſink.

"In this way, ſingly, they can kill none but the careleſs ſtupid ſeal called *attarſoak*. Several in company muſt purſue the cautious kaſſigiak by the clapper-hunt. In the ſame manner they alſo ſurround and kill the attarſoit in great numbers at certain ſeaſons of the year; for in autumn they retire into the creeks or inlets in ſtormy weather, as in the Nepiſet ſound in Ball's river, between the main land and the iſland Kangek, which is full two leagues long, but very narrow. There the Greenlanders cut off their retreat, and frighten them under water by ſhouting, clapping, and throwing ſtones; but as they muſt come up again continually to draw breath, then they perſecute them again till they are tired, and at laſt are obliged to ſtay ſo long above water that they ſurround them, and kill them with a kind of dart for the purpoſe. During this hunt we have a fine opportunity to ſee the agility of the Greenlanders, or if I may call it ſo, their huſſar-like manœuvres. When the ſeal riſes out of the water, they all fly upon it as if they had wings, with a deſperate noiſe; the poor creature is forced to dive again directly; and the moment he does, they diſperſe again as faſt as they came, and every one gives heed to his poſt to ſee where it will ſtart up again; which is an uncertain thing, and is commonly three quarters of a mile from the former ſpot. If a ſeal has a good broad water, three or four leagues each way, it can keep the ſportſmen in play for a couple of hours before it is ſo ſpent that they can ſurround and kill it. If a ſeal in its fright betakes itſelf to the land for a retreat, it is welcomed with ſticks and ſtones by the women and children, and preſently pierced by the men in the rear. This is a very lively and a very profitable diverſion for the Greenlanders, for many times one man will have eight or ten ſeals for his ſhare.

"The third method of killing ſeals upon the ice is moſtly practiſed in Diſko, where the bays are frozen over in the winter. There are ſeveral ways of proceeding. The ſeals themſelves make ſometimes holes in the ice, where they come and draw breath; near ſuch a hole a Greenlander ſeats himſelf on a ſtool, putting his feet on a lower one to keep them from the cold. Now when the ſeal comes and puts its noſe to the hole, he pierces it inſtantly with his harpoon; then breaks the hole larger, and draws it out and kills it quite. Or a Greenlander lays himſelf upon his belly on a kind of a ſledge, near other holes, where the ſeals come out upon the ice to baſk themſelves in the ſun. Near this great hole they make a little one, and another Greenlander puts a harpoon into it with a very long ſhaft or pole. He that lies upon the ice looks into the great hole, till he ſees a ſeal coming under the harpoon: then he gives the other the ſignal, who runs the ſeal through with all his might.

"If the Greenlander ſees a ſeal lying near its hole upon the ice, he ſlides along upon his belly towards it, wags his head, and grunts like a ſeal; and the poor ſeal, thinking it is one of its innocent companions, lets him come near enough to pierce it with his long dart. When the current wears a great hole in the ice in the ſpring, the Greenlanders plant themſelves all round it, till the ſeals come in droves to the brim to fetch breath, and then they kill them with their harpoons. Many alſo are killed on the ice while they lie ſleeping and ſnoring in the ſun."

To the foregoing ingenious and intereſting account, we ſhall ſubjoin the following obſervations of Mr. Pennant, which are not leſs worthy of the attention of the naturaliſt.

"Nature (ſays that intelligent writer) has been ſo niggardly in providing variety of proviſion for the Greenlanders, that they are neceſſitated to have recourſe to ſuch which is offered to them with a liberal hand. The Kamtſchatkan nations, which enjoy ſeveral animals, as well as a great and abundant choice of fiſh, are ſo enamoured with the taſte of the fat of ſeals, that they can make no feaſt without making it one of the diſhes. Of that both Ruſſians and Kamtſchatkans make their candles. The latter eat the fleſh boiled, or elſe dried in the ſun. If they have a great quantity, they preſerve it in the following manner:

"They dig a pit of a requiſite depth, and pave it with ſtones; then fill it with wood, and ſet it on fire ſo as to heat the pit to the warmth of a ſtove. They then collect all the cinders into a heap. They ſtrew the bottom with the green wood of alder, on which they place ſeparately the fleſh and the fat, and put between every layer branches of the ſame tree; when the pit is filled, they cover it with ſods, ſo that the vapour cannot eſcape. After ſome hours they take out both fat and fleſh, and keep it for winter's proviſions, and they may be preſerved a whole year without ſpoiling.

"The Kamtſcatkans have a moſt ſingular ceremony. After they take the fleſh from the heads of the ſeals, they bring a veſſel in form of a canoe, and fling into it all the ſkulls, crowned with certain herbs, and place them on the ground. A certain perſon enters the habitation with a ſack filled with *tonchitche*, ſweet herbs, and a little of the bark of willow. Two of the natives then roll a great ſtone towards the door, and cover it with pebbles; two others take the ſweet herbs and diſpoſe them tied in little packets. The great ſtone is to ſignify the ſea-ſhore, the pebbles the waves, and the packets ſeals. They then bring three diſhes of a haſh called *tolkoucha*: of this they make little balls, in the middle of which they ſtick the packets of herbs: of the willow-bark they make a little canoe, and fill it with tolkoucha, and cover it with the ſack. After ſome time the two Kamtſchatkans, who had put the mimic ſeals into the tolkoucha, take the balls, and a veſſel reſembling a canoe, and draw it along the ſand as if it was on the ſea, to convince the real ſeals how agreeable it would be to them to come among the Kamtſchatkans, who have a ſea in their very jurts or dwellings. And this they imagine will induce the ſeals to ſuffer themſelves to be taken in great numbers. Various other ceremonies, equally ridiculous, are practiſed; in one of which they invoke the winds, which drive the ſeals on their ſhores, to be propitious.

"Beſides the uſes which are made of the fleſh and fat of ſeals, the ſkins of the largeſt are cut into ſoles for ſhoes. The women make their ſummer boots of the undreſſed ſkins, and wear them with the hair outmoſt. In a country which abounds ſo greatly in furs, very little more uſe is made of the ſkins of ſeals in the article of dreſs than what has been mentioned. But the Koriaks, the Oloutores, and Tchutſchi, form with the ſkins canoes and veſſels of different ſizes, ſome large enough to carry thirty people.

"Seals ſwarm on all the coaſts of Kamtſchatka, and will go up the rivers eighty verſts in purſuit of fiſh. The Tunguſi give the milk of theſe animals to their children inſtead of phyſic. The navigators obſerved abundance of ſeals about

Bering's iſland, but that they decreaſed in numbers as they advanced towards the ſtraits; for where the walruſes abounded, the ſeals grew more and more ſcarce.

"I did not obſerve any ſeal-ſkin garments among thoſe brought over by the navigators, ſuch as one might have expected among the Eſquimaux of the high latitudes they viſited, and which are ſo much in uſe with thoſe of Hudſon's Bay and Labrador. That ſpecies of dreſs doubtleſs was worn in the earlieſt times. Theſe people wanted their hiſtorians; but we are aſſured that the Maſſagetæ clothed themſelves in the ſkins of ſeals. They, according to D'Anville, inhabited the country to the eaſt of the Caſpian ſea, and the lake Aral, both of which waters abound with ſeals.

"Seals are now become a great article of commerce. The oil from the vaſt whales is no longer equal to the demand for ſupplying the magnificent profuſion of lamps in and round our capital. The chaſe of theſe animals is redoubled for that purpoſe; and the ſkins, properly tanned, are in conſiderable uſe in the manufactory of boots and ſhoes."

4. The *phoca barbata*, or great ſeal, has long white whiſkers with curled points. The back is arched; hair black, very deciduous, and very thinly diſperſed over a thick ſkin, which is almoſt naked in ſummer. The teeth of this ſpecies are like thoſe of the common ſeal; the fore-feet are like the human hand, the middle toe being the longeſt and the thumb ſhort. They are upwards of 12 feet long. The inhabitants of Greenland cut out of the ſkin of this ſpecies thongs and lines, a finger-thick, for the ſeal-fiſhery. Its fleſh is as white as veal, and is eſteemed the moſt delicate of any. They produce plenty of lard, but very little oil. The ſkins of the young are ſometimes uſed to lie on.—It inhabits the high ſea about Greenland, is very timid, and commonly reſts on the floating ice. It breeds about the month of March, and brings forth a ſingle young one, on the ice, generally among the iſlands; for then it approaches a little nearer to the land. The large old ones ſwim very deliberately.

In Scotland, on the northern coaſt, is found a ſeal twelve feet long. A young one, ſeven feet and a half long, was ſhown in London ſome years ago, which was ſo far from maturity as to have ſcarcely any teeth. See Phil. Tranſ. Abr. ix. 74. tab. v. xlvii. 120. Yet the common ſeals have them complete before they attain the ſize of ſix feet, which is their utmoſt growth. But a ſpecies larger than an ox was found in the Kamtſchatkan ſeas from 56 to 64 north latitude, called by the natives *lachtak*. They weighed 800 pounds, and were eaten by Bering's crew; but their fleſh was very loathſome. The cubs are black all over.

Accounts of other ſeals found in thoſe wild ſeas, have been given by Steller; but his deſcriptions are ſo very imperfect as to render it impoſſible to aſcertain the ſpecies. He ſpeaks in his MSS. of a middle-ſized kind, wholly and moſt elegantly ſpotted; of another which is black with brown ſpots, having the belly of a yelloviſh white, and as large as a yearling ox. He mentions a third ſpecies, black, and with a particular formation of the hinder legs; and a fourth of a yelloviſh colour, with a great circle of the colour of a cherry around it.

5. The *phoca fœtida*, or rough ſeal, is diſtinguiſhed by a ſhort noſe and ſhort round head; a body almoſt elliptical, covered with lard almoſt to the hind feet. This ſpecies ſeldom if ever exceeds four feet in length. Their hairs are cloſely ſet together, ſoft, long, and ſomewhat erect, intermixed with curled. They are of a duſky colour, mixed with white, which ſometimes varies to white, with a duſky dorſal line. This ſpecies never frequents the high ſeas, but keeps on the fixed ice in the remote bays near the frozen land; and when old never forſakes its haunts. They couple in June, and bring forth in January on the fixed ice, its proper element. In that cold ſituation they have a hole for the benefit of fiſhing; near which they generally remain ſolitary, being rarely found in pairs. They are very incautious, and often ſleep on the ſurface of the water, by which means they become an eaſy prey to the eagle. They feed on ſmall fiſh, ſhrimps, &c. The ſkin, tendons, and lard, are uſed in the ſame way with thoſe of other ſeals. The fleſh is red and fœtid, eſpecially in males; hence it is nauſeated even by the inhabitants of Greenland. The ſeal-hunters in Newfoundland have a larger kind, which they call the *ſquare phipper*, and which weighs 500 pounds. Its coat is like that of a water-dog; ſo that it appears by the length of its hair to be allied to this ſpecies; but the vaſt difference in ſize admits not of any degree of certainty in this particular.

6. The *phoca leporina*, or leporine ſeal, has hair of a dirty white colour, tinged with yellow, but never ſpotted. The hairs are erect, interwoven, and ſoft, like thoſe of a hare, eſpecially in the young. The head is long; the upper lip ſwelling and thick; the whiſkers very ſtrong and very thick, ranged in 15 rows, covering the whole front of the lip, ſo that it appears bearded; the eyes are blue, and the pupil of them black; the teeth are ſtrong; the fore-feet are ſhort; the membranes of the hind-feet are even not waved; the tail is ſhort and thick, it being four inches two lines in length; the cubs are of a milk white colour. The length of the ſpecies is about ſix feet ſix inches, and the circumference where greateſt five feet two inches. This ſpecies inhabits the White ſea in the ſummer time, and aſcends and deſcends the mouths of rivers with the tide in queſt of prey. It is likewiſe found on the coaſts of Iceland, and within the polar circle from Spitzbergen to Tchutki Noſs, and from thence ſouthward about Kamtſchatka.

Travellers and naturaliſts have deſcribed ſeveral other ſpecies of this genus, and a variety of curious particulars reſpecting them, which our limits permit us not to give. Such of our readers however as wiſh for further information on this ſubject, will find themſelves amply gratified by a careful peruſal of what Mr. Pennant has written on the ſubject, from whoſe labours we have extracted much of this article. See his *Hiſtory of Quadrupeds*, vol. ii. p. 518—536; his *Arctic Zoology*, vol. i. p. 151—177; and his *Britiſh Zoology*, as alſo the ſeveral authors whoſe works he has quoted in the publications referred to.

Bear, in aſtronomy. See Ursa.

Order of the Bear was a military order in Switzerland, erected by the Emperor Frederick II. in 1213, by way of acknowledgment for the ſervice the Swiſs had done him, and in favour of the abbey of St. Gaul. To the collar of the order hung a medal, on which was repreſented a bear raiſed on an eminence of earth.

Bear's-*Breech*, in botany. See Acanthus.

Bear's-*Fleſh* was much eſteemed by the ancients: even at this day, the paw of a bear ſalted and ſmoked is ſerved up at the table of princes.

Bear's-*Greaſe* was formerly eſteemed a ſovereign remedy againſt rheumatiſms, and other painful affections. It is now much uſed in dreſſing ladies' and gentlemen's hair, on a ſuppoſition of its cauſing the hair to grow thick and long. This notion indeed is ſo far inculcated by ſome of the perfumers, that they actually fatten and afterwards kill young bears, for the profit which ariſes from ſelling the fat to their credulous cuſtomers. The animal is generally ſkinned and hung up to view in their ſhops, and ſlices of fat are cut away in the preſence of the buyers in order that they may be ſure it is genuine.

Bear's-*Skin*, a fur once in great eſteem, and a conſiderable article of commerce, having been uſed in houſings, on coach-

boxes, &c. In cold countries, clothes are made of it, and more eſpecially bags wherein to keep the feet warm. Of the ſkins of bears' cubs are made gloves, muffs and the like.

BEARALSTON, a poor town of Devonſhire, which however is a borough by preſcription, and ſends two members to parliament.

BEARD, the hair growing on the chin and adjacent parts of the face, chiefly of adults and males. Various have been the ceremonies and cuſtoms of moſt nations in regard to the beard. The Tartars, out of a religious principle, waged a long and bloody war with the Perſians, declaring them infidels, merely becauſe they would not cut their whiſkers after the rite of Tartary: and we find that a conſiderable branch of the religion of the ancients conſiſted in the management of their beards. The Greeks wore their beards till the time of Alexander the Great; that prince having ordered the Macedonians to be ſhaved, for fear it ſhould give a handle to their enemies. According to Pliny, the Romans did not begin to ſhave till the year of Rome 454, when P. Ticinius brought over a ſtock of barbers from Sicily.—Perſons of quality had their children ſhaved the firſt time by others of the ſame or greater quality, who, by this means, became god-father or adoptive father of the children. Anciently indeed, a perſon became god-father of the child by barely touching his beard: thus Hiſtorians relate, that one of the articles of the treaty between Alaric and Clovis was, that Alaric ſhould touch the beard of Clovis to become his god-father.

As far as concerns eccleſiaſtics, the diſcipline has been very different on the article of beards: ſometimes they have been enjoined to wear them, from a notion of too much effeminacy in ſhaving, and that a long beard was more ſuitable to the eccleſiaſtical gravity; and ſometimes again they were forbid it, as imagining pride to lurk beneath a venerable beard. The Greek and Roman churches have been long together by the ears about their beards: ſince the time of their ſeparation, the Roman Catholics ſeem to have given more into the practice of ſhaving, by way of oppoſition to the Greeks; and have even made ſome expreſs conſtitutions *de radendis barbis*. The Greeks, on the contrary, eſpouſe very zealouſly the cauſe of long beards, and are extremely ſcandalized at the beardleſs images of ſaints in the Roman churches. By the ſtatues of ſome monaſteries it appears, that the lay-monks were to let their beards grow, and the prieſts among them to ſhave; and that the beards of all that were received into the monaſteries, were bleſſed with a great deal of ceremony. There are ſtill extant the prayers uſed in the ſolemnity of conſecrating the beard to God, when an eccleſiaſtic underwent the ceremony of ſhaving.

It is remarked by Le Comte, that the Chineſe affect long beards extravagantly; but nature has balked them, and only given them very little ones, which, however, they cultivate with infinite care: the Europeans are ſtrangely envied by them on this account, and eſteemed the greateſt men in the world. Chryſoſtom obſerves, that the kings of Perſia had their beards wove or matted together with gold thread; and ſome of the firſt kings of France had their beards knotted and buttoned with gold.

There is nothing among the Turks more infamous than for any one to have his beard cut off. It is not leſs diſgraceful, for inſtance, than among us to be publicly whipped or branded with a hot iron. Nay, there are many in that country who would prefer death to this kind of puniſhment. The Arabs make the preſervation of their beards a capital point of religion, becauſe Mahomet never cut his. Hence the razor is never drawn over the Grand Signior's face. The Perſians, who clip them, and ſhave above the jaw, are reputed heretics. It is likewiſe a mark of authority and liberty among them, as well as among the Turks. They who ſerve in the ſeraglio have their beards ſhaven, as a ſign of their ſervitude. They do not ſuffer it to grow till the ſultan has ſet them at liberty, which is beſtowed as a reward upon them, and is always accompanied with ſome employment.

Moſt of the celebrated ancient writers, and ſeveral modern ones, have ſpoken honourably of the fine beards of antiquity. Homer ſpeaks highly of the white beard of Neſtor and that of old king Priam. Virgil deſcribes Mezentius's to us, which was ſo thick and long as to cover all his breaſt; Chryſippus praiſes the noble beard of Timothy, a famous player on the flute. Pliny the younger tells us of the white beard of Euphrates, a Syrian philoſopher; and he takes pleaſure in relating the reſpect mixed with fear with which it inſpired the people. Plutarch ſpeaks of the long white beard of an old Laconian, who, being aſked why he let it grow ſo, replied, *'Tis that, ſeeing continually my white beard, I may do nothing unworthy of its whiteneſs.* Strabo relates, that the Indian philoſophers, the Gymnoſophiſts, were particularly attentive to make the length of their beards contribute to captivate the veneration of the people. Diodorus, after him, gives a very particular and circumſtantial hiſtory of the beards of the Indians. Juvenal does not forget that of Antilochus the ſon of Neſtor. Fenelon, in deſcribing a prieſt of Apollo in all his magnificence, tells us, that he had a white beard down to his girdle. But Perſius ſeems to outdo all theſe authors: this poet was ſo convinced that a beard was the ſymbol of wiſdom, that he thought he could not beſtow a greater encomium on the divine Socrates, than by calling him *Magiſtrum barbatum*, the bearded maſter.

During that period when the Gauls were under their ſovereignty, none but the nobles and Chriſtian prieſts were permitted to wear long beards. The Franks having made themſelves maſters of Gaul, aſſumed the ſame authority as the Romans: the bondſmen were expreſsly ordered to ſhave their chins; and this law continued in force until the entire abolition of ſervitude in France. So likewiſe, in the time of the firſt race of kings, a long beard was a ſign of nobility and freedom. The kings, as being the higheſt nobles in their kingdom, were emulous likewiſe to have the largeſt beards: Eginard, ſecretary to Charlemagne, ſpeaking of the laſt kings of the firſt race, ſays, they came to the aſſemblies in the Field of Mars in a carriage drawn by oxen, and ſat on the throne with their hair diſhevelled, and a very long beard, *crine profuſo, barba ſubmiſſa, ſolio reſiderent, et ſpeciem dominantis effingerent.*

The act of touching any one's beard, or cutting off a bit of it, was, among the firſt French, the moſt ſacred pledge of protection and confidence. For a long time all letters that came from the ſovereign had, for greater ſanction, three hairs of his beard in the ſeal. There is ſtill in being a charter of 1121, which concludes with the following words: *Quod ut ratum et ſtabile perſeveret in poſterum præſentis ſcripto ſigilli mei robur appoſui cum tribus pilis barbæ meæ.* Several great men have honoured themſelves with the ſurname of *Bearded*. The Emperor Conſtantine is diſtinguiſhed by the epithet of *Pogonate*, which ſignifies *the Bearded*. In the time of the Cruſades, we find there was a *Geffrey the Bearded*. Baldwin IV. Earl of Flanders, was ſurnamed *Handſome-beard*; and, in the illuſtrious houſe of Montmorenci, there was a famous *Bouchard*, who took a pride in the ſurname of *Bearded*. He was always the declared enemy of the monks, without doubt, becauſe of their having parted with their beards.

In the tenth century, we find, that King Robert (of France), the rival of Charles the Simple, was not more famous for his exploits than for his long white beard. In order that it might be more conſpicuous to the ſoldiers when he was in the field, he uſed to let it hang down outſide his cuiraſs: this venerable

ight encouraged the troops in battle, and ſerved to rally them when they were overpowered.

A certain noted painter in Germany, called *John Mayo*, had ſuch a large beard that he was nicknamed *John the Bearded*. It was ſo long that he wore it faſtened to his girdle; and, though he was a very tall man, it would hang upon the ground when he ſtood upright. He took the greateſt care of this extraordinary beard; ſometimes he would untie it before the Emperor Charles V. who took great pleaſure to ſee the wind make it fly againſt the faces of the lords of his court.

In England, the famous chancellor Thomas More, one of the greateſt men of his time, being on the point of falling a victim to court intrigues, was able, when on the fatal ſcaffold, to procure reſpect to his beard in preſence of all the people, and ſaved it, as one may ſay, from the fatal ſtroke which he could not eſcape himſelf. When he had laid his head on the block, he perceived that his beard was likely to be hurt by the axe of the executioner; on which he took it away, ſaying, *My beard has not been guilty of treaſon; it would be an injuſtice to puniſh it.* Much has been ſaid of the beard of the great Henry IV. of France, which diffuſed over the countenance of that prince a majeſtic ſweetneſs and amiable openneſs. But what dependence is to be placed on the ſtability of the things of this world? By an event, as fatal as unforeſeen, the beard, which was arrived at its higheſt degree of glory, all of a ſudden loſt its favour, and was at length entirely proſcribed. The unexpected death of Henry the Great, and the youth of his ſucceſſor, were the ſole cauſes of it. Louis XIII. mounted the throne of his anceſtors without a beard. Every one concluded immediately, that the courtiers, ſeeing their young king with a ſmooth chin, would look upon their own as too rough. The conjecture proved right; for they preſently reduced their beards to whiſkers and a ſmall tuft of hair under the lower lip. The people however at firſt would not follow this dangerous example. The Duke of Sully never would adopt what he deemed an effeminate cuſtom. This man, great both as a general and a miniſter, was likewiſe ſo in his retirement: he had the courage to keep his long beard, and to appear with it at the court of Louis XIII. where he was called to give his advice in an affair of importance. The young crop-bearded courtiers laughed at the ſight of his grave look and old-faſhioned phiz. The duke, nettled at the affront put on his fine beard, ſaid to the king, "Sir, when your father, of glorious memory, did me the honour to conſult me on his great and important affairs, the firſt thing he did was to ſend away all the buffoons and ſtage-dancers of his court."

The Czar Peter, who had ſo many claims to the ſurname of *Great*, ſeems to have been but little worthy of it on this occaſion. He had the boldneſs to lay a tax on the beards of his ſubjects. He ordered that the noblemen and gentlemen, tradeſmen and artiſans, the prieſts and peaſants excepted, ſhould pay 100 rubles for permiſſion to retain their beards; that the lower claſs of people ſhould pay a copeck for the ſame liberty; and he eſtabliſhed clerks at the gates of the different towns to collect theſe duties. Such a new and ſingular impoſt troubled the vaſt empire of Ruſſia. Both religion and manners were thought in danger. Complaints were heard from all parts; they even went ſo far as to write libels againſt the ſovereign; but he was inflexible, and at that time powerful. Even the fatal ſcenes of St. Bartholomew were renewed againſt theſe unfortunate beards, and the moſt unlawful violences were publicly exerciſed. The razor and ſciſſars were every where made uſe of. A great number, to avoid theſe cruel extremities, obeyed with reluctant ſighs. Some of them carefully preſerved the ſad trimmings of their chins: and, in order to be never ſeparated from theſe dear locks, ordered that they ſhould be buried along with them.

Example, more powerful than authority, produced in Spain what it had not been able to bring about in Ruſſia without great difficulty. Philip V. aſcended the throne with a ſhaved chin. The courtiers imitated the prince, and the people, in turn, the courtiers. However, though this revolution was brought about without violence, and by degrees, it cauſed much lamentation and murmuring; the gravity of the Spaniards loſt by the change. The favourite cuſtom of a nation can never be altered without incurring diſpleaſure. They have this old ſaying in Spain: *Deſde que no hay barba, no hay mas alma.* "Since we have loſt our beards, we have loſt our ſouls."

There have been none among the European nations that have been ſo curious in beards and whiſkers as the Spaniſh. This grave and romantic people have always regarded the beard as the ornament which ſhould be moſt prized; and the Spaniards have often made the loſs of honour conſiſt in that of their whiſkers. The Portugueſe, whoſe national character is much the ſame, are not the leaſt behind them in that reſpect. In the reign of Catherine Queen of Portugal, the brave John de Caſtro had juſt taken in India the caſtle of Diu: victorious, but in want of every thing, he found himſelf obliged to aſk the inhabitants of Goa to lend him a thouſand piſtoles for the maintenance of his fleet; and, as a ſecurity for that ſum, he ſent them one of his whiſkers, telling them, "All the gold in the world cannot equal the value of this natural ornament of my valour; and I depoſit it in your hands as a ſecurity for the money." The whole town was penetrated with this heroiſm, and every one intereſted himſelf about this invaluable whiſker: even the women were deſirous to give marks of their zeal for ſo brave a man: ſeveral ſold their bracelets to increaſe the ſum aſked for; and the inhabitants of Goa ſent him immediately both the money and his whiſker. A number of other examples of this kind might be produced, which do as much honour to whiſkers as to the good faith of thoſe times.

In the reign of Louis XIII. whiſkers attained the higheſt degree of favour, at the expence of the declining beard. In thoſe days of gallantry, not yet empoiſoned by wit, they became the favourite faſhion of lovers. A fine black whiſker, elegantly turned up, was a very powerful mark of dignity with the fair ſex. Whiſkers were ſtill in vogue in the beginning of Louis XIV.'s reign. This king, and all the great men of his reign, took a pride in wearing them. They were the ornament of Turenne, Condé, Colbert, Corneille, Moliere, &c. It was then no uncommon thing for a favourite lover to have his whiſkers turned up, combed, and pomatumed by his miſtreſs; and for this purpoſe a man of faſhion took care to be always provided with every little neceſſary article, eſpecially whiſker-wax. It was highly flattering to a lady to have it in her power to praiſe the beauty of her lover's whiſkers; which, far from being diſguſting, gave his perſon an air of vivacity: ſeveral even thought them an incitement to love. It ſeems the levity of the French made them undergo ſeveral changes both in form and name: there were *Spaniſh*, *Turkiſh*, *guard-dagger*, &c. whiſkers; in ſhort, *royal* ones, which were the laſt worn. Their ſmallneſs, however, proclaimed the approaching change of faſhion in this reſpect.

Conſecration of the BEARD was a ceremony among the Roman youth, who, when they were ſhaved the firſt time, kept a day of rejoicing, and were particularly careful to put the hair of their beard into a ſilver or gold box, and make an offering of it to ſome god, particularly to Jupiter Capitolinus, as was done by Nero, according to Suetonius.

Kiſſing the BEARD. The Turkiſh wives kiſs their huſbands beards, and children their fathers, as often as they come to ſalute them. The men kiſs one another's beards reciprocally on both ſides when they ſalute in the ſtreets, or come off from any journey or voyage.

The faſhion of the BEARD has varied in different ages and countries; ſome cultivating and entertaining one part of it, ſome another. Thus the Hebrews wear a beard on their chin; but not on the upper-lip or cheeks. Moſes forbids them to cut off entirely the angle or extremity of their beard; that is, to manage it after the Egyptian faſhion, which left only a little tuft of beard at the extremity of the chin; whereas the Jews to this day ſuffer a little fillet of hair to grow from the lower end of their ears to their chins, where, as well as on their lower-lips, their beards are in a pretty long bunch. The Jews, in time of mourning, neglected to trim their beards, that is, to cut off what grew ſuperfluous on the upper-lips and cheeks. In time of grief and great affliction they alſo plucked off the hair of their beards.

Anointing the BEARD with unguents is an ancient practice both among the Jews and Romans, and ſtill continues in uſe among the Turks; where one of the principal ceremonies obſerved in ſerious viſits is to throw ſweet-ſcented water on the beard of the viſitant, and to perfume it afterwards with aloes-wood, which ſticks to this moiſture, and gives it an agreeable ſmell, &c. In middle-age writers we meet with *adlentare barbam*, uſed for ſtroking and combing it, to render it ſoft and flexible. The Turks, when they comb their beards, hold a handkerchief on their knees, and gather very carefully the hairs that fall; and when they have got together a certain quantity, they fold them up in paper, and carry them to the place where they bury their dead.

BEARD *of a Comet*, the rays which the comet emits towards that part of the heavens to which its proper motion ſeems to direct it. In this the beard of a comet is diſtinguiſhed from the tail, which is underſtood of the rays emitted towards that part from whence its motion ſeems to convey it.

BEARD *of a Horſe*, that part underneath the lower mandible on the outſide, and above the chin, which bears the curb. It is alſo called the *chuck*. It ſhould have but little fleſh upon it, without any chaps, hardneſs, or ſwelling; and be neither too high raiſed nor too flat, but ſuch as that the curb may reſt in its right ſituation.

BEARD *of a Muſcle*, oyſter, or the like, denotes an aſſemblage of threads or hairs, by which thoſe animals faſten themſelves to ſtones. The hairs of this beard terminate in a flat ſpongy ſubſtance, which being applied to the ſurface of a ſtone, ſticks to it like the wet leather uſed by boys.

BEARDS, in the hiſtory of inſects, are two ſmall, oblong, fleſhy bodies, placed juſt above the trunk, as in the gnat, and alſo in moths and butterflies.

BEARDED, denotes a perſon or thing with a beard, or ſome reſemblance thereof. The faces on ancient Greek and Roman medals are generally bearded. Some are denominated *pogonati*, as having long beards, *e. g.* the Parthian kings. Others have only a lanugo about the chin, as the Seleucid family. Adrian was the firſt of the Roman emperors who nouriſhed his beard: hence all imperial medals before him are *beardleſs*; after him, *bearded*.

BEARDED *Women* have been all obſerved to want the menſtrual diſcharge; and ſeveral inſtances are given by Hippocrates, and other phyſicians, of grown women, eſpecially widows, in whom the menſes coming to ſtop, beards appeared. Euſebius Nierembergius mentions a woman who had a beard reaching to her navel.

Of women remarkably bearded we have ſeveral inſtances. In the cabinet of curioſities of Stutgard in Germany, there is the portrait of a woman called *Bartel Graetje*, whoſe chin is covered with a very large beard. She was drawn in 1587, at which time ſhe was but 25 years of age. There is likewiſe in the ſame cabinet another portrait of her when ſhe was more advanced in life, but likewiſe with a beard. It is ſaid, that the Duke of Saxony had the portrait of a poor Swiſs woman taken, remarkable for her long buſhy beard; and thoſe who were at the carnival at Venice, in 1726, ſaw a female dancer aſtoniſh the ſpectators not more by her talents than by her chin covered with a black buſhy beard. Charles XII. had in his army a female grenadier: it was neither courage nor a beard that ſhe wanted to be a man. She was taken at the battle of Pultowa, and carried to Peterſburg, where ſhe was preſented to the Czar in 1724: her beard meaſured a yard and a half. We read in the Trévoux Dictionary, that there was a woman ſeen at Paris, who had not only a buſhy beard on her face, but her body likewiſe covered all over with hair. Among a number of other examples of this nature, that of Margaret, the governeſs of the Netherlands, is very remarkable. She had a very long ſtiff beard, which ſhe prided herſelf on; and being perſuaded that it contributed to give her an air of majeſty, ſhe took care not to loſe a hair of it. This Margaret was a very great woman. It is ſaid, that the Lombard women, when they were at war, made themſelves beards with the hair of their heads, which they ingeniouſly arranged on their cheeks, in order that the enemy, deceived by the likeneſs, might take them for men. It is aſſerted, after Suidas, that in a ſimilar caſe the Athenian women did as much. Theſe women had more maſculine qualities than our effeminate countrymen. About a century ago the French ladies adopted a mode of dreſſing their hair in ſuch a manner that curls hung down their cheeks as far as their boſoms; theſe curls went by the name of *whiſkers*. This cuſtom, it cannot be ſuppoſed, was invented after the example of the Lombard women, to *frighten* the men. Neither is it with intention to carry on a very bloody war, that in our time the beaus affect to bring forward the hair of the cheeks from each ear towards the mouth; yet theſe are alſo termed *whiſkers*.

BEARERS, in heraldry, the ſame with ſupporters, which are certain figures, ſtanding on the ſcroll, and placed by the ſide of an eſcutcheon, and ſeeming to ſupport or hold up the ſame.

Supporters are, chiefly, figures of beaſts: figures of human creatures, uſed for the like purpoſe, are more properly called *tenants*. Some make another difference between tenant and ſupporter: when the ſhield is borne by a ſingle animal, it is called *tenant*; when by two, they are called *ſupporters*. The figures of things inanimate, ſometimes placed aſide of eſcutcheons, but not touching, or ſeeming to bear them, though ſometimes called *ſupporters*, are more properly called *cotiſes*.

Supporters have formerly been taken from ſuch animals as were borne in the ſhields; and ſometimes they have been choſen as bearing ſome alluſion to the names of thoſe whoſe arms they are made to ſupport. F. Meneſtrier traces their origin to the ancient tournaments, in which the knights cauſed their ſhields to be carried by ſervants or pages under the diſguiſe of lions, bears, griffins, blackamoors, &c. who alſo held and guarded the eſcutcheons, which the knights were obliged to expoſe to public view ſome time before the liſts were opened. But Sir G. Mackenzie ſays, that the firſt origin and uſe of them are derived from the cuſtom of leading ſuch as are inveſted with any great honour to the prince who confers it, and of his being ſupported by two of the quality, when he receives the ſymbols of ſuch honour: and in remembrance of that ſolemnity, his arms were afterwards ſupported by any two creatures which he might chooſe.

The ſupporters of the Engliſh arms are a lion, and an unicorn. Some of our former kings have had a leopard, and an unicorn; others, gryphons; others, eagles, &c. Before the abolition of monarchy and all heraldic diſtinctions in France, the ſupporters of the French arms were angels; which, it is ſaid, were firſt introduced by Philip VI. his device being an

angel overthrowing a dragon; for the dragon was, at that time, the device of the kings of England. The supporters of the prince of Monaco are Auguſtine monks; thoſe of the family of the Urſini, bears; in alluſion to their names.

In England, ſupporters are the prerogative, firſt, of thoſe called *nobiles maiores*, viz. dukes, marquiſſes, earls, viſcounts, and barons; ſecondly, of all Knights of the Garter, although they ſhould be under the degree of barons; thirdly, of Knights of the Bath, who each receive on their creation a grant of ſupporters: and laſtly, of ſuch knights as the king chooſes to beſtow this honour upon. Supporters are not hereditary, except to the elder branches of ſome Knights of the Garter, whoſe anceſtors had this honour granted them; and to the eldeſt ſons of peers, above the degree of a baron, who bear their father's arms and ſupporters with a label, &c. The Germans permit none but princes, and noblemen of rank, to bear them: among the French, the uſe of them was formerly very promiſcuous.

BEARER, in architecture, a poſt, or brick wall, trimmed up between the two ends of a piece of timber, to ſhorten its bearing, or to prevent its bearing with the whole weight at the ends only.

Bearers, *geſtantes*, in middle age writers, are ſometimes uſed for a child's goſſips, becauſe they hold the infant in their arms, and preſent him to the prieſt in the ceremony of baptiſm.

Bearers *of a* Bill *of* Exchange, denote the perſons in whoſe hands it is, and in favour of whom the laſt order or indorſement was made. When a bill is ſaid to be payable to bearer, it is underſtood to be payable to him who firſt offers himſelf after it becomes due. To be paid a bill of this kind, there needs neither order nor transfer; yet it is good to know to whom it is paid.

Bearers are more peculiarly uſed among us for thoſe who carry the dead to their graves. In a ſenſe ſomewhat different from this, we alſo ſay pall-bearers, &c. The ancients had peculiar orders or officers of bearers, called by the Greeks κοπιάται; by the Romans, *lecticarii*. The *veſpillones*, or *bajuli*, were a lower ſort of bearers, appointed for perſons of inferior rank.

Bearers, in horticulture, denote the fruit branches, or ſuch as bear fruit. The bearers, or bearing-branches of an apple-tree, and the like, are found to be rougher, and fuller of aſperities in their bark, than the other branches.

BEARING, in navigation, an arch of the horizon intercepted between the neareſt meridian and any diſtinct object, either diſcovered by the eye, or reſulting from the ſinical proportion; as in the firſt caſe, at 4 P. M. Cape Spado, in the iſle of Candia, bore S. by W. by the compaſs. In the ſecond, the longitudes and latitudes of any two places being given, and conſequently the difference of latitude and longitude between them, the bearing from one to the other is diſcovered by the following analogy:

As the meridional difference of latitude
Is to the difference of longitude;
So is radius
To the tangent bearing.

Bearing is alſo the ſituation of any diſtant object, eſtimated from ſome part of the ſhip according to her poſition. In this ſenſe, an object ſo diſcovered muſt be either a-head, a ſtern, a-breaſt, on the bow, or on the quarter. Theſe bearings, therefore, which may be called *mechanical*, are on the beam, before the beam, abaft the beam, on the bow, on the quarter, a-head, or a-ſtern. If the ſhip ſails with a ſide-wind, it alters the names of ſuch bearings in ſome meaſure, ſince a diſtant object on the beam is then ſaid to be to leeward or to windward; on the lee-quarter or bow, and on the weather-quarter or bow.

Bearing, in the ſea-language. When a ſhip ſails towards the ſhore, before the wind, ſhe is ſaid to *bear in* with the land or harbour: to let the ſhip ſail more before the wind, is to *bear up*. To put her right before the wind, is to *bear round*. A ſhip that keeps off from the land, is ſaid to *bear off*. When a ſhip that was to windward comes under a ſhip's ſtern, and ſo gives her the wind, ſhe is ſaid to *bear under her lee*, &c. There is another ſenſe of this word, in reference to the burden of a ſhip; for they ſay a ſhip *bears*, when, having too ſlender or lean a quarter, ſhe will ſink too deep into the water with an overlight freight, and thereby can carry but a ſmall quantity of goods.

To Bear *ſail well* is ſaid of a ſhip, when ſhe is a ſtiff-guided ſhip, and will not couch down on a ſide with a great deal of ſail. When a ſhip is ſaid to *bear out her ordnance*, it is meant, that her ordnance lie ſo high, and ſhe will go ſo upright, that in reaſonable fighting weather ſhe will be able to keep out her lower tier, and not be forced to ſhut in her ports. A ſhip is ſaid to *overbear another*, when it is able, in a great gale of wind, to carry out more ſails, viz. a top-ſail more, or the like.

Bearing *off* is alſo uſed by ſeamen generally in buſineſs belonging to ſhipping, for *thruſt off*. Thus, in hoiſting any thing into the ſhip, if it has caught hold of any part of the ſhip, or become in any way entangled, they ſay, *bear it off from the ſhip's ſide*. So if they would have the breech or mouth of a piece of ordnance, &c. put from them, they ſay, *bear off* or *bear about* the breech.

Bearing *up*, or *bearing away*, is improperly uſed to denote the act of changing the courſe of a ſhip, in order to make her ſail before the wind, after ſhe had ſailed ſome-time with a ſide-wind, or cloſe-hauled.

Bearing *of a piece of timber*, in the buſineſs of a carpenter, denotes the ſpace either between the two fixed extremes of it, when it has no other ſupport; which is called *learing at length*: or between one extreme, and a poſt, brick, wall, or the like, trimmed up between the ends to ſhorten its bearing. By an act of 19 Car. II. c. 3. joiſts are not to bear above ten feet in length, nor ſingle rafters more than nine feet.

Bearing *of an arch* or *vault*, denotes the effort which the ſtones make to ſeparate by their gravity the piers or piedroits. This amounts to the ſame with what the French call *pouſſée*.

Bearings, in heraldry, a term uſed to expreſs a coat of arms, or the figures of armories, by which the nobility and gentry are diſtinguiſhed from the lower ranks of the people, and from one another. Theſe ſigns of nobility with us are evidently a copy of the ſtatues and images among the ancient Romans, which they uſed to expoſe before their houſes on public days, and carried before the body at the funeral of a great perſon. Theſe ſtatues among them were the reſemblances of their noble anceſtors. And as our coats of arms evidently were brought up in the place of them, it ſeems very natural to date the riſe and origin of heraldry in England, as now practiſed, from the time of the ſubverſion of the Roman empire by the Goths and Vandals; who, as they deſtroyed many liberal arts, ſo they ſeem, in return, to have given birth to the cuſtom of heraldry, for which poſterity, it muſt be confeſſed, are under few obligations.

Theſe warlike nations, having ſubdued the mighty Roman empire, and raiſed their glory by military ſervice, became very fond of the achievements of their anceſtors and great men, and derived their enſigns and titles of honour from what concerned a ſoldier. They firſt, therefore, diſtinguiſhed the whole community into three ranks, which they named, according to the different orders of military men, *miles*, *eques*, and *ſcutifer*; and their poſterity, willing to commemorate their honours, re-

ſerved to themſelves their ſeveral military enſigns; and theſe became what we call *bearings*, or arms, the marks of gentility, or of houſes, ſome one of which had once deſerved an elevation above the common rank of men. While the direct deſcendant of this honourable perſon carried his enſigns of honour for his diſtinction, the collateral branches alſo were ambitious of preſerving the memory of their having belonged to ſuch an honourable houſe; and therefore aſſumed the ſame figure, but with ſome difference, to diſtinguiſh the diſtance from the original claim. In proceſs of time, other families, who had deſerved as well of their prince and country, whether in civil or military affairs, became deſirous of the ſame ſort of diſtinction, by way of perpetual memorial of their ſervices; and upon this occaſion many other devices were formed into arms, and continued down to poſterity in their ſeveral families.

Armorial bearings, in the tenth and eleventh centuries, were ſingle and plain, conſiſting only of few figures. Charges, differences, quarterings, &c. are the inventions of later times.

Bearing *of an organ pipe* denotes an error or variation from the juſt ſound it ought to yield.

Bearing *down of the uterus*, a diſorder incident to pregnant women, being a ſenſation of weight about the pubis, or a preſſure on the neck of the womb, ſufficient to hinder the woman from walking without pain; and ſometimes alſo by the preſſure made on the neck of the bladder, occaſioning difficulty of urine, numbneſs of the hips, uneaſineſs in going to ſtool, and, in the end perhaps, abortion.

Bearing *claws*, among cock-fighters, are the foremoſt toes on which the bird moves: if theſe be hurt or gravelled, he cannot fight.

Bearing *of a Stag* is uſed in reſpect of the ſtate of his head, or the croches which he bears on his horns. If you are aſked what a ſtag bears, you are only to reckon the croches, and never to expreſs an odd number: as, if he have four croches on his near horn and five on his far, you muſt ſay he bears ten; a falſe right on his near horn: if but four on the near horn and ſix on the far horn, you muſt ſay he bears twelve; a double falſe right on the near horn.

BEARN, a late province of France, bounded on the eaſt by Bigorre, on the ſouth by the mountains of Arragon, on the weſt by Soule and part of Navarre, and on the north by Gaſcony and Armagnac. It lies at the foot of the Pyrenæan mountains, being about 16 leagues in length and 12 in breadth, and now forms, with Baſque, the department of the Lower Pyrenees. In general it is but a barren country; yet the plains yield conſiderable quantities of flax, and a good quantity of Indian corn called *mailloc*. The mountains are rich in mines of iron, copper, and lead; ſome of them alſo are covered with vines, and others with pine-trees; and they give riſe to ſeveral mineral ſprings, and two conſiderable rivers, the one called the *Gave of Oleron*, and the other the *Gave of Bearn*. Some wine is exported from this country; and the Spaniards buy up great numbers of the horſes and cattle, together with moſt of their linen, of which there is a conſiderable manufactory. The principal places are Pau, Leſcar, Ortez, Novarreins, Sallies, and Oleron.

BEAST, in a general ſenſe, an appellation given to all four-footed animals, employed by man either for food, labour, or ſport.

Beasts *of Burden*, in a commercial ſenſe, all four-footed animals which ſerve to carry merchandizes on their backs. The beaſts generally uſed for this purpoſe, are elephants, dromedaries, camels, horſes, mules, aſſes, and the ſheep of Mexico and Peru.

Beasts *of the Chaſe* are five, *viz.* the buck, the doe, the fox, the roe, and the martin.

Beasts *and Fowls of the Warren* are the hare, the coney, the pheaſant, and partridge.

Beasts *of the Foreſt* are the hart, hind, hare, boar, and wolf.

Beast, among gameſters, a game at cards, played in this manner: the beſt cards are the king, queen, &c. whereof they make three heaps, the king, the play, and troilet. Three, four, or five, may play; and to every one are dealt five cards. However, before the play begins, every one ſtakes to the three heaps. He that wins moſt tricks, takes up the heap called the *play*; he that has the king, takes up the heap ſo called; and he that has three of any ſort, that is, three fours, three fives, three ſixes, &c. takes up the troilet heap.

BEAT, in a general acceptation, ſignifies to chaſtiſe, ſtrike, knock down, or vanquiſh. But this word has ſeveral other ſignifications in the manufactures, and in the arts and trades. Sometimes it ſignifies to forge and hammer; in which ſenſe ſmiths and farriers ſay, to *beat iron*. Sometimes it means to pound, to reduce into powder: thus we ſay, to *beat drugs*, to *beat pepper*, to *beat ſpices*; that is to ſay, to *pulverize them*.

Beat, in fencing, denotes a blow or ſtroke given with the ſword. There are two kinds of beats; the firſt performed with the foible of a man's ſword on the foible of his adverſary's, which in the ſchools is commonly called *baterie*, from the French *batre*, and is chiefly uſed in a purſuit, to make an open upon the adverſary. The ſecond and beſt kind of beat is performed with the fort of a man's ſword upon the foible of his adverſary's, not with a ſpring, as in binding, but with a jerk or dry beat; and is therefore moſt proper for the parades without or within the ſword, becauſe of the rebound a man's ſword has thereby from his adverſary's, whereby he procures to himſelf the better and ſurer opportunity of riſpoſting.

Beat, in the manege. A horſe is ſaid *to beat the duſt* when at each ſtroke or motion he does not take in ground or way enough with his fore-legs. He is more particularly ſaid to beat the duſt at *terra à terra*, when he does not take in ground enough with his ſhoulders, making his ſtrokes or motions too ſhort, as if he made them all in one place. He *beats the duſt at curvets*, when he does them too precipitately and too low. He *beats upon a walk*, when he walks too ſhort, and thus rids but little ground, whether it be in ſtraight lines, rounds, or paſſings.

Beat *of Drum*, in the military art, is to give notice by beat of drum of a ſudden danger; or, that ſcattered ſoldiers may repair to their arms and quarters. The beat is an alarm, or to arms. Alſo to ſignify, by different manners of ſounding a drum, that the ſoldiers are to fall on the enemy; to retreat before, in, or after, an attack; to move or march from one place to another; to permit the ſoldiers to come out of their quarters at break of day; to order to repair to their colours, &c. is to beat a charge, a retreat, a march, &c.

Beat (St.), a town of France, in the former county of Comminges, at the confluence of the Garonne and the Pique. It is ſeated between two mountains which are cloſe to the town on each ſide. All the houſes are built with marble, becauſe they have no other materials. W. long. 1. 6. N. lat. 42. 50.

BEATER is applied, in matters of commerce, to divers ſorts of workmen, whoſe buſineſs is to hammer or flatten certain matters, particularly metals.

Gold-Beaters are artiſans, who, by beating gold and ſilver with a hammer on a marble in moulds of vellum and bullocks gut, reduce them to thin leaves fit for gilding, or ſilvering of copper, iron, ſteel, wood, &c. Gold-beaters differ from flatters of gold or ſilver; as the former bring their metal into leaves by the hammer; whereas the latter only flatten it by preſſing it through a mill preparatory to beating.

There are alſo *Tin*-Beaters employed in the looking-glaſs

trade, whose business is to beat tin on large blocks of marble till it be reduced to thin leaves fit to be applied with quicksilver behind looking-glasses. See FOLIATING, GOLD-*Beating*, &c.

BEATIFICATION, an act by which the pope declares a person beatified or blessed after his death. It is the first step towards canonization, or raising any one to the honour and dignity of a saint. No person can be beatified till 50 years after his or her death. All certificates or attestations of virtues and miracles, the necessary qualifications for sainthip, are examined by the congregation of rites. This examination often continues for several years; after which his holiness decrees the beatification. The corps and relics of the future saint are from thenceforth exposed to the veneration of all good Christians; his images are crowned with rays, and a particular office is set apart for him; but his body and relics are not carried in procession: indulgences likewise, and remission of sins, are granted on the day of his beatification; which, though not so pompous as that of canonization, is however very splendid.

BEATING, or PULSATION, in medicine, the reciprocal agitation or palpitation of the heart and arteries.

BEATING *Flax* or *Hemp* is an operation in the dressing of these matters, contrived to render them more soft and pliant. When hemp has been swingled a second time, and the hurds laid by, they take the strikes, and, dividing them into dozens and half dozens, make them up into large thick rolls, which being broached on long strikes, are set in the chimney-corner to dry; after which they lay them in a round trough made for the purpose, and there with beetles beat them well till they handle both without and within as pliant as possible, without any hardness or roughness to be felt: that done, they take them from the trough, open and divide the strikes as before; and if any be found not sufficiently beaten, they roll them up and beat them over as before. Beating hemp is a punishment inflicted on loose or disorderly persons in Bridewell and other houses of correction.

BEATING, in book-binding, denotes the knocking a book in quires on a marble block, with a heavy broad-faced hammer, after folding, and before binding or stitching it. On the beating it properly, the compactness of the binding, and the easy opening of the book, principally depend.

BEATING, in the paper-works, signifies the beating of paper on a stone with a heavy hammer, with a large smooth head and short handle, in order to render it more smooth and uniform, and fit for writing.

BEATING *the Wind* was a practice in use in the ancient method of trial by combat. If either of the combatants did not appear in the field at the time appointed, the other was to beat the wind, or make so many flourishes with his weapon; by which he was intitled to all the advantages of a conqueror.

BEATING *the Hands* or *Feet*, by way of praise or approbation. See APPLAUSE.

BEATING *Time*, in music, a method of measuring and marking the time for performers in concert, by a motion of the hand and foot up or down successively and in equal times. Knowing the true time of a crotchet, and supposing the measure actually subdivided into four crotchets, and the half measure into two, the hand or foot being up, if we put it down with the very beginning of the first note or crotchet, and then raise it with the third, and then down with the beginning of the next measure; this is called *beating the time*; and, by practice, a habit is acquired of making this motion very equal. Each down and up is sometimes called a *time* or *measure*. The general rule is, to contrive the division of the measure so, that every down and up of the beating shall end with a particular note, on which very much depends the distinctness, and, as it were, the sense of the melody. Hence the beginning of every time or beating in the measure is reckoned the accented part of it.

Beating time is denoted, in the Italian music, by the term *á battuta*, which is usually put after what they call *recitativo*, where little or no time is observed, to denote that here they are to begin again to mark or beat the time exactly. The Romans aimed at somewhat of harmony in the strokes of their oars; and had an officer called *portisculus* in each galley, whose business was to beat time to the rowers, sometimes by a pole or mallet, and sometimes only by his voice.

The ancients marked the rhyme in their musical compositions; but to make it more observable in the practice, they beat the measure or time, and this in different manners. The most usual consisted in a motion of the foot, which was raised from, and struck alternately against the ground, according to the modern method. Doing this was commonly the province of the master of the music, who was thence called μεσογοιος, and χειφαι, because placed in the middle of the choir of musicians, and in an elevated situation, to be seen and heard more easily by the whole company. These beaters of measure were also called by the Greeks ποδοκτυποι and ποδοψιφοι, because of the noise of their feet; and σκιδιαφοι, because of the uniformity or monotony of the rhyme. The Latins denominated them *pedarii*, *podarii*, and *pedicularii*. To make the beats or strokes more audible, their feet were generally shod with a sort of sandals either of wood or iron, called by the Greeks κρουπεζεα, κρουπαλα, κρυπεδα, and by the Latins *pedicula*, *scabella*, or *scabilla*, because like to little stools or foot-stools. Sometimes they beat upon sonorous foot-stools, with the foot shod with a wooden or iron sole. They beat the measure not only with the foot, but also with the right hand, all the fingers whereof they joined together, to strike into the hollow of the left. He who thus marked the rhythm, was called *manuductor*. The ancients also beat time or measure with shells, as oyster-shells and bones of animals, which they struck against one another, much as the moderns now use castanets, and the like instruments. This the Greeks called κρημβαλιζειν, as is noted by Hesychius. The scholiast on Aristophanes speaks much to the same purpose. Other noisy instruments, as drums, cymbals, citterns, &c. were also used on the same occasion. They beat the measure generally in two equal or unequal times; at least, this holds of the usual rhythm of a piece of music, marked either by the noise of sandals, or the clapping of the hands. But the other rhythmic instruments last-mentioned, and which were used principally to excite and animate the dancers, marked the cadence after another manner; that is, the number of their percussions equalled, or even sometimes surpassed that of the different sounds which composed the air or song played.

BEATING, with hunters, a term used of a stag, which runs first one way and then another. He is then said *to beat up and down*.—The noise made by conies in rutting time is also called *beating* or *tapping*.

BEATING, in navigation, the operation of making a progress at sea against the direction of the wind, in a zig-zag line, or traverse, like that in which we ascend a steep hill. See TACKING.

BEATITUDE imports the supreme good, or the highest degree of happiness human nature is susceptible of; or the most perfect state of a rational being, wherein the soul has attained to the utmost excellency and dignity it is framed for. In which sense it amounts to the same with what we otherwise call *blessedness* and *sovereign felicity*; by the Greeks, μακαριοτης; and by the Latins, *summum bonum*, *beatitudo*, and *beatitas*.

BEATITUDE, among divines, denotes the beatific vision, or the fruition of God in a future life to all eternity.

BEATITUDE is also used in speaking of the three con-

tained in Chriſt's ſermon on the mount, whereby he pronounces bleſſed the poor in ſpirit, thoſe that mourn, the meek, &c.

BEATON (David), archbiſhop of St. Andrew's, and a cardinal of Rome, in the early part of the 16th century, was born in 1494. Pope Paul III. raiſed him to the degree of a cardinal in December 1538; and being employed by James V. in negotiating his marriages with the Court of France, he was there conſecrated biſhop of Mirepoix. Soon after his inſtalment as archbiſhop of St. Andrew's, he promoted a furious perſecution of the reformers in Scotland; when the king's death put a ſtop, for a time, to his arbitrary proceedings, he being then excluded from affairs of government, and confined. He raiſed however ſo ſtrong a party, that, upon the coronation of the young queen Mary, he was admitted of the council, made chancellor, and procured a commiſſion as legate *à latere* from the court of Rome. He now began to renew his perſecution of heretics; and among the reſt, of the famous Proteſtant preacher Mr. George Wiſhart, whoſe ſufferings at the ſtake the cardinal viewed from his window with apparent exultation. It is pretended, that Wiſhart at his death foretold the murder of Beaton; which indeed happened ſhortly after, he being aſſaſſinated in his chamber, May 29th, 1547. He was a haughty bigoted churchman, and thought ſeverity the proper method of ſuppreſſing hereſy: he had great talents, and vices that were no leſs conſpicuous.

BEATS, in a watch or clock, are the ſtrokes made by the fangs or pallets of the ſpindle of the balance, or of the pads in a royal pendulum. To find the beats of the balance in any watch, or in one turn of any wheel:—Having found the number of turns, which the crown-wheel makes in one turn of the wheel you ſeek for (by the direction given under the word TURN), thoſe turns of the crown-wheel, multiplied by its notches, give half the number of beats in that one turn of the wheel: for the balance or ſwing has two ſtrokes to every tooth of the crown-wheel: inaſmuch as each of the two pallets has its blow againſt each tooth of the crown-wheel: whence it is, that a pendulum which beats ſeconds, has in its crown-wheel only 30 teeth. To explain this, ſuppoſe the numbers of a ſixteen hour watch, wherein the pinion of report is 4, the dial-wheel 32, the great wheel 55, the pinion of the ſecond wheel 5, &c. The number of the notches in the crown-wheel 17, being multiplied into 6336 (the product ariſing from the continual multiplication of the quotients 8, 11, 9, 8) gives 107712, for half the number of beats in one turn of the dial-wheel; for 8 times 17 is 136, which is half the number of beats in one turn of the contrate-wheel 40; and 9 times 136 is 1224, the half-beats in one turn of the ſecond wheel; and 11 times 1224 is 13464, the half-beats in one turn of the great wheel 55; and 8 times 13464, makes 107712. If you multiply this by the two pallets, i. e. double it, it gives 215424, which is the number of beats in one turn of the dial-wheel, or 12 hours.

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4)32( 8
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5)55(11
5)45( 9
5)40( 8
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  17
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To know how many beats this watch has an hour, divide the beats in 12 hours into 12 parts, and it gives 17952, which is called the train of the watch, or the beats in an hour. If this be divided into 60 parts, it gives 299, and a little more, for the beats in a minute; and ſo you may proceed to ſeconds or thirds.

By the beats and turns of the fuſee, the hours that any watch will go may be found thus:—As the beats of the balance in one hour, are to the beats in one turn of the fuſee; ſo is the number of the turns of the fuſee 1, to the continuance of the watch's going. Thus, 20196 : 26928 :: 12 : 16. To find the beats of the balance in one turn of the fuſee, ſay, as the number of turns of the fuſee, to the continuance of the watch's going in hours: ſo are the beats in one hour, to the beats of one turn of the fuſee; i. e. 12 : 16 :: 20196 : 26928. To find the beats of the balance in an hour, ſay, as the hours of the watch's going, to the number of turns of the fuſee; ſo are the beats in one turn of the fuſee, to the beats of an hour. Thus, 16 : 12 :: 26928 : 20196. Derham's Artificial Clock Maker, p. 14, &c. and 22.

BEAUCAIRE, a town of France, in the department of Gard and late province of Languedoc, on the Rhone, oppoſite Taraſcon, with which it had a communication by a bridge of boats. The fair of the Magdalen, which is held July 22, partly in the town, and partly under tents in an adjacent valley, is, perhaps, one of the moſt famous in Europe. It is 10 miles E. of Niſmes. Long. 4. 39. E. Lat. 43. 50. N.

BEAUCE, a late province of France, between the Iſle of France, Blaſois, and Orleanois. It is ſo fertile in wheat, that it is called the granary of Paris. It now forms the department of Eure and Loire.

BEAVER (*Caſtor*), in zoology, a genus of quadrupeds belonging to the order of glires. The fore-teeth of the upper jaw are truncated, and hollowed in a tranſverſe angular direction. The tops of the fore-teeth of the lower jaw lie in a tranſverſe direction; and the tail is depreſſed. There are three ſpecies of caſtor, viz.

1. The *fiber*, or common beaver, with a plain ovated tail, is found on the banks of the rivers in Europe, Aſia, and America. It has ſhort ears hid in the fur; a blunt noſe; the fore-feet ſmall, the hinder large; its length from noſe to tail about three feet, tail about one foot. It is from the inguinal glands of this animal that the caſtor is obtained; it is contained in cods or pouches reſembling a dog's teſticles. Nothing equals the art with which theſe animals conſtruct their dwellings. They chooſe a level piece of ground, with a ſmall rivulet running through it. This they form into a pond, by making a dam acroſs; firſt by driving into the ground ſtakes of five or ſix feet in length, placed in rows, wattling each row with pliant twigs, and filling the interſtices with clay, ramming it down cloſe. The ſide next the water is ſloped, the other perpendicular; the bottom is from ten to twelve feet thick; but the thickneſs gradually diminiſhes to the top, which is about two or three; the length of theſe dams is ſometimes not leſs than 100 feet.

Their houſes are made in the water collected by means of the dam, and are placed near the edge of the ſhore. They are built on piles; are either round or oval; but their tops are vaulted, ſo that their inſide reſembles an oven, the top a dome. The walls are two feet thick, made of earth, ſtones, and ſticks, moſt artificially laid together; and the walls within as neatly plaſtered as if with a trowel. In each houſe are two openings, the one into the water, the other towards the land. The height of theſe houſes above the water is eight feet. They often make two or three ſtories in each dwelling, for the convenience of change in caſe of floods. Each houſe contains from 20 to 30 beavers; and the number of houſes in each pond is from 10 to 25. Each beaver forms its bed of moſs; and each family forms its magazine of winter proviſions, which conſiſt of bark and boughs of trees. Thoſe they lodge under water, and fetch into their apartments as occaſion requires. Lawſon ſays, they are fondeſt of the ſaſſafras, aſh, and ſweet gum. Their ſummer food is leaves, fruits, and ſometimes crabs and craw-fiſh; but they are not fond of fiſh.

To effect theſe works, a community of two or three hundred aſſembles; each bears his ſhare in the labour; ſome fall to gnawing with their teeth trees of great ſize, to form beams or piles; others roll the pieces along to the water; others dive,

and with their feet ſcrape holes in order to place them in; while others exert their efforts to rear them in their proper places: another party is employed in collecting twigs to wattle the piles with; a third in collecting earth, ſtones, and clay; a fourth is buſied in beating and tempering the mortar; others in carrying it on their broad tails to proper places, and with the ſame inſtrument ramming it between the piles, or plaſtering the inſide of their houſes. A certain number of ſmart ſtrokes given with their tails is a ſignal made by the overſeer for repairing to ſuch and ſuch places, either for mending any defects, or at the approach of an enemy; and the whole ſociety attend to it with the utmoſt aſſiduity. Their time of building is early in ſummer; for in winter they never ſtir but to their magazines of proviſions, and during that ſeaſon are very fat. They breed once a year, and bring forth at the latter end of the winter two or three young at a birth. See Plate 51.

Beſides theſe aſſociated beavers, there is another ſort, called *terriers*, which either want induſtry or ſagacity to form houſes like the others. They burrow in the banks of rivers, making their holes beneath the freezing depth of the water, and work up for a great number of feet. Theſe alſo form their winter ſtock of proviſion.

Beavers vary in their colours; the fineſt are black, but the general colour is a cheſnut brown, more or leſs dark: ſome have been found, but very rarely, white. The ſkins are a prodigious article of trade, being the foundation of the hat manufactory. In 1763 were ſold, in a ſingle ſale of the Hudſon's-Bay Company, 54,670 ſkins. They are diſtinguiſhed by theſe names: *Coat-beaver*, which is what has been worn as coverlets by the Indians: *Parchment-beaver*, becauſe the lower ſide reſembles it: *Stage-beaver*, which is the worſt, and is that which the Indians kill out of ſeaſon, on their ſtages or journeys.

In hunting the beavers, the ſavages ſometimes ſhoot them, always getting on the contrary ſide of the wind; for they are very ſhy, quick in hearing, and of a keen ſcent. This is generally done when the beavers are at work, or on ſhore feeding on poplar bark. If they hear any noiſe when at work, they immediately jump into the water, and continue there ſome time; and when they riſe, it is at a diſtance from the place where they went in.

They ſometimes are taken with traps made of nothing but poplar ſticks laid in a path near the water; which when the beaver begins to feed upon, they cauſe a large log of wood to fall upon their necks, which is put in motion by their moving of the ſticks, and either kills them or prevents their eſcape. The ſavages generally prefer this way of taking them, becauſe it does not damage their ſkins; but another method is this: In the winter time they break the ice in two places at a diſtance from the houſe, the one behind the other. Then they take away the broken ice with a kind of racket, the better to ſee where to place their ſtakes. They faſten their nets to theſe, which have large meſhes, and ſometimes are eighteen or twenty yards in length. When theſe are fixed, they proceed to demoliſh the houſe, and turn a dog into it; which terrifying the beaver, he immediately leaves it, and takes to the water; after which, he is ſoon entangled in the net.

2. The *moſchatus*, with a long compreſſed lanceolated tail, and palmated feet. It has a long ſlender noſe like that of a ſhrew mouſe; no external ears, and very ſmall eyes. Length from noſe to tail, ſeven inches; of the tail, eight. It is the water-rat of Cluſius; and inhabits Lapland, Ruſſia, the banks of the rivers Wolga and the Yaick. It never wanders far from the ſides; is very ſlow in its pace; makes holes in the cliffs, with the entrance far beneath the loweſt fall of the water; works upwards, but never to the ſurface, only high enough to be beyond the higheſt flow of the river; feeds on fiſh; is devoured by the pikes and *ſiluri*, and gives thoſe fiſh ſo ſtrong a flavour of muſk as to render them not eatable; has the ſame ſcent as the former, eſpecially about the tail, out of which is expreſſed a ſort of muſk very much reſembling the genuine kind. The ſkins are put into cheſts among clothes to drive away moths. At Orenburgh the ſkins and tails ſell for 15 or 20 copces *per* hundred. They are ſo common near Nizney Novogorod, that the peaſants bring 500 a-piece to market, where they are ſold for one ruble *per* hundred. The German name for theſe animals is *bieſemratze*: the Ruſſian *wy-hozhol*.

3. The *zibethicus*, or muſk-rat, with a long, compreſſed, lanceolated tail, and the toes of the feet ſeparated from each other. Length from noſe to tail, one foot; of the tail, nine inches. This ſpecies inhabits North America, breeds three or four times in a year, and brings from three to ſix young ones at a time: during ſummer the male and female conſort together: at the approach of winter they unite in families, and retire into ſmall round edifices covered with a dome, formed of herbs and reeds cemented with clay; at the bottom are ſeveral pipes, through which they paſs in ſearch of food; for they do not form magazines like the beavers. During winter their habitations are covered many feet deep with ſnow and ice; but they creep out and feed on the roots beneath: they quit their old habitations annually, and form new ones: the fur is ſoft and much eſteemed; the whole animal, during ſummer, has a moſt exquiſite ſmell of muſk, which it loſes in winter: perhaps the ſcent is derived from the calamus aromaticus, a favourite food of this animal. Leſcarbot ſays they are very good to eat.

Beaver-*Skins*, in commerce. Of theſe, merchants diſtinguiſh three ſorts. 1. The *new* beaver, which is alſo called the *white beaver*, or *Muſcovy beaver*, becauſe it is commonly kept to be ſent into Muſcovy, is that which the ſavages catch in their winter hunting. It is the beſt, and the moſt proper for making fine furs, becauſe it has loſt none of its hair by ſhedding. 2. The *dry* beaver, which is ſometimes called *lean beaver*, comes from the ſummer hunting, which is the time when theſe animals loſe part of their hair. Though this ſort of beaver be much inferior to the former, yet it may alſo be employed in furs; but it is chiefly uſed in the manufacture of hats. The French call it *ſummer caſtor*, or *beaver*. 3. The *fat* beaver is that which has contracted a certain oilineſs from the ſweat which exhales from the bodies of the ſavages, who wear it for ſome time. Though this ſort be better than the dry beaver, yet it is uſed only in the hat manufactories.

Beſides hats and furs, in which the beaver's hair is commonly uſed, they attempted in France, in the year 1699, to make cloths, flannels, ſtockings, &c. partly of beaver's hair, and partly of Segovia wool. This manfactory, which was ſet up at Paris, in St. Anthony's ſuburbs, ſucceeded at firſt pretty well; and according to the genius of the French, the novelty of the thing brought into ſome repute the ſtuffs, ſtockings, gloves, and cloth, made of beavers hair. But they went out of faſhion on a ſudden, becauſe it was found, by experience, that they were of a very bad wear, and beſides that the colours faded very much: when they had been wet, they became dry and hard, like felt, which occaſioned the miſcarriage of the manufactory for that time.—When the hair has been cut off from the beavers ſkins, to be uſed in the manufacturing of hats, thoſe ſkins are ſtill employed by ſeveral workmen; namely, by the trunkmakers, to cover trunks and boxes; by the ſhoemakers, to put into ſlippers; and by turners, to make ſieves for ſifting grain and ſeeds.

BEAUFORT, a town of France, in the department of Maine and Loire, and late province of Anjou, with a caſtle, near the river Authion. It contains two pariſhes, and formerly had a convent of Recolets. W. long. 0. 3. N. lat. 47. 26.

Beaufort gives title of Duke in England to the noble family of Somerſet, who are lineally deſcended from John of Gaunt, duke of Lancaſter, whoſe ducheſs reſided in this town.

Beaufort, a ſtrong town of Savoy in Italy, on the river Oron, E. long. 6. 48. N. lat. 45. 40.

BEAUJEU, a town of France in the department of Rhone and Loire, and late province of Lyonois. It is ſeated on the river Ardieres, at the foot of a mountain, in E. long. 4. 40. N. lat. 46. 9.

BEAULIEU (Sebaſtian de Pontault de), a celebrated French engineer, and field marſhal under Louis XIV. He publiſhed plans of all the military expeditions of his maſter, with military lectures annexed. He died in 1674.

BEAUMARIS, a market-town of Angleſey in North Wales, which ſends one member to parliament. W. long. 4. 15. N. lat. 53. 25. It is, as the name implies, pleaſantly ſeated on a low land at the water's edge; is neat and well built, and one ſtreet is very handſome. Edward I. created the place; for after founding the caſtles of Caernarvon and Conway, he diſcovered that it was neceſſary to put another curb on the Welch. He therefore built a fortreſs here in 1295; and fixed on a marſhy ſpot, near the chapel of St. Meugan, ſuch as gave him opportunity of forming a great foſs round the caſtle, and of filling it with water from the ſea. He alſo cut a canal, in order to permit veſſels to diſcharge their lading beneath the walls: and as a proof of the exiſtence of ſuch a convenience, there were within this century iron rings affixed to them, for the purpoſe of mooring the ſhips or boats. The marſh was in early times of far greater extent than at preſent, and covered with fine bulruſhes. The firſt governor was Sir William Pickmore, a Gaſcon knight appointed by Edward I. There was a conſtable of the caſtle, and a captain of the town. The firſt had an annual fee of forty pounds, the laſt of twelve pounds three ſhillings and four pence; and the porter of the gate of Beaumaris had nine pounds two ſhillings and ſixpence. Twenty-four ſoldiers were allowed for the guard of the caſtle and town, at fourpence a-day to each. The conſtable of the caſtle was always captain of the town, except in one inſtance: in the 36th of Henry VI. Sir John Boteler held the firſt office, and Thomas Norrays the other. The caſtle was extremely burthenſome to the country: quarrels were frequent between the garriſon and the country people. In the time of Henry VI. a bloody fray happened, in which David ap Evan ap Howel of Llwydiarth, and many others, were ſlain. From the time of Sir Rowland Villeville, *alias* Brittayne, reputed baſe ſon of Henry VII. and conſtable of the caſtle, the garriſon was withdrawn till the year 1642, when Thomas Cheadle, deputy to the earl of Dorſet, then conſtable, put into it men and ammunition. In 1643, Thomas Bulkeley, Eſq. ſoon after created Lord Bulkeley, ſucceeded: his ſon Colonel Richard Bulkeley, and ſeveral gentlemen of the country, held it for the king till June 1646, when it ſurrendered on honourable terms to general Mytton, who made captain Evans his deputy governor. In 1653, the annual expence of the garriſon was ſeventeen hundred and three pounds. Edward I. when he built the town, ſurrounded it with walls, made it a corporation, and endowed it with great privileges, and lands to a conſiderable value. He removed the ancient freeholders, by exchange of property, into other countries. Henllys, near the town, was the ſeat of Gwerydd ap Rys Goch, one of the fifteen tribes, and of his poſterity till this period, when Edward removed them to Boddle Wyddan in Flintſhire, and beſtowed their ancient patrimony on the corporation. It ſends one member to parliament. Its firſt repreſentative was Maurice Gryffydd, who ſat in the ſeventh year of Edward VI. There is very good anchorage for ſhips in the bay which lies before the town; and has ſeven fathom water even at the loweſt ebb. Veſſels often find ſecurity here in hard gales. The town has no trade of any kind, yet has its cuſtom-houſe for the caſual reception of goods. The ferry lies near the town, and is paſſable at low water. It was granted by charter to the corporation in the 4th of Queen Elizabeth. There is an order from Edward II. to Robert Power, chamberlain of North Wales, to inſpect into the ſtate of the boat, which was then out of repair; and, in caſe it was feaſible, to cauſe it to be made fit for uſe, at the expence of the bailiwick: but if the boat proved paſt repair, a new one was to be built, and the expence allowed by the king. It appears, that the people of Beaumaris paid annually for the privilege of a ferry thirty ſhillings into the exchequer; but by this order it ſeems that the king was to find the boat. After paſſing the channel, the diſtance over the ſands to Aber in Caernarvonſhire, the point the paſſenger generally makes for, is four miles. The ſands are called *Traeth Telavan*, and *Wylofaen*, or the *place of weeping*, from the ſhrieks and lamentations of the inhabitants when it was overwhelmed by the ſea, in the days of Aelig ap Clunog. The church is dependent on Llandegvan, which is in the gift of lord Bulkeley. The former is called the *chapel of the bleſſed virgin;* yet in ancient writings one aile is called *St. Mary's chapel*, and another that of *St. Nicholas*.

BEAUMONT (Sir John), the elder brother of Mr. Francis Beaumont the famous dramatic poet, was born in the year 1582, and in 1626 had the dignity of a baronet conferred upon him by king Charles I. In his youth he applied himſelf to the Muſes with great ſucceſs; and wrote The Crown of Thorns, a poem, in eight books: a miſcellany, intitled, *Boſworth Field:* Tranſlations from the Latin Poets: and ſeveral poems on religious and political ſubjects; as, On the Feſtivals; On the Bleſſed Trinity; A Dialogue between the World, a Pilgrim, and Virtue; Of the miſerable State of Man; Of Sickneſs, &c. He died in 1628. His poetic genius was celebrated by Ben Jonſon, Michael Drayton, and others.

Beaumont *and* Fletcher, two celebrated Engliſh dramatic writers, who flouriſhed in the reign of James I. and ſo cloſely connected, both as authors and as friends, that it has been judged not improper to give them under one article.

Mr. Francis Beaumont was deſcended from an ancient family of his name at Grace-dieu in Leiceſterſhire, where he was born about the year 1585 or 1586, in the reign of Queen Elizabeth. His grandfather John Beaumont was maſter of the rolls, and his father Francis Beaumont one of the judges of the common-pleas. He was educated at Cambridge, and afterwards admitted of the Inner Temple. It is not, however, apparent that he made any great proficiency in the law, that being a ſtudy probably too dry and unentertaining to be attended to by a man of his fertile and ſprightly genius: and indeed we ſhould ſcarcely be ſurpriſed to find that he had given no application to any other ſtudy but poetry, nor attended to any court but that of the Muſes. But, on the contrary, our admiration might fix itſelf in the oppoſite extreme, and fill us with aſtoniſhment at the unuſual aſſiduity of his genius and rapidity of his pen, when we look back on the voluminouſneſs of his works, and then inquire into the time allowed him for them—works that might well have taken up a long life to have executed. For although, out of 53 plays which are collected together as the labours of theſe united authors, Mr. Beaumont was concerned in much the greateſt part of them, yet he did not live to complete his 30th year: the king of terrors ſummoning him away in the beginning of March 1615, on the 9th day of which he was interred in the entrance of St. Benedict's chapel in Weſtminſter-abbey.

There is no inſcription on his tomb: But there are two epiaphs to his memory; one by his elder brother Sir John Beaumont:

On death, thy murderer, this revenge I take;
I ſlight his terrors, and juſt queſtion make,
Which of us two the beſt precedence have,
Mine to this wretched world, thine to the grave?
Thou ſhouldſt have followed me; but death, to blame,
Miſcounted years, and meaſur'd age by fame.
So dearly haſt thou bought thy precious lines;
Their praiſe grew ſwiftly, ſo thy life declines.
Thy muſe, the hearer's queen, the reader's love,
All ears, all hearts (but death's), could pleaſe and move.
Boſworth Field, p. 164.

The other is the following by Bp. Corbet. (*Poems*, p. 68.)

He that hath ſuch acuteneſs and ſuch wit,
As would aſk ten good heads to huſband it:
He that can write ſo well, that no man dare
Reſume it for the beſt; let him beware:
Beaumont is dead; by whoſe ſole death appears,
Wit's a diſeaſe conſumes men in few years.

He left a daughter, Frances Beaumont, who died in Leiceſterſhire ſince the year 1700. She had in her poſſeſſion ſeveral poems of her father's writing; but they were loſt at ſea in her voyage from Ireland, where ſhe had lived for ſome time in the duke of Ormond's family.

Mr. John Fletcher was not more meanly deſcended than his poetical colleague; his father, the reverend Dr. Fletcher, having been firſt made biſhop of Briſtol by queen Elizabeth, and afterwards by the ſame monarch, in the year 1593, tranſlated to the rich and honourable ſee of London. Our poet was born in 1576: and was, as well as his friend, educated at Cambridge, where he made a great proficiency in his ſtudies, and was accounted a very good ſcholar. His natural vivacity and wit, for which he was remarkable, ſoon rendered him a devotee to the muſes; and his cloſe attention to their ſervice, together with his fortunate connection with a genius equal to his own, ſoon raiſed him to one of the higheſt places in the temple of poetical fame. As he was born near ten years before Mr. Beaumont, ſo did he alſo ſurvive him by an equal number of years; the dreadful calamity of a plague, which happened in the year 1625, involving him, at the age of 49, in the general deſtruction.

During the joint lives of theſe two great poets, it appears that they wrote nothing ſeparately, except each one little piece, which ſeemed of too trivial a nature for either to require aſſiſtance in, *viz.* The faithful Shepherd, a paſtoral, by Fletcher; and the Maſque of Gray's-Inn Gentlemen, by Beaumont. Yet what ſhare each had in the writing or deſigning of the pieces thus compoſed by them jointly, there is no poſſibility of determining. It is however generally allowed, that Fletcher's peculiar talent was *wit*, and Beaumont's, though much the younger man, *judgment*. Nay, ſo extraordinary was the latter property in Mr. Beaumont, that it is recorded of the great Ben Jonſon, who ſeems moreover to have had a ſufficient degree of ſelf-opinion of his own abilities, that he conſtantly, ſo long as this gentleman lived, ſubmitted his own writings to his cenſure, and, as it is thought, availed himſelf of his judgment at leaſt in the correcting, if not even in the contriving all his plots. It is probable, therefore, that the forming the plots and contriving the conduct of the fable, the writing of the more ſerious and pathetic parts, and lopping the redundant branches of Fletcher's wit, whoſe luxuriance, we are told, frequently ſtood in need of caſtigation, might be in general Beaumont's portion in the work; while Fletcher, whoſe converſation with the *beau monde* (which indeed both of them from their birth and ſtation in life had been ever accuſtomed to), added to the volatile and lively turn he poſſeſſed, rendered him perfectly maſter of dialogue and polite language, might execute the deſigns formed by the other, and raiſe the ſuperſtructure of thoſe lively and ſpirited ſcenes which Beaumont had only laid the foundation of; and in this he was ſo ſucceſsful, that though his wit and raillery were extremely keen and poignant, yet they were at the ſame time ſo perfectly genteel, that they uſed rather to pleaſe than diſguſt the very perſons on whom they ſeemed to reflect. Yet that Fletcher was not entirely excluded from a ſhare in the conduct of the drama, may be gathered from a ſtory related by Winſtanley, *viz.* that our two bards having concerted the rough draught of a tragedy over a bottle of wine at a tavern, Fletcher ſaid, he would undertake to *kill the king*; which words being overheard by the waiter, who had not happened to have been witneſs to the context of their converſation, he lodged an information of treaſon againſt them. But on their explanation of it only to mean the deſtruction of a theatrical monarch, their loyalty moreover being unqueſtioned, the affair ended in a laugh.

It cannot be doubted on the whole, that the works of theſe authors have very great merit, and ſome of their pieces deſervedly ſtand as ornaments of our theatres. The plots are ingenious, intereſting, and well managed; the characters ſtrongly marked; and the dialogue ſprightly and natural: yet there is in the latter a coarſeneſs which is not ſuitable to the politeneſs of the preſent age; and a fondneſs of repartee, which frequently runs into obſcenity; and which we may ſuppoſe was the vice of that time, ſince even the delicate Shakeſpeare himſelf is not entirely free from it. But as theſe authors have more of that kind of wit than the laſt-mentioned writer, it is not to be wondered if their works were, in the licentious reign of Charles II. preferred to his. Now, however, to the honour of the preſent age be it ſpoken, the tables are entirely turned; and while Shakeſpeare's immortal works are our conſtant and daily fare, thoſe of Beaumont and Fletcher, though delicate in their kind, are only occaſionally ſerved up; and even then great pains are taken to clear them of that *double entendre* and obſcenity, which, according to the *haut gout* of thoſe times, was conſidered as their ſupremeſt reliſh, but which the more undepraved taſte of ours has been juſtly taught to look on in its true light.

Some of their plays were printed in quarto during the lives of the authors; and in the year 1645 there was publiſhed in folio a collection of ſuch plays as had not been printed before, amounting to between 30 and 40. This collection was publiſhed by Mr. Shirley, after the ſhutting up of the theatres; and dedicated to the Earl of Pembroke by ten of the moſt famous actors. In 1679 there was an edition of all their plays publiſhed in folio; another edition in 1711 by Mr. Tonſon in ſeven volumes 8vo, and the laſt in 1751.

Beaumont, a town of France in the department of the North and late French Hainault, on the confines of the territory of Liege. It was taken in 1691 by the Engliſh, who blew up the caſtle. It is ſituated between the rivers Maeſe and Sambre, ten miles Eaſt of Maubeuge. E. long. 4. 1. N. lat. 50. 12.

Beaumont *le Roger*, a town of France, in the department of Lower Seine and late province of Normandy; 22 miles South Weſt of Rouen. E. long. 0. 56. N. lat. 49. 2.

Beaumont *le Vicompte*, a town of France, in the department of Sarte and late province of Maine. E. long. 0. 10. N. lat. 48. 12.

Beaumont *ſur Oiſe*, a town of France, in the department

of Seine and Oiſe and late province of the iſle of France, ſeated on the declivity of a hill, with a bridge over the river Oiſe; 20 miles North of Paris. E. long. 2. 29. N. lat. 49. 9.

BEAUNE, a handſome town of France, in the department of Côte d'Or and late province of Burgundy, remarkable for its excellent wine, and for an hoſpital founded here in 1443. Its collegiate church was reckoned one of the fineſt in France; and the great altar was adorned with a table enriched with jewels, which have ſhared the fate of other rich decorations of the churches ſince the new order of things was eſtabliſhed in France. The organs belonging to this church were very magnificent, and were placed on a piece of architecture of very curious workmanſhip. E. long. 4. 50. N. lat. 47. 2.

BEAUSOBRE (Iſaac de), a very learned Proteſtant writer, of French original, was born at Niort in 1659. He was forced into Holland to avoid the execution of a ſentence upon him, which condemned him to make the *amende honorable:* and this for having broken the royal ſignet, which was put upon the door of a church of the Reformed, to prevent the public profeſſion of their religion. He went to Berlin in 1694; was made chaplain to the king of Pruſſia, and counſellor of the royal conſiſtory. He died in 1738, aged 79, after having publiſhed ſeveral works: as, 1. *Defenſe de la Doctrine des Reformes.* 2. A Tranſlation of the New Teſtament, and Notes, jointly with M. Lenfant; much eſteemed by the Reformed. 3. *Diſſertation ſur les Adamites de Boheme;* a curious work. 4. *Hiſtoire Critique de Manichée et du Manicheiſme*, 2 tom. in 4to. This has been deemed by philoſophers an intereſting ſubject, and nobody has developed it better than this author. 5. Several diſſertations in the *Bibliotheque Britanniqae.*—Mr. Beauſobre united ſtrong ſenſe with profound erudition, and was one of the beſt writers among the Reformed.

BEAUTY is a term whereby we expreſs a certain relation of ſome object, either to an agreeable ſenſation, or to an idea of approbation. When, therefore, we ſay a thing is beautiful, we either mean that we perceive ſomething that we approve, or ſomething that gives us pleaſure: whence it appears, that the idea annexed to the word beauty is double; which renders the word equivocal, and this is the ſource of moſt of the diſputes on the ſubject of beauty.

We muſt therefore diſtinguiſh between *ideas* and *ſenſations*. Ideas occupy the mind, ſenſations intereſt the heart. Though we ſee nothing in an object to intereſt us, we may yet diſcover ſomething in its idea to merit our approbation. Such an object therefore pleaſes, and does not pleaſe, i. e. it pleaſes the underſtanding, and not the ſenſe. On the contrary, there are ſome objects, whoſe ideas do not offer any thing laudable, which yet excite agreeable ſenſations. There is therefore beauty of two ſorts. It is exceeding hard to fix any general characteriſtic of beauty: for, as the ideas and ſenſations of different perſons differ according to the habitudes of the body, and the turn of the mind; ſo do the relations of objects to thoſe ideas and ſenſations vary, whence what we call beauty reſults. Hence ariſe thoſe different opinions of a beautiful thought, a beautiful woman, a beautiful painting, &c. The principles of beauty, according to Mr. Hogarth, are fitneſs, variety, uniformity, ſimplicity, intricacy, and quantity. Dr. Hutcheſon makes uniformity amidſt variety the ſource of beauty; and he refers our ideas of it merely to an implanted ſenſe.

M. Perrault diſtinguiſhes two kinds of beauty in architecture, which correſpond with the two ſpecies of beauty above; the one, he calls *poſitive* and *convincing*, ſuch as the richneſs of the materials, grandeur of the ſtructure, neatneſs of the workmanſhip, ſymmetry, &c. The others he calls *arbitrary*, which depend on the will, and which would admit of having their proportion changed without deformity. Theſe only pleaſe by the connection or aſſociation of their ideas with others of a different kind which pleaſe themſelves; they owe their beauty to that prepoſſeſſion of the mind whereby a thing, whoſe value we do know, inſinuates an eſteem for others which we do not. Thus, he obſerves, there are many things in architecture, which reaſon and good ſenſe would judge deformed, and which, however, cuſtom has not only made tolerable, but even beautiful, by their being always joined with other beauties that are poſitive. Thus, being at firſt pleaſed with viewing them in company, and merely on account of their company, at length we become pleaſed with them alone; and thus we frequently grow fond of faults, and fall in love even with *deformity*.

Objects of ſight are more complex than thoſe of any other ſenſe: in the ſimpleſt we perceive colour, figure, length, breadth, thickneſs. A tree is compoſed of a trunk, branches, and leaves; it has colour, figure, ſize, and ſometimes motion: by means of each of theſe particulars, ſeparately conſidered, it appears beautiful; but a complex perception of the whole greatly augments the beauty of the object. The human body is a compoſition of numberleſs beauties ariſing from the parts and qualities of the object, various colours, various motions, figures, ſize, &c. all united in one complex object, and ſtriking the eye with combined force. Hence it is, that beauty, a quality ſo remarkable in viſible objects, lends its name to every thing that is eminently agreeable. Thus, by a figure of ſpeech, we ſay, a *beautiful ſound*, a *beautiful thought*, a *beautiful diſcovery*, &c.

If we conſider attentively the beauty of viſible objects, we diſcover two kinds. The firſt may be termed *intrinſic* beauty, becauſe it is diſcovered in a ſingle object, without relation to any other: the other may be termed *relative*, being founded on the relation of objects. Intrinſic beauty is a perception of ſenſe merely; for to perceive the beauty of a ſpreading oak, or of a flowing river, no more is required but ſingly an act of viſion. Relative beauty is accompanied with an act of underſtanding and reflection: for we perceive not the relative beauty of a fine inſtrument or engine until we learn its uſe and deſtination. In a word, intrinſic beauty is ultimate; and relative beauty is that of means relating to ſome good end or purpoſe. Theſe different beauties agree in one capital circumſtance, that both are equally perceived as belonging to the object; which will be readily admitted with reſpect to intrinſic beauty, but is not ſo obvious with reſpect to the other. The utility of the plough, for example, may make it an object of admiration or of deſire; but why ſhould utility make it beautiful? A natural propenſity of the human mind will explain this difficulty: By an eaſy tranſition of ideas, the beauty of the effect is transferred to the cauſe, and is perceived as one of the qualities of the cauſe. Thus a ſubject void of intrinſic beauty appears beautiful by its utility; a dwelling-houſe void of all regularity is however beautiful in the view of convenience; and the want of ſymmetry in a tree will not prevent its appearing beautiful, if it be known to produce fruit of a good quality and flavour.

When theſe two beauties concur in any object, it appears delightful. Every member of the human body poſſeſſes both in a high degree. The beauty of utility, being accurately proportioned to the degree of utility, requires no illuſtration: But intrinſic beauty, being more complex, cannot be treated diſtinctly without being analyſed. If a tree be beautiful by means of its colour, figure, motion, ſize, &c. it is in reality poſſeſſed of ſo many different beauties. The beauty of colour is too familiar to need explanation. The beauty of figure is more: for example, viewing any body as a whole, the beauty of its figure ariſes from regularity and ſimplicity; viewing the

parts with relation to each other, uniformity, proportion, and order, contribute to its beauty. The beauties of *grandeur* and *motion* are conſidered in their proper places.

It may not be improper here to make a few obſervations on ſimplicity, which may be of uſe in examining the beauty of ſingle objects. A multitude of objects crowding into the mind at once, diſturb the attention, and paſs without making any laſting impreſſion. In the ſame manner, even a ſingle object, conſiſting of a multiplicity of parts, equals not, in ſtrength of impreſſion, a more ſimple object comprehended in one view. This juſtifies ſimplicity in works of art, as oppoſed to complicated circumſtances and crowded ornaments.

It would be endleſs to enumerate the effects that are produced by the various combinations of the principles of beauty. A few examples will be ſufficient to give the reader ſome idea of this ſubject. A circle and a ſquare are each perfectly regular; a ſquare however is leſs beautiful than a circle; and the reaſon is, that the attention is divided among the ſides and angles of a ſquare; whereas the circumference of a circle, being a ſingle object, makes one entire impreſſion: and thus ſimplicity contributes to beauty. For the ſame reaſon a ſquare is more beautiful than a hexagon or octagon. A ſquare is likewiſe more beautiful than a parallelogram, becauſe it is more regular and uniform. But this holds with reſpect to intrinſic beauty only; for, in many inſtances, as in the doors and windows of a dwelling-houſe, utility turns the ſcale in favour of the parallelogram.

Again, a parallelogram depends, for its beauty, on the proportion of its ſides. A great inequality of its ſides annihilates its beauty. Approximation toward equality has the ſame effect; for proportion there degenerates into imperfect uniformity, and the figure appears an unſucceſsful attempt toward a ſquare. And hence proportion contributes to beauty. An equilateral triangle yields not to a ſquare in regularity nor in uniformity of parts, and it is more ſimple. But an equilateral triangle is leſs beautiful than a ſquare; which muſt be owing to inferiority of order in the poſition of its parts; the order ariſing from the equal inclination of the ſides of ſuch an angle is more obſcure than the parallelism of the ſides of a ſquare. And hence order contributes to beauty not leſs than ſimplicity, regularity, or proportion.

Uniformity is ſingular in one circumſtance, that it is apt to diſguſt by exceſs. A number of things deſtined for the ſame uſe, as windows, chairs, &c. cannot be too uniform. But a ſcrupulous uniformity of parts in a large garden or field, far from being agreeable, offends the eye.

In all the works of nature ſimplicity makes a capital object. It alſo makes a figure in works of art: profuſe ornament in painting, gardening, or architecture, as well as in dreſs or in language, ſhows a falſe or corrupted taſte. Simplicity in behaviour and manners has an enchanting effect, and never fails to gain our affection. Very different are the artificial manners of modern times. A gradual progreſs from ſimplicity to complex forms and profuſe ornament, ſeems to be the fate of all the fine arts; reſembling behaviour, which, from original candour and ſimplicity, has degenerated into duplicity of heart and artificial refinement. At preſent, literary productions are crowded with words, epithets, and figures. In muſic, ſentiment is neglected for the luxury of harmony, and for difficult movement.

Reſpecting the final cauſe of beauty, one thing is evident, that our reliſh of regularity, uniformity, proportion, order, and ſimplicity, contributes greatly to enhance the beauty of the objects that ſurround us, and of courſe tends to our happineſs. We may be confirmed in this thought, upon reflecting, that our taſte for theſe particulars is not accidental, but uniform and univerſal, making a branch of our nature. At the ſame time, regularity, uniformity, order, and ſimplicity, contribute each of them to readineſs of apprehenſion, and enable us to form more diſtinct ideas of objects than can be done where theſe particulars are wanting. In ſome inſtances, as in animals, proportion is evidently connected with utility, and is the more agreeable for that reaſon.

In many inſtances beauty promotes induſtry; and as it is frequently connected with utility, it proves an additional incitement to enrich our fields and improve our manufactures. Theſe, however, are but ſlight effects, compared with the connections that are formed among individuals in ſociety by means of beauty. The qualifications of the head and heart are undoubtedly the moſt ſolid and moſt permanent foundations of ſuch predilections: but as external beauty lies more in view, and is more obvious to the bulk of mankind, than the qualities now mentioned, the ſenſe of beauty has a more extenſive influence in forming theſe attachments. At any rate, it concurs in an eminent degree with mental qualifications, in producing ſocial intercourſe, mutual good-will, and conſequently mutual aid and ſupport, which are the life of ſociety: it muſt not however be overlooked, that the ſenſe of beauty does not tend to advance the intereſts of ſociety, but when in a due mean with reſpect to ſtrength. Love, in particular, ariſing from a ſenſe of beauty, loſes, when exceſſive, its ſocial character: the appetite for gratification, prevailing over affection for the beloved object, is ungovernable, and tends violently to its end, regardleſs of the miſery that muſt follow. Love, in this ſtate, is no longer a ſweet agreeable paſſion: it becomes painful, like hunger or thirſt; and produces no happineſs, but in the inſtant of fruition. This ſuggeſts an important leſſon, that moderation in our deſires and appetites, which fits us for doing our duty, contributes at the ſame time the moſt to happineſs. Even ſocial paſſions, when moderate, are more pleaſant than when they ſwell beyond proper bounds, in which caſe the ſenſations they excite are in ſome degree tumultuous and overpowering.

Perſonal Beauty. This having been only ſlightly touched upon in the preceding article, merits more particular diſcuſſion; and may be conſidered under theſe four heads: Colour, Form, Expreſſion, and Grace; the two former being, as it were, the Body; the two latter the Soul, of beauty.

1. *Colour* or *complexion*. Although this be the loweſt of all the conſtituent parts of perſonal beauty, yet it is uſually the moſt ſtriking, and the moſt obſerved; for which there is this very obvious reaſon to be given; that "every body can ſee, and very few can judge;" the beauties of the human complexion requiring much leſs of judgment than either of the other three.

We may remark, as to the colour of the body in general, that the moſt beautiful perhaps that ever was imagined, was that which Apelles expreſſed in his famous Venus; and which, though the picture itſelf be loſt, Cicero has in ſome degree preſerved to us, in his animated deſcription of it. It was, as we learn from him, a fine red, beautifully intermixed and incorporated with white; and diffuſed, in its due proportions, through each part of the body. Such are the deſcriptions of a moſt beautiful ſkin, in ſeveral of the Roman poets; and ſuch often is the colouring of Titian, and particularly in his ſleeping Venus, or whatever other beauty that charming piece was meant to repreſent. The reaſon why theſe colours pleaſe ſo much, is not only their natural livelineſs, nor the much greater charms they obtain from their being properly blended together, but is alſo owing in ſome degree to the idea they carry with them of good health; without which all beauty grows languid and leſs engaging; and with which it always recovers an additional degree of luſtre and animation.

As to the face in particular, a great deal of beauty is ow-

ing, beſide the cauſes already mentioned, to variety; that being deſigned by nature for the greateſt concourſe of different colours, of any part in the human body. Colours pleaſe by oppoſition; and it is in the face that they are the moſt diverſified, and the moſt oppoſed. It is an obſervation apparently whimſical, but perhaps not unjuſt, that the ſame thing which makes a fine evening, makes a fine face; that is, as to the particular part of beauty now under conſideration. The beauty of an evening ſky, about the ſetting of the ſun, is owing to the variety of colours that are ſcattered along the face of the heavens. It is the fine red clouds, intermixed with white, and ſometimes darker ones, with the azure bottom appearing here and there between them, which makes all that beautiful compoſition that delights the eye ſo much, and gives ſuch a ſerene pleaſure to the heart. In the ſame manner, if you conſider ſome beautiful faces, you may obſerve, that it is much the ſame variety of colours which gives them that pleaſing look which is ſo apt to attract the eye, and but too often to engage the heart. For all this ſort of beauty is reſolvable into a proper variation of fleſh colour and red, with the clear blueneſs of the veins pleaſingly intermixed about the temples and the going off of the cheeks, and ſet off by the ſhade of full eye-brows; and of the hair, when it falls gracefully over the face and neck.

The ſame reaſon it is that induces the beſt landſcape-painters to chooſe the autumnal part of the year for their pieces, rather than the ſpring. They prefer the variety of ſhades and colours, though in their decline, to all their freſhneſs and verdure in their infancy; and think all the charms and livelineſs even of the ſpring more than compenſated by the choice, oppoſition, and richneſs of colours that appear almoſt on every tree in the autumn.

Though the judgment is apt to be guided by particular attachments, and that more perhaps in this part of beauty than any other, yet the general perſuaſion ſeems well founded, that a complete brown beauty is really preferable to a very fair one; the bright brown giving a luſtre to all the other colours, a vivacity to the eyes, and a richneſs to the whole look, which one ſeeks in vain in the whiteſt and moſt tranſparent ſkins. Raphael's moſt charming Madonna is a brunette beauty; and his earlier Madonnas (or thoſe of his middle ſtyle) are generally of a lighter and leſs pleaſing complexion. All the beſt artiſts in the nobleſt age of painting, about Leo the tenth's time, uſed this deeper and richer kind of colouring; and perhaps one might add, that the glaring lights introduced by Guido went a great way towards the declenſion of that art; as the enfeebling of the colours by Carlo Marat (or his followers) has ſince almoſt completed the fall of it in Italy.

While we are treating on this ſubject, it ſeems doubtful whether ſome things ought not to be comprehended which are not perhaps commonly meant by the name of colour: as that appearing ſoftneſs or ſilkineſs of ſome ſkins; that Magdalen-look in ſome fine faces, after weeping *; that brightneſs, as well as tint of the hair; that luſtre of health that ſhines forth upon the features; that luminous appearance in ſome eyes, and that fluid fire or gliſtening in others, which are nearly allied to the ſubject on which we have been treating. Some of them indeed are of a nature ſo much ſuperior to the common beauties of colour, that they make it doubtful whether they ſhould not be ranked under a higher claſs, and reſerved for the expreſſion of the paſſions. They are however mentioned here; becauſe even the moſt doubtful of them appear to belong partly to this head, though not entirely.

2. *Form.* This takes in the turn of each part, as well as the ſymmetry of the whole body collectively. It relates even to the turn of an eye-brow, or the falling of the hair. Perhaps too the attitude, while fixed, ought to be reckoned under this article; by which is not only meant the poſture of the body, but alſo the poſition of each part; as the turn of the neck, the extending of the hand, the placing of a foot; and ſo on to the moſt minute particular.

The general cauſe of beauty in the form or ſhape in both ſexes, is a proportion, or an union and harmony, in all parts of the body. The diſtinguiſhing character of beauty in the female form, is delicacy and ſoftneſs; and in the male, either apparent ſtrength or agility. The fineſt example that can be ſeen of the former, is the Venus of Medici; and of the two latter, the Hercules Farneſe and the Apollo Belvedere.

There is one excellence indeed in the laſt of theſe figures, which exceeds the bounds of our preſent inquiry; namely, what an Italian artiſt called *Il ſovra umano*; and what we may call the tranſcendent, or celeſtial. It is ſomething diſtinct from all human beauty, and of a nature greatly ſuperior to it; ſomething like an air of divinity, expreſſed in the works of very few artiſts; and of which ſcarcely any of the poets even have caught any ray in their deſcriptions, except Homer and Virgil, among the ancients; and our Shakeſpear and Milton among the moderns.

The beauty of the mere human form is much ſuperior to that of colour; for when one is obſerving the fineſt works of the ancient artiſts at Rome, one feels the mind more charmed with the ſtatues, than with the pictures even of the greateſt maſters.

One of the old Roman poets, in ſpeaking of a very handſome man, who was a candidate for the prize in ſome of the public games, ſays, that he was much admired by all the ſpectators at his firſt appearance; but that, when he flung off his robes, and diſcovered the beauty of his ſhape altogether, it was ſo ſuperior, that it quite extinguiſhed the charms they had before ſo much admired in his face. Much the ſame effect may be felt in viewing the Venus of Medici. If we obſerve the face only, it appears extremely beautiful; but if we conſider all the other elegancies of her make, the beauty of her face becomes leſs ſtriking, and is almoſt loſt in ſuch a multiplicity of charms.

That artiſt who would learn what conſtitutes the beauty of each part of the human body, may find it at large in *Felibien*, or may ſtudy it, with more pleaſure to himſelf, in the fineſt pictures and ſtatues; for in life we commonly ſee but a ſmall part of the human body, moſt of it being either diſguiſed or altered by what we call dreſs. In fact we do not only thus, in a great meaſure, hide beauty; but even injure it, and produce deformity by ſome parts of our dreſs. A child is no ſooner born into the world, than it is bound up, almoſt as firmly as an old Egyptian mummy, in ſeveral folds of linen. It is in vain for him to give all the ſigns of diſtreſs that nature has put in his power, to ſhow how much he ſuffers whilſt they are thus impriſoning his limbs; or all the ſigns of joy, every time they

* The look here meant is that moſt frequently expreſſed by the beſt painters in their Magdalens; in which, if there were no tears on the face, you would ſee, by the humid redneſs of the ſkin, that ſhe had been weeping bitterly. There is a very ſtriking inſtance of this in a Magdalen by Le Brun, in one of the churches at Paris; and ſeveral by Titian, in Italy; but the beſt is at the Barberino palace at Venice. In ſpeaking of this figure, Roſalba hardly went too far, when ſhe ſaid, "It wept all over;" "*Elle pleure* (ſays ſhe) *juſqu'aux bouts de doigts.*"

ſet him at liberty. When he comes to be dreſt like a man, he has ligatures applied to his arms, legs, and middle; in ſhort, all over him, ſo as to prevent the natural circulation of his blood, and make him leſs active and healthy. If it be a child of the tenderer ſex, ſhe muſt be bound yet more ſtraitly about the waiſt and ſtomach, to give her a diſproportion that nature never meant in her ſhape. The two other conſtituent parts of beauty are expreſſion and grace; the former of which is common to all perſons and faces; and the latter only to be met with in a very few.

3. By *Expreſſion* is meant the expreſſion of the paſſions; the turns and changes of the mind, ſo far as they are made viſible to the eye by our looks or geſtures. Though the movements of the mind appear principally in the face and attitudes of the head; yet almoſt every part of the human body, on ſome occaſion or other, may become expreſſive. Hence the languiſhing fall of the arm, or the vehement exertion of it; the pain expreſſed by the fingers of one of the ſons in the famous group of Laocoon, and in the toes of the dying gladiator. But this again is often loſt among us by our dreſs; and indeed is of the leſs concern, becauſe the expreſſion of the paſſions exiſts chiefly in the face, which we, by good luck, have not as yet concealed.

The parts of the face in which the paſſions moſt frequently become evident, are the eyes and mouth; but from the eyes, they diffuſe themſelves very ſtrongly about the eye-brows; as, in the other caſe, they appear often in the parts all round the mouth. Philoſophers may diſpute as much as they pleaſe about the ſeat of the ſoul; but, wherever it reſides, we are ſure that it ſpeaks in the eyes. Perhaps it is an injuſtice to the eye-brows, to make them only ſubſervient to the eye; for they, eſpecially in lively faces, have as it were a language of their own; and are extremely varied, according to the different ſentiments and paſſions of the mind. It is certain that a degree of diſpleaſure may be often diſcerned in our eye brows, though we have addreſs enough not to let it appear in our eyes. Homer indeed makes the eye-brows the ſeat of *majeſty*, Virgil of *dejection*, Horace of *modeſty*, and Juvenal of *pride*; and it is not certain whether every one of the paſſions be not aſſigned, by one or other of theſe poets, to the ſame part. Thus Homer,

Η, ῥ' κυανεῃσιν επ' οφρυσιν ευσε Κρονιων·
Αμβροσιαι δ' αρα χαιται επερρωσαντο ανακτος
Κρατος απ' αθανατοιο· μεγαν δ' ελελιξεν Ολυμπον. Il. α. 528.

It was from this paſſage that Phidias borrowed all the ideas of that majeſty which he had expreſſed ſo ſtrongly in his famous ſtatues of the Jupiter Olympus; and Horace, probably, his——Cuncta ſupercilio moventis. *Lib.* iii. *Od.* 1. 8.

Frons læta parum, et dejecto lumina vultu.
Virg. Æn. vi. 863.

Deme ſupercilio nubem; plerumque moteſtus
Occupat obſcuri ſpeciem.
Horat. lib. i. Epiſt. 18. 95.

Malo Venuſinam, quam te, Cornelia, mater
Gracchorum; ſi cum magnis virtutibus affers
Grande ſupercilium, et numeras in dote triumphos.
Juvenal, Sat. vi. 168.

It is here that the Romans uſed the word *ſuperciliosus*, as we do from it the word *ſupercilious*, for proud and arrogant perſons.

Having hitherto ſpoken only of the paſſions in a general way, we now proceed to conſider which of them add to beauty, and which of them take from it. We may ſay, in general, that all the tender and kind paſſions add to beauty; and all the cruel and unkind ones add to deformity. It is on this account that good nature may very juſtly be ſaid to be "the beſt feature even in the fineſt face."

Love, hope, and joy, fair pleaſure's ſmiling train;
Hate, fear, and grief, the family of pain. Popr.

The former of theſe naturally give an additional luſtre and enlivening to beauty; as the latter are too apt to fling a gloom and cloud over it.

Yet in theſe, and all the other paſſions, moderation ought perhaps to be conſidered in a great meaſure the rule of their beauty, almoſt as far as moderation in actions is the rule of virtue. Thus an exceſſive joy may be too boiſterous in the face to be pleaſing; and a degree of grief, in ſome faces, and on ſome occaſions, may be extremely beautiful. Some degrees of anger, ſhame, ſurpriſe, fear, and concern, are beautiful; but all exceſs is hurtful and offenſive. Dulneſs, auſterity, impudence, pride, affectation, malice, and envy, are always diſguſting when viſible in the human countenance.

The fineſt union of paſſions that can perhaps be obſerved in any face, conſiſts of a juſt mixture of modeſty, ſenſibility, and ſweetneſs; each of which when taken ſingly is very pleaſing: but when they are all blended together, in ſuch a manner as either to enliven or correct each other, they give almoſt as much attraction as the paſſions are capable of adding to a very pretty face.

The prevailing paſſion in the Venus of Medici is modeſty: it is expreſſed by the poſition of her hands, in her looks, and in the turn of her head. And by the way, it may be queſtioned, whether one of the chief reaſons why ſide-faces pleaſe more than full ones, be not from the former having more of the air of modeſty than the latter. This at leaſt is certain, that the beſt artiſts uſually chooſe to give a ſide-face rather than a full one; in which attitude the turn of the neck too has more beauty, and the paſſions more activity and force. Thus, as to hatred and affection in particular, the look that was formerly ſuppoſed to carry infection with it from malignant eyes, was a ſlanting regard; like that which Milton gives to Satan, when he is viewing the happineſs of our firſt parents in paradiſe.

It is owing to the great power of the diſpoſition to pleaſe, by which all the kinder paſſions are called into action, "that lovers do not only ſeem, but are really more beautiful to each other than they are to the reſt of the world;" becauſe, when they are together, the moſt amiable paſſions are more frequently diſplayed in each of their faces than they are in either before indifferent perſons. There is then, as a certain French writer very well expreſſes it, "a ſoul upon their countenances, which does not appear when they are abſent from each other; or even when they are together converſing with other perſons, that do not intereſt them, or perhaps lay a reſtraint upon their features."

The ſuperiority which the beauty of the paſſions has over the two parts of beauty firſt mentioned, will probably be now pretty evident: or if this ſhould appear ſtill problematical to any one, let him conſider a little the following particulars, of which every body muſt have met with ſeveral inſtances in common life: that there is a great deal of difference in the ſame face, according as the perſon is in a better or worſe humour, or in a greater or leſs degree of livelineſs: that the beſt complexion, the fineſt features, and the exacteſt ſhape, without any thing of the mind expreſſed on the face, are as inſipid and unmoving as the waxen figure of the fine Ducheſs of Richmond in Weſtminſter-Abbey: that the fineſt eyes in the world, with an exceſs of malice or rage in them, will grow as ſhocking as they are in that fine face of Meduſa on the famous ſcal in the Strozzi family at Rome: that a face without any good features in it, and with a very indifferent complexion, ſhall have a very taking air, from the ſenſibility of the eyes, the general

good-humoured turn of the look, and perhaps a little agreeable ſmile about the mouth. And theſe three things perhaps would go a great way towards accounting for the *Je ne ſçai quoi*, or that inexplicable pleaſingneſs of the features, which is ſo often talked of, and ſo little underſtood; but the greater part, and perhaps all the reſt of this, will fall under the laſt article, that of *grace*.

Thus it appears that the paſſions can give beauty without the aſſiſtance of colour or form; and take it away where thoſe have united the moſt ſtrongly to give it. And hence the ſuperiority of this part of beauty over the other two. This, by the way, may help us to account for the juſtneſs of what Pliny aſſerts in ſpeaking of the famous ſtatue of Laocoon and his two ſons: he ſays, it was the fineſt piece of art in Rome; and to be preferred to all the other ſtatues and pictures, of which they had ſo noble a collection in his time. It had no beauties of colour to vie with the paintings and other ſtatues there; as the Apollo Belvedere and the Venus of Medici, in particular, were as finely proportioned as the Laocoon. But this had much greater variety of expreſſion even than thoſe fine ones; and it muſt be on that account alone, that it could have been preferable to them and all the reſt.

Before quitting this head, two things before mentioned deſerve to be repeated: that the chief rule of the beauty of the paſſions is moderation; and that the part in which they appear moſt ſtrongly is the eyes. It is there that love holds all his tendereſt language: it is there that virtue commands, modeſty charms, joy enlivens, ſorrow engages, and inclination fires the hearts of the beholders: it is there that even fear, and anger, and confuſion, may become charming. But all theſe, to be charming, muſt be kept within their due bounds and limits; for too ſullen an appearance of virtue, an inordinate ſwell of paſſion, a ruſtic and overwhelming modeſty, a deep ſadneſs, or too wild and impetuous a joy, become all either oppreſſive or diſagreeable.

4. The laſt finiſhing and nobleſt part of beauty is *Grace*; which every body is accuſtomed to ſpeak of as a thing inexplicable; and in a great meaſure perhaps it is ſo. Every judge of beauty can point out grace; but no one ſeems even yet to have fixed upon a definition for it. Grace often depends on ſomething very incidental in a fine face; and in actions it conſiſts more in the manner of doing things than in the things themſelves. It is perpetually varying its appearance, and is therefore much more difficult to be conſidered than in any thing fixed and ſteady. While we are admiring, it ſteals from under the eye of the obſerver; and is ſucceeded perhaps by another that eſcapes as ſoon and as imperceptibly. It is on this account that grace is better to be ſtudied in Corregio's, Guido's, and Raphael's pictures, than in real life.

But though we cannot preciſely ſay what grace is, we may point out the parts and things in which it is moſt apt to appear. Though at times it may viſit every limb or part of the body, yet the mouth is the chief ſeat of grace, as much as the chief ſeat for the beauty of the paſſions is in the eyes. Thus, when the French uſe the expreſſion of *une bouche fort gracieuſe*, they mean it properly of grace: but when they ſay *des yeux tres gracieux*, it then falls to the ſhare of the paſſions; and means kind or favourable. In a very graceful face, by which we do not ſo much mean a majeſtic as a ſoft and pleaſing one, there is now and then (for no part of beauty is either ſo engaging or ſo uncommon) a certain deliciouſneſs that almoſt always lives about the mouth, in ſomething not quite enough to be called a ſmile, but rather an approach toward one, which varies gently about the different lines there like a little fluttering Cupid, and perhaps ſometimes diſcovers a little dimple, that after juſt lightening upon you diſappears and appears again by turns.

The grace of attitude may belong to the poſition of each part, as well as to the carriage or diſpoſition of the whole body: but how much more it belongs to the head than to any other part may be ſeen in the pieces of the moſt celebrated painters; and particularly in thoſe of Guido, who has been rather too laviſh in beſtowing this beauty on almoſt all his fine women; whereas nature has given it in ſo high a degree but to very few. The turns of the neck are extremely capable of grace, and are very eaſy to be obſerved, though very difficult to be accounted for. How much of this grace may belong to the arms and feet, as well as to the neck and head, may be ſeen in dancing. But it is not in genteel motions alone that a very pretty woman will be graceful; and Ovid, who was ſo great a critic in beauty, had very good reaſon for ſaying, That when Venus, to pleaſe her gallant, imitated the hobbling gait of her huſband, her very lameneſs had a great deal of prettineſs and grace in it. "Every motion of a graceful woman, ſays Tibullus (a writer of the ſame age), is full of grace." She deſigns nothing by it perhaps, and may not even be ſenſible of it herſelf: and indeed ſhe ſhould not be ſo; for the moment any geſture or action is *affected*, it ceaſes to be graceful.

Horace and Virgil ſeem to extend grace ſo far as to the flowing of the hair, and Tibullus even to the dreſs of his miſtreſs; but then he aſſigns it more to her manner of putting on and appearing in whatever ſhe wears, than to the dreſs itſelf. It is true, there is another wicked poet (Ovid) who has ſaid with much leſs decency, "that dreſs is the better half of the woman:"—*Pars minima eſt ipſa puella ſui.*

There are two very diſtinct, and as it were oppoſite, ſorts of grace; the majeſtic and the familiar. The former belongs chiefly to very *fine* women, and the latter to very *pretty* ones. *That* is more commanding, and *this* the more delightful and engaging. The Grecian painters and ſculptors uſed to expreſs the former moſt ſtrongly in the looks and attitudes of their Minervas, and the latter in thoſe of Venus. Xenophon, in his Choice of Hercules (or at leaſt the excellent tranſlator of that piece), has made juſt the ſame diſtinction in the perſonages of wiſdom and pleaſure; the former of which he deſcribes as moving on to that young hero with the majeſtic ſort of grace; and the latter with the familiar:

Graceful, yet each with different grace they move;
This ſtriking ſacred awe, that ſofter winning love.

No poet ſeems to have underſtood this part of beauty ſo well as Milton. He ſpeaks of theſe two ſorts of grace very diſtinctly; and gives the majeſtic to Adam, and both the familiar and majeſtic to Eve; but the latter in a leſs degree than the former:

Two of far nobler ſhape, erect and tall,
Godlike erect, with native honour clad,
In naked majeſty, ſeem'd lords of all;
And worthy ſeem'd. For in their looks divine
The image of their glorious Maker ſhone:
Truth, wiſdom, ſanctitude ſevere and pure;
Severe, but in true filial freedom plac'd;
Whence true authority in men: though both
Not equal, as their ſex not equal, ſeem'd.
For contemplation he, and valour, form'd;
For ſoftneſs ſhe, and ſweet attractive grace.
Par. Loſt, b. iv. 298.

——I eſpy'd thee, fair indeed and tall,
Under a plantain; yet methought leſs fair,
Leſs winning ſoft, leſs amiably mild,
Than that ſmooth wat'ry image.——
(*Eve, of Adam and herſelf*) *Ib.* ver. 480.

——————Her heav'nly form
Angelic, but more ſoft and feminine;
Her graceful innocence; her ev'ry air
Of geſture, or leaſt action. —— B. ix. 461.

Grace was in all her ſteps: heav'n in her eye;
In ev'ry geſture, dignity and love. B. viii. 489.

Speaking, or mute, all comelineſs and grace
Attends thee; and each word, each motion, forms.
Ib. 223.

But though grace is ſo difficult to define, yet there are two particular things which ſeem to hold univerſally in relation to it. The firſt is, "That there is no grace without motion;" that is, without ſome genteel or pleaſing motion, either of the whole body or of ſome limb, or at leaſt of ſome feature. And it may be hence that Lord Bacon calls grace by the name of decent motion; juſt as if they were equivalent terms: "in beauty, that of favour is more than that of colour; and that of gracious and decent motion, more than that of favour." Virgil in one place points out the majeſty of Juno, and in another the graceful air of Apollo, by only ſaying that they move; and poſſibly he means no more when he makes the motion of Venus the principal thing by which Æneas diſcovers her under all her diſguiſe; though the commentators, as uſual, would fain find out a more dark and myſterious meaning for it. All the beſt ſtatues are repreſented as in ſome action or motion; and the moſt graceful ſtatue in the world, the Apollo Belvedere, is ſo much ſo, that when we face it at a little diſtance, we are almoſt apt to imagine that he is actually going to move towards us.

All graceful heads, in the portraits of the beſt painters, are in motion; and very ſtrongly on thoſe of Guido in particular; which are all either caſting their looks up toward heaven, or down toward the ground, or ſide-way, as regarding ſome object. A head that is quite inactive, and laid flat upon the canvas, like the faces on medals after the fall of the Roman empire, or the Gothic heads before the revival of the arts, will be ſo far from having any grace, that it will not even have the leaſt appearance of animation.

The ſecond obſervation is, "That there can be no grace with *impropriety*;" or, in other words, that nothing can be graceful that is not conformable to the character and ſituation of the perſon in queſtion. For inſtance, the graces of a little lively beauty would become ungraceful in majeſty; and ſo would the majeſtic airs of an empreſs quite deſtroy the prettineſs of the former. The vivacity that adds a grace to beauty in youth would give an additional deformity to old age; and the very ſame airs which would be charming on ſome occaſions, would be ſhocking, if greatly ill-timed or miſplaced.

Indeed the inſeparable union of propriety and grace ſeems to have been the general ſenſe of mankind, as we may deduce from the languages of ſeveral nations; in which the words that anſwer to what we term *proper* or *becoming*, are uſed indifferently for *beautiful* or *graceful*. Thus, among the Greeks, the words Πρεπον and Καλον, and among the Romans *pulchrum* and *decens*, or *decorum*, are uſed indifferently for each other.

Thoſe are wrong, however, who have gone ſo far as to aſſert, that grace conſiſts entirely in propriety; becauſe propriety is a thing eaſy enough to be underſtood, and grace, after all that we can ſay about it, very difficult. Propriety, therefore, and grace are no more one and the ſame thing than grace and motion are. It is true, it cannot ſubſiſt without either; but then there ſeems to be ſomething elſe ſuperadded, which cannot be explained, but which poſſibly may give it its greateſt force and effect.

Whatever are the cauſes of it, this is certain, that grace is the chief of all the conſtituent parts of beauty; and ſo much ſo, that it ſeems to be the only one which is abſolutely and univerſally admired: All the reſt are only relative. One likes a brunette beauty better than a fair one; I may love a little woman, and you a large one, beſt; a perſon of a mild temper will be fond of the gentler paſſions in the face, and one of a bolder caſt may chooſe to have more vivacity and more vigorous paſſions expreſſed there: but grace is found in few, and is pleaſing to all. Grace, like poetry, muſt be the gift of the Creator; it is never wholly to be acquired by art. The moſt celebrated of all the ancient painters was Apelles, and the moſt celebrated of all the modern, Raphael; and it is remarkable, that the diſtinguiſhing character of each of theſe was grace. Indeed, that alone could have given them ſo high a pre-eminence over all their competitors.

Grace has nothing to do with the loweſt part of beauty or colour; very little with ſhape, and very much with the paſſions: for it is ſhe who gives their higheſt zeſt, and the moſt delicious part of their effect to the expreſſions of each. All the other parts of beauty are pleaſing in ſome degree, but none ſo much ſo as grace. And the old Romans in general ſeem to have had this notion of it, as may be inferred from the original import of the names which they uſed for this part of beauty: *Gratia* from *gratus*, or "pleaſing;" and *decor* from *decens*, or "becoming."

The Greeks as well as the Romans muſt have been of this opinion, when, in ſettling their mythology, they made the graces the conſtant attendants of Venus or the cauſe of love. In fact, there is nothing cauſes love ſo generally and irreſiſtibly as grace. It is like the ceſtus of the ſame goddeſs, which was ſuppoſed to comprehend every thing that was winning and engaging in it; and beſide all, to oblige the heart to love by a ſecret and inexplicable force like that of magic.

Now that fancy has perhaps more to do with beauty than judgment, there is an infinity of taſtes, and conſequently an infinity of beauty; for to the mind of the lover, ſuppoſed beauty is full as good as real. Every body may now chooſe out what happens to hit his own turn and caſt. This increaſes the extent of beauty vaſtly, and makes it in a manner univerſal: for there are but few people in compariſon that are truly beautiful; but every body may be beautiful in the imagination of ſome one or other. Some may delight themſelves in a black ſkin, and others in a white; ſome in a gentle natural roſineſs of complexion, others in a high exalted artificial red; ſome nations in waiſts diſproportionably large, and another in waiſts as diſproportionably ſmall. In ſhort, the moſt oppoſite things imaginable may each be generally looked upon as beautiful in different countries, or by different people in the ſame country.

We ſhould perhaps make a diſtinction here again, as to the two former parts of beauty and the two latter. Fancy has much more to do in the articles of form and colour than in thoſe of the paſſions and grace. The good paſſions, as they are viſible on the face, are apparent goodneſs; and that muſt be generally amiable: and true grace, wherever it appears to any degree, one ſhould think muſt be pleaſing to every human creature; or perhaps this may never appear in the women of any nation, where the men are grown ſo ſavage and brutal as to have loſt all taſte for it.

Yet even grace itſelf, under the notion of pleaſingneſs, may become almoſt univerſal, and be as ſubject to the dominion of fancy as any of the leſs ſignificant parts of beauty. A parent can ſee gentility of demeanour in the moſt awkward of their children; and a perſon who is in love, will be pleaſed with every motion and air of the perſon beloved; which is the moſt diſtinguiſhing character that belongs to grace. It is true, this is all a miſtaken grace; but as to that particular perſon, it has all the effects of the true.

Beauty, in architecture, painting, and other arts, is the harmony and juſtneſs of the whole compoſition taken together.

BEAUVAIS, a city of France in the department of Oiſe and late province of the Iſle of France. The cathedral church is dedicated to St. Peter, and is much admired for its fine architecture. It once had a great number of relics, and a library of curious books. There are ſeveral other churches, among which is one dedicated to St. Stephen, remarkable for its curious windows. The town was ineffectually beſieged by the Engliſh in 1443, and by the Duke of Burgundy with an army of 80,000 men. In this laſt ſiege the women ſignalized themſelves under the conduct of Jeane Hachette, who ſet up a ſtandard which was long after preſerved in the church of the Jacobins. The Duke was obliged to raiſe the ſiege; and in memory of the women's exploits, they uſed to walk firſt in a proceſſion on the 10th of July, the anniverſary of their deliverance. The inhabitants carry on a good trade in beautiful tapeſtry. Beauvais is ſituated on the river Therin, in E. long. 2. 15. N. lat. 49. 26.

BEAUVOIR *ſur Mer*, a maritime town of France in the department of Vendée, and late province of Poictou; 25 miles S. W. of Nantes. W. long. 1. 5. N. lat. 46. 45.

BEBELINGUEN, a town of Germany, in the duchy of Wirtemberg, ſeated on a lake from which proceeds the river Worm. E. long. 9. 8. N. lat. 48. 45.

BEC, a town of France, in the department of Lower Seine, and late province of Normandy, ſeated on a tongue of land, at the confluence of two rivers, in E. long. 0. 52. N. lat. 48. 45.

BECAH, or Bekah, a Jewiſh coin, being half a ſhekel. In Dr. Arbuthnot's table of reductions, the bekah amounts to $13\frac{11}{20}$d. in Dr. Prideaux's computation to 1s. 6d. Every Iſraelite paid an hundred bekahs a head annually for the ſupport of the temple.

BECALM, in a general ſenſe, ſignifies to appeaſe, or allay. As a term in the ſea language, a ſhip is ſaid to be becalmed, when there is not a breath of wind to fill the ſails. This may ariſe either from the want of a ſufficient wind, or from the hindrance of any large body which prevents its effect on the ſails. Ships commonly becalm each other by coming cloſe to windward.

BECANOR, a town of India, in Aſia, ſeated on the river Ganges, in E. long. 83. 5. N. lat. 27. 40.

BECASSINE, in zoology, a name given by many to the *tringa minor*, or, as we commonly call it, the *ſand-piper*.

BECCA, in the Materia Medica of the ancients, a name given to a fine kind of reſin collected from the turpentine and maſtich-trees of Greece and Syria, and mixed together for uſe. It was much eſteemed formerly, and not only uſed in the country where it was produced, but carried in great quantities to Mecca, and other parts of the Turkiſh dominions, where it was valued at a very great rate.

BECCABUNGA, brooklime, in botany, the trivial name of a ſpecies of veronica.—Veronica, *Speedwell*, is a genus of the *diandria-monogynia* claſs. Its characters are theſe: the flower has a permanent empalement, cut into five acute ſegments, and it has one tubulous petal the length of the empalement; the brim is cut into four oval plain ſegments, which ſpread open, and two ſtamina, which are terminated by oblong ſummits; it has a compreſſed germen, ſupporting a ſlender declining ſtyle, crowned by a ſingle ſtigma; the germen becomes a compreſſed heart-ſhaped capſule, with two cells, filled with roundiſh ſeeds. Miller reckons ſixteen, and Linnæus thirty-five ſpecies.

The common male ſpeedwell, or Paul's betony, is in great eſteem among the Germans, in diſorders of the breaſt, both catarrhous and ulcerous, and for purifying the blood and humours. Infuſions of the leaves, which are not unpalatable, are drunk as tea, and are found to operate ſenſibly by urine.

BECCIFAGO, in zoology, the name of a ſmall bird, ſcarcely ſo large as the common linnet, and with a very remarkable ſhort body. Its head, neck, back, wings, and tail, are of a greeniſh grey, and in ſome of the birds of a greeniſh brown. It feeds on vegetables, berries, &c. and is common in the north of England, where, according to Ray, it is called the *pettychaps*.

BECCLES, a large town of Suffolk in England, in E. long. 1. 30. N. lat. 52. 38.

BECHER (John Joachim), a celebrated chemiſt, was born at Spires, in 1645. He was connected with the moſt learned men in Europe; and the Emperor, the Electors of Mentz and Bavaria, and other perſons of high rank, furniſhed him with the means of making experiments in mathematics, natural philoſophy, medicine, and chemiſtry. As his thoughts were very judicious and uncommon with reſpect to œconomy and to increaſing the revenues of a ſtate, he was invited to Vienna, where he contributed greatly to the eſtabliſhment of ſeveral manufactures, a chamber of commerce, and an India company; but the jealouſy of ſome of the miniſters occaſioned his diſgrace and ruin. He was not leſs unhappy at Mentz, Munich, and Wurtzburg; which determined him to go to Haerlem, where he invented a machine for working a great quantity of ſilk in a little time, and with few hands; but new misfortunes made him come to England, and he died at London in 1685. He wrote many works; the principal of which are, 1. *Phyſica Subterranea*, which was reprinted at Leipſic in 1703, and in 1739, in octavo, with a ſmall treatiſe, by E. Stahl, intitled *Specimen Becherianum*. 2. *Experimentum chymicum novum*, 8vo. 3. *Character pro Notitia Linguarum univerſali*. 4. *Inſtitutiones Chymicæ, ſeu Manuductio ad Philoſophiam Hermeticam*, 4to. 5 *Inſtitutionis Chymicæ prodromi*, 12mo. 6. *Experimentum novum ac curioſum de Minera arenaria perpetua*, &c.

BECHICS, Bechicha, among the old phyſicians, were medicines proper for relieving coughs. The word is formed of the Greek βηξ, βηχω, *a cough*. *Bechics* amount to much the ſame with what we otherwiſe call *pneumonics*, *thoracics*, *expectorants*, and *pectorals*.

BECHIN, a town of Bohemia, in a circle of the ſame name. It was taken and burnt by General Bequoi in 1619. It is ſeated on the river Laufnics, in E. long. 15. 12. N. lat. 49. 14.

BECK, or Beke, a word which imports a ſmall ſtream of water iſſuing from ſome bourn or ſpring. Hence the term *Hell-becks*, which are little brooks in the rough and wild mountains about Richmond near Lancaſhire. They are ſo called on account of their ghaſtlineſs and depth.

Beck is chiefly uſed among us in the compoſition of names of places originally ſituated in rivulets: hence Walbeck, Bournbeck, &c. The Germans uſe *beck* in the ſame ſenſe.

BECK, (David) an eminent portrait-painter, was born at Arnheim in Guelderland in 1621, and became a diſciple of Vandyck; from whom he acquired a fine manner of pencilling, and that ſweet ſtyle of colouring which is peculiar to that great maſter and to all the diſciples trained up under his direction. He poſſeſſed, beſides, that freedom of hand, and readineſs, or rather rapidity of execution, for which Vandyck was ſo remarkably famous; and King Charles I. when he obſerved the expeditious manner of Beck's painting, was ſo exceedingly ſurpriſed, that he told Beck, it was his opinion, he could paint if he was riding poſt. He was appointed portrait-painter and chamberlain to Queen Chriſtina of Sweden; and, by her recommendation, moſt of the illuſtrious perſons in Europe ſat to him for their pictures. He was agreeable, handſome, and polite, and lived in the higheſt favour with his royal miſtreſs; but, having an earneſt deſire to viſit his friends in Holland,

nd leaving the court of Sweden much againſt the queen's nclination, ſhe apprehended that he intended never to return; nd, as he died ſoon after at the Hague, it was ſuſpected that e was poiſoned. This happened in 1656, when he was aged nly 35 years.—A very ſingular adventure happened to this ainter as he travelled through Germany, which ſeems not unworthy of being recited. He was ſuddenly and violently aken ill at the inn where he lodged, and was laid out as a orpſe, ſeeming to all appearance quite dead. His valets exreſſed the ſtrongeſt marks of grief for the loſs of their maſter, nd whilethey ſat beſide his bed, they drank very freely, by way f conſolation. At laſt one of them, who grew much intoxiated, ſaid to his companions, Our maſter was fond of his laſs while he was alive, and out of gratitude let us give him a laſs now he is dead. As the reſt of the ſervants aſſented to he propoſal, he raiſed up the head of his maſter, and endeaoured to pour ſome of the liquor into his mouth. By the ragrance of the wine, or probably by a ſmall quantity that imerceptibly got down his throat, Beck opened his eyes; and the ervant being exceſſively drunk, and forgetting that his maſter vas conſidered as dead, compelled him to ſwallow what wine emained in the glaſs. The painter gradually revived, and by roper management and care recovered perfectly and eſcaped a remature interment. How highly the works of this maſter were eſteemed, may appear from the many marks of diſtinction nd honour which were ſhown him; for he received from diferent princes, as an acknowledgement of his ſingular merit, ine gold chains, and ſeveral medals of gold of large dimenions.

BECKET (Thomas), lord chancellor of England, archiſhop of Canterbury in the 12th century. The ſtory of his irth is as extraordinary as that of his life. It is related, that is father Gilbert Becket, ſome time ſheriff of London, went n a pilgrimage to Jeruſalem, where being ſurpriſed and enlaved by a party of Saracens, his maſter's daughter fell in ove with him; and that when he made his eſcape, ſhe followed im to London. So ſingular an inſtance of heroic affection truck him; and after conſulting with ſome biſhops, he bapized her by the name of *Matilda*, and married her; from which narriage proceeded the haughty Thomas Becket. Being raiſed to the archbiſhopric, he began the great diſpute between he crown and the mitre, and ſided with the pope: at which King Henry II. was greatly offended; and calling an aſſembly of the biſhops at Weſtminſter, offered ſix articles againſt papal encroachments, which he urged Becket to aſſent to. Becket, at the importunities of ſeveral lords, ſigned them; but elapſing, he was ordered to be tried as a traitor; upon which e fled into Flanders. The king baniſhed all his relations, nd Becket excommunicated all his oppoſers. At laſt, after even years, by the interceſſion of the French king and the ope, he returned; but refuſed to abſolve theſe Biſhops and thers he had excommunicated: whereupon the king grew nraged; and is reported to have dropped theſe expreſſions: 'That he was an unhappy prince, who maintained a great umber of lazy inſignificant perſons about him, none of whom ad gratitude or ſpirit enough to revenge him on a ſingle inolent prelate who gave him ſo much diſturbance." Theſe words of the king put four gentlemen of his court on forming a deſign againſt the archbiſhop's life, which they executed in the cathedral church of Canterbury, on the 29th of December 1171. They endeavoured to drag him out of the church; but finding they could not do this without difficulty, killed him there. The aſſaſſins being afraid they had gone too far, durſt not return to the king's court at Normandy, but retired to Knareſburgh in Yorkſhire; where every body avoided their company, hardly any perſon even chooſing to eat or drink with them. They at length took a voyage to Rome, and being admitted to penance by pope Alexander III. they went to Jeruſalem; where, according to the pope's order, they ſpent their lives in penitential auſterities, and died in the Black Mountain. They were buried at Jeruſalem, without the church door belonging to the Templars. King Henry was, or affected to be, much diſturbed at the news of Becket's death, and diſpatched an embaſſy to Rome to clear himſelf from the imputation of being the cauſe of it. Immediately all divine offices ceaſed in the church of Canterbury, and this for a year, excepting nine days; at the end of which, by order of the pope, it was reconſecrated. Two years after, Becket was canonized; and the following year, Henry returning to England, went to Canterbury, where he did penance as a teſtimony of his regret for the murder of Becket. When he came within ſight of the church where the archbiſhop was buried, he alighted off his horſe, and walked barefoot in the habit of a pilgrim, till he came to Becket's tomb; where, after he had proſtrated himſelf and prayed for a conſiderable time, he ſubmitted to be ſcourged by the monks, and paſſed all that day and night without any refreſhment, and kneeling upon the bare ſtone. In 1221 Becket's body was taken up, 50 years after his murder, in the preſence of king Henry III. and a great concourſe of the nobility and others, and depoſited in a rich ſhrine, erected at the expence of Stephen Langton archbiſhop of Canterbury, which was ſoon viſited from all parts, and enriched with the moſt coſtly gifts and offerings; and the miracles ſaid to be wrought at his tomb were ſo numerous, that Gervaſe of Canterbury tells us, there were two large volumes of them kept in that church. The monks uſed to raiſe his body every year; and the day on which this ceremony was performed, which was called the *day of tranſlation*, was a general holiday: every 50th year there was celebrated a jubilee to his honour, which laſted 15 days: plenary indulgences were then granted to all that viſited his tomb; and 100,000 pilgrims have been regiſtered at a time in Canterbury. The devotion towards him had quite effaced in that town the adoration of the Deity; nay, even that of the Virgin. At God's altar, for inſtance, there were offered in one year 3l. 2s. 6d. at the Virgin's, 63l. 5s. 6d. at St. Thomas's, 832l. 12s. 3d. But next year the diſproportion was ſtill greater: there was not a penny offered at God's altar; the Virgin's gained only 4l. 1s. 8d. but St. Thomas's had got for his ſhare 954l. 6s. 3d. Louis VII. of France had made a pilgrimage to this miraculous tomb, and had beſtowed on the ſhrine a jewel which was eſteemed the richeſt in Chriſtendom. Henry VIII. to whom it may eaſily be imagined how obnoxious a ſaint of this character behoved to appear, and how much contrary to all his projects for degrading the authority of the court of Rome, not only pillaged the rich ſhrine dedicated to St. Thomas, but made the ſaint himſelf be cited to appear in court, and be tried and condemned as a traitor: he ordered his name to be ſtruck out of the calendar; the office for his feſtival to be expunged from all breviaries; and his bones to be burnt, and the aſhes thrown in the air. From Mr. Thomas Warton we learn, that Becket was the ſubject of poetical legends. *The Lives of the Saints* in verſe, in Bennet's library (Numb. clxv.), contain his martyrdom and tranſlation. This manuſcript is ſuppoſed to be of the 14th century. The ſame ingenious writer informs us, from Peter de Blois, that the palace of Becket was perpetually filled with biſhops highly accompliſhed in literature, who paſſed their time there in reading, diſputing, and deciding important queſtions of the ſtate. "Theſe prelates, though men of the world, were a ſociety of ſcholars; yet very different from thoſe who frequented the univerſities, in which nothing was taught but words and ſyllables, unprofitable ſubtleties, elementary ſpeculations, and trifling diſtinctions. De Blois was himſelf emi-

nently learned, and one of the moſt diſtinguiſhed ornaments of Becket's attendants. We know that John of Saliſbury, his intimate friend, the companion of his exile, and the writer of his life, was ſcarcely exceeded by any man of his time for his knowledge in philological and polite literature."

BECKINGHAM (Charles), an Engliſh dramatic writer, was the ſon of a linen-draper in London, and born in 1699. He was educated at that great nurſery of learning Merchant-Taylors' ſchool, under the learned Dr. Smith, where he made a very great proficiency in all his ſtudies, and gave the ſtrongeſt teſtimonials of very extraordinary abilities. In poetry more particularly he very early diſcovered an uncommon genius, two dramatic pieces of his writing being repreſented on the ſtage before he had completed his 20th year: and thoſe not ſuch as required the leaſt indulgence or allowance on account of his years; but ſuch as bore evidence to a boldneſs of ſentiment, an accuracy of diction, an ingenuity of conduct, and a maturity of judgement, which would have done honour to a much more ripened age. The titles of his plays, both of which are tragedies, are, 1. *Henry IV. of France.* 2. *Scipio Africanus.* At the repreſentation of the laſt-mentioned piece, which indeed was the firſt he wrote, his ſchool-maſter Dr. Smith, as a peculiar mark of diſtinction and regard to the merit of his pupil, gave all his boys a holiday on the afternoon of the author's benefit, in order to afford an opportunity to ſuch of them as pleaſed to pay their compliments to their ſchool-fellow on that occaſion. Beſides theſe dramatic pieces, he wrote ſeveral other poems: but his genius was not permitted any very long period to expand itſelf in; for he died on the 18th of February 1730, at the age of 32.

BECKUM, a town of the biſhopric of Munſter, in Germany, ſeated at the ſource of the river Verſe, in E. long. 8. 18. N. lat. 51. 46.

BECSANGIL, anciently Bithynia, a province of Natolia in Aſia; bounded on the north by the Black Sea; on the weſt, by the Sea of Marmora; on the ſouth, by Natolia Proper; and on the eaſt, by the province of Bolli. The principal town is Burſa.

BECTASSE, an order or ſect of religious among the Turks, denominated from their founder *Bectaſh*, preacher to Sultan Amurath. All the janizaries belonging to the Porte are of the religion of Bectaſſe, being even ſaid to have derived their origin from the founder of this ſect. The habit of the Bectaſſe is white: on their heads they wear white caps of ſeveral pieces, with turbans of wool twiſted rope-faſhion. They obſerve conſtantly the hour of prayer, which they perform in their own aſſemblies, and make frequent declarations of the unity of God.

BED, a convenience for ſtretching and compoſing the body on, for eaſe, reſt, or ſleep, conſiſting generally of feathers incloſed in a ticken caſe. There are varieties of beds, as a ſtanding bed, a ſettee-bed, a tent-bed, a truckle-bed, a turn-up-bed, &c.

It was the univerſal practice of mankind in the firſt ages, to ſleep upon the ſkins of beaſts. It was originally the cuſtom alſo of the Greeks and Romans. It was particularly common with the ancient Britons before the Roman invaſion; and theſe ſkins were ſpread on the floor of their apartments. Afterwards they were changed for looſe ruſhes and heather, as the Welch a few years ago lay on the former, and the Highlanders of Scotland ſleep on the latter to this preſent moment. In proceſs of time, the Romans ſuggeſted to the interior Britons the uſe, and the introduction of agriculture ſupplied them with the means, of the greater conveniency of ſtraw beds. The beds of the Roman gentry, according to Pliny, were generally at this period filled with feathers, and thoſe of the inns with the ſoft down of reeds. But for many ages the beds of the Italians had been conſtantly compoſed of ſtraw it ſtill formed thoſe of the ſoldiers and officers at the conqueſ of Lancaſhire; and from both, our countrymen learnt thei uſe. But it appears to have been taken up only by the gen tlemen, as the common Welch had their beds thinly ſtuffe with ruſhes as late as the concluſion of the 12th century and with the gentlemen it continued many ages afterwards Straw was uſed even in the royal chambers of England as lat as the cloſe of the 13th. According to Mr. Whitaker moſ of the peaſants about Manchеſter lie on chaff at preſent, as d likewiſe the common people all over Scotland: In the High lands, heath alſo is very generally uſed as bedding even by th gentry; and the repoſe on a heath bed has been celebrated b travellers as a peculiar luxury, ſuperior to that yielded b down: In France and Italy, ſtraw beds remain general to thi day. But after the above period, beds were no longer ſuffere to reſt upon the ground. The better mode, that had anciently prevailed in the eaſt, and long before been introduced int Italy, was adopted in Britain; and they were now mounte on pedeſtals. This, however, was equally confined to th gentry: the bed ſtill continued on the floor among the com mon people. And the groſs cuſtom, that had prevailed from the beginning, was retained by the lower Britons t the laſt; and theſe ground-beds were laid along the walls o their houſes, and formed one common dormitory for all th members of the family. The faſhion continued univerſall among the inferior ranks of the Welch within theſe four o five ages, and with the more uncivilized part of the High landers down to our own times. And even at no great diſtance from Manchеſter, in the neighbouring Buxton, and within theſe 60 or 70 years, the perſons that repaired to that bath are all ſaid to have ſlept in one long chamber together; the upper part being allotted to the ladies, and the lower to the gentlemen, and only partitioned from each other by a curtain.

Dining-BED, *lectus tricliniaris*, or *diſcubitorius*, that whereon the ancients lay at meals. The dining or diſcubitory beds were four or five feet high. Three of theſe beds were ordinarily ranged by a ſquare table (whence both the table and the room where they ate were called *triclinium*) in ſuch a manner, that one of the ſides of the table remained open and acceſſible to the waiters. Each bed would hold three or four, rarely five perſons. Theſe beds were unknown before the ſecond Punic war: the Romans, till then, ſat down to eat on plain wooden benches, in imitation of the heroes of Homer, or, as Varro expreſſes it, after the manner of the Lacedemonians and Cretans. Scipio Africanus firſt made an innovation: he had brought from Carthage ſome of theſe little beds called *punicani*, or *archaici;* being of a wood common enough, very low, ſtuffed only with ſtraw or hay, and covered with goats or ſheep ſkins, *hædinis pellibus ſtrati*. In reality, there was no great difference, as to delicacy, between theſe new beds and the ancient benches; but the cuſtom of frequent bathing, which began then to obtain, by ſoftening and relaxing the body, put men on trying to reſt themſelves more commodiouſly by lying along than by ſitting down. For the ladies, it did not ſeem at firſt conſiſtent with their modeſty to adopt the mode of lying; accordingly they kept to the old cuſtom all the time of the commonwealth; but, from the firſt Cæſars, they ate on their beds. For the youth, who had not yet put on the *toga virilis*, they were long kept to the ancient diſcipline. When they were admitted to table, they only ſat on the edge of the beds of their neareſt relations. Never, ſays Suetonius, did the young Cæſars, Caius and Lucius, eat at the table of Auguſtus; but they were ſet *in imo loco*, or, as Tacitus expreſſes it, *ad lecti fulcra*. From the greateſt ſimplicity, the Romans by degrees carried their dining-beds to the moſt ſurpriſing

magnificence. Pliny aſſures us, it was no new thing to ſee them covered over with plates of ſilver, adorned with the ſoft-eſt mats, and the richeſt counterpanes. Lampidius, ſpeaking of Heliogabalus, ſays, he had beds of ſolid ſilver, *ſolido argento habuit lectos & triclinares & cubiculares*. We may add, that Pompey, in his third triumph, brought in beds of gold.—The Romans had alſo beds whereon they ſtudied, and beds whereon the dead were carried to the funeral pile.

Bed-*Moulding*, in architecture, a term uſed for thoſe members of a corniche, which are placed below the coronet; and now uſually conſiſts of an ogee, a liſt, a large boultine, and another liſt under the coronet.

Bed *of Juſtice*, in the former French cuſtoms, a throne upon which the king was ſeated when he went to the parliament. The king never held a bed of juſtice unleſs for affairs that concerned the ſtate, and then all the officers of parliament were clothed in ſcarlet robes. The revolution in France has put an end to all this.

Bed *of a Gun-Carriage*, a thick plank that lies under the gun; being, as it were, the body of the carriage.

Bed, in maſonry, a courſe or range of ſtones; and the joint of the bed is the mortar between two ſtones, placed over each other.

Bed, in gardening, ſquare or oblong pieces of ground in a garden, raiſed a little above the level of the adjoining ground, and wherein they ſow ſeeds, or plant roots.

Hot-Bed. See Hot-*Bed*.

Lords of the Bed-*Chamber*, in the Britiſh court, are 12 noblemen who attend in their turns, each a month; during which time they lie in the king's bed-chamber, and wait on him when he dines in private. Their ſalary is 1000l. *per annum*.

BEDA, commonly called *Venerable Bede*, one of our moſt ancient hiſtorians, was born in the year 672, in the neighbourhood of Weremouth, in the biſhopric of Durham. He was educated by the abbot Benedict in the monaſtery of St. Peter, near the mouth of the river Wyre. At the age of 19 he was ordained deacon, and prieſt in the year 702. About this time he was invited to Rome by Pope Sergius; but there is no ſufficient reaſon to believe that he accepted the invitation. In the year 731 he publiſhed his Eccleſiaſtical Hiſtory; a work of ſo much merit, notwithſtanding the legendary tales it contains, that it were alone ſufficient to immortalize the author. He died in the year 735 of a lingering conſumption, probably occaſioned by a ſedentary life, and a long uninterrupted application to ſtudy and literary compoſitions, of which he left an incredible number. He was buried in the church of his convent at Jarrow; but his bones were afterwards removed to Durham, and there depoſited in the ſame coffin with thoſe of St. Cuthbert. Bede was undoubtedly a ſingular phenomenon in an ignorant and illiterate age. His learning, for the times, was extenſive, his application incredible, his piety exemplary, and his modeſty exceſſive. He was univerſally admired, conſulted, and eſteemed, during his life; and his writings are deſervedly conſidered as the foundation of our eccleſiaſtical hiſtory. His language is neither elegant nor pure, but perſpicuous and eaſy.—All his works are in Latin. The firſt general collection of them appeared at Paris in 1544, in three volumes in folio. They were printed again at the ſame place in 1554, in eight volumes. They were alſo publiſhed in the ſame ſize and number of volumes at Baſil in 1563, reprinted at Cologne in 1612, and at the ſame place in 1688. Beſides this general collection, there are ſeveral of his compoſitions, which have been printed ſeparately, or amongſt the collections of the writings of ancient authors; and there are ſeveral manuſcripts aſcribed to him, which are preſerved in the different libraries in our two univerſities.

BEDALL, a town in the north riding of Yorkſhire. Through this town paſſes a Roman cauſeway to Richmond, Barnard-Caſtle, &c. The parts adjacent are noted for hunting and road horſes. W. long. 31. 0. N. lat. 54. 30.

BEDARIEUX, or Bec d'Arieux, a town of France in the department of Herault and late province of Languedoc; ſeated on the river Obe, in E. long. 3. 24. N. lat. 43. 29.

BEDEL. See Beadle.

Bedel, a ſmall town in the north riding of Yorkſhire, ſeated on a little brook, in W. long. 1. 30. N. lat. 54. 30.

BEDELL (Dr. William), a learned prelate, born in Eſſex in 1570. He went with Sir Henry Wotton the Engliſh ambaſſador to the republic of Venice, as his chaplain, in 1604; and continuing eight years in that city, contracted an intimate acquaintance with the famous Father Paul, of whom he learned Italian ſo well as to tranſlate the Engliſh Common-Prayer Book into that language: in return he drew up an Engliſh grammar for Father Paul, who declared he had learned more from him in all parts of divinity than from any one beſide. He was accordingly much concerned when Bedell left Venice; and at his departure preſented him with his picture, the MSS. of his Hiſtory of the Council of Trent, his Hiſtory of the Interdict and Inquiſition, with other literary donations. In 1629, he obtained the biſhopric of Kilmore and Adragh in Ireland; and finding theſe dioceſes in great diſorder, applied himſelf vigorouſly to reform the abuſes there. He was no perſecutor of Papiſts, but laboured with great ſucceſs to convert the better ſort of the Popiſh clergy: he procured an Iriſh tranſlation of the Common-Prayer Book, which he cauſed to be read in his cathedral every Sunday; and the New Teſtament having been tranſlated by Archbiſhop Daniel, he procured one of the Old Teſtament; which he having been prevented from printing himſelf, was afterwards executed at the expence of the great Mr. Robert Boyle. He publiſhed, in 1624, a controverſial book againſt the Roman-Catholics, which he dedicated to Charles prince of Wales; and aſſiſted the archbiſhop of Spalatro in finiſhing his famous work *De Republica Eccleſiaſtica*. When the bloody rebellion broke out in Ireland in Oct. 1641, the biſhop at firſt did not feel the violence of its effects; for the very rebels had conceived a great veneration for him, and they declared he ſhould be the laſt Engliſhman they would drive out of Ireland. His was the only houſe in the county of Cavan that was unviolated, and it was filled with the people who fled to him for ſhelter. About the middle of December, however, the rebels, purſuant to orders received from their council of ſtate at Kilkenny, required him to diſmiſs the people that were with him; which he refuſed to do, declaring he would ſhare the ſame fate with the reſt. Upon this they ſeized him, his two ſons, and Mr. Clogy who had married his daughter-in-law, and carried them priſoners to the caſtle of Cloughboughter, ſurrounded by a deep water, where they put them all, except the biſhop, in irons; after ſome time, however, this part of their ſeverity was abated. After being confined for about three weeks, the biſhop and his two ſons, and Mr Clogy, were exchanged for ſome of the principal rebels: but the biſhop died ſoon after, on the 7th of February 1642, his death being chiefly occaſioned by his late impriſonment, and the weight of ſorrows which lay upon his mind. The Iriſh did him unuſual honours at his burial; for the chief of the rebels gathered their forces together, and with them accompanied his body to the grave.

BEDER, a ſtrong town of Aſia, in the dominions of the Great Mogul. E. long. 95. 10. N. lat. 16. 50.

BEDFORD, the county town of Bedfordſhire in England, ſeated on both ſides of the river Ouſe, over which there is a ſtone bridge; in W. long. 0. 20. N. lat. 52. 6. It is an ancient town, and pleaſantly ſituated, but not very large

nor well built; though the buildings are much improved of late, and the river made navigable. It ſends two members to parliament, and gives title of *duke* to the noble family of Ruſſel. At this place the Britons were overthrown in a great battle in 572, by Cuthwulf the Saxon king; and here was a ſtrong caſtle, built in the time of the Normans by Pagan de Beauchamp, the third baron of Bedford. It was reduced by king Stephen, after a long ſiege; and afterwards taken by king John, after a ſiege of 60 days, from Fulco de Brent, who rebelled againſt his ſovereign, notwithſtanding he had taken this caſtle before from the barons, and had it beſtowed upon him by the king. The town is a very ancient corporation, and has long ſent members to parliament. It is governed at preſent by a mayor, recorder, two bailiffs, twelve aldermen, two chamberlains, a town clerk, and three ſerjeants. The neighbouring country is very fruitful in wheat, great quantities of which are carried from hence to Hitchen and Hertford markets, ſold, ground, and conveyed to London. The town has five churches, a free-ſchool, and ſeveral hoſpitals, and enjoys a good trade in corn by the way of Lynn. When the river is ſwelled by rains, eſpecially in winter, it is uſual in Cambridgeſhire to ſay, *the bailiff of Bedford is coming*; meaning, that it is going to lay their fens under water.

BEDFORDSHIRE, a ſmall inland county of England. When the Romans landed in Britain, 55 years before Chriſt, it was included in the diſtrict inhabited by the Catieuchlani, whoſe chief or governor Caſſibelinus headed the forces of the whole iſland againſt Cæſar, and the year following was totally defeated. In 310 the emperor Conſtantine divided Britain into five Roman provinces, when this county was included in the third diviſion, called *Flavia Cæſarienſis*; in which ſtate it continued 426 years, when the Romans quitted Britain. At the eſtabliſhment of the kingdom of Mercia (one of the diviſions of the Saxon heptarchy) it was conſidered as part of that kingdom; and ſo continued from 582 to 827, when with the other petty kingdoms of the iſland it became ſubject to the Weſt Saxons under Egbert, and the whole was named *England*. In 889, Alfred held the ſovereignty, when England was divided into counties, hundreds, and tythings, and Bedfordſhire firſt received its preſent name. It is in the Norfolk circuit, the province of Canterbury, and biſhopric of Lincoln. Its form is oval, being about 33 miles long, 16 broad, and nearly 73 in circumference; containing an area of about 323 ſquare miles, or 260,000 ſquare acres. It ſupplies 400 men to the national militia. It contains 124 pariſhes, 58 vicarages, and 10 market-towns, *viz.* Bedford, Ampthill, Biggleſwade, Dunſtable, Leighton, Beaudeſart, Luton, Potton, Shefford, Tuddington, and Woburn, and 59 villages. The inhabitants by computation are 67,350, and it has 7,294 houſes that pay taxes. It is divided into nine hundreds, ſends two members to parliament, and pays ſeven parts of 513 of the land-tax. Its principal river, the Ouſe, is navigable to Bedford; and divides the county into two parts, of which that to the ſouth is the moſt conſiderable. In its courſe, which is very meandering, it receives ſeveral ſmall ſtreams; the principal one is the Ivel, which takes its riſe in the ſouthern part of the county. The air is healthy, and the ſoil in general a deep clay. The north ſide of the Ouſe is fruitful and woody, but the ſouth ſide is leſs fertile; yet producing great quantities of wheat and barley, excellent in their kind, and woad for dyers. The ſoil yields plenty of fuller's-earth for our woollen manufactory. The chief manufactures of the county are thread, lace, and ſtraw ware. In this county there are many remains of Roman, Saxon, and Norman antiquities; but few Roman ſtations, *viz.* Sandy near Potton, and the Magiovinum of Antoninus, by others ſuppoſed to be the ancient Salenæ, containing 30 acres, where many urns, coins, &c. have been dug up. Another at Madining-bowre, or Maiden-bower, one mile from Dunſtable, containing about nine acres, which Camden ſuppoſes to have been a Roman ſtation, from the coins of the emperors having been frequently dug up there, and calls it *Magintum*. Leighton Beaudeſart is ſuppoſed to have been a Roman camp, and another is at Arleſey near Shefford, and a Roman amphitheatre may be traced near Bradford Magna. The Roman road, Icknield-ſtreet, croſſes this county, entering at Leighton Beaudeſart, from whence it paſſes Dunſtable, where it inclines northward over Wardon-hills to Baldock in Hertfordſhire. The Watling-ſtreet enters this county near Luton from St. Alban's, paſſes a little north of Dunſtable, where it croſſes the Icknield-ſtreet, and from thence to Stoney Stratford in Buckinghamſhire. A Roman road alſo enters near Potton, paſſes on to Sandy, and from thence to Bedford, where it croſſes the Ouſe, and proceeds to Newport Pagnell in Buckinghamſhire. The following antiquities in this county are worthy of notice: Bedford Bridge and Priory; Chickſand Abbey near Shefford; Dunſtable Priory near Luton; Eaton Park Houſe, or Eaton Bray; Five Knolls near Dunſtable; Newnham Priory near Bedford; Northill Church, three miles from Biggleſwade; Summeris Tower near Luton; Wardon Abbey near Shefford; Woburn Abbey; Woodhill Caſtle, or Oddhill Caſtle, near Harewood.

BEDLOE (William), otherwiſe called the *Captain*, was an infamous adventurer of low birth, who had travelled over a great part of Europe under different names and diſguiſes, and had paſſed among ſeveral ignorant perſons for a man of rank and fortune. Encouraged by the ſucceſs of Oates, he turned evidence, gave an account of Godfrey's murder, and added many circumſtances to the narrative of the former. Theſe villains had the boldneſs to accuſe the Queen of entering into a conſpiracy againſt the King's life. A reward of 500l. was voted to Bedloe by the Commons. He is ſaid to have aſſerted the reality of the plot on his death-bed: but it abounds with abſurdity, contradiction, and perjury; and ſtill remains one of the greateſt problems in the Britiſh annals. He died at Briſtol the 20th of Auguſt 1680. Giles Jacob informs us, that he was author of a play called *The Excommunicated Prince, or the Falſe Relict*, 1679. The printer of it having, without the author's knowledge, added a ſecond title, and called it *The Popiſh Plot in a Play*, greatly excited the curioſity of the public, who were however much diſappointed when they found the plan of the piece to be founded on a quite different ſtory. Anth. à Wood will not allow Bedloe the merit of this play; but aſſerts that it was written partly, if not entirely, by one Walter, of Jeſus College, Oxford.

BEDOUINS, or Bedouis, a modern appellation of the wild Arabs, whether in Aſia or Africa. When ſpeaking of the Arabs, we ſhould diſtinguiſh whether they are cultivators or paſtors; for this difference in their mode of life occaſions ſo great a one in their manners and genius, that they become almoſt foreign nations with reſpect to each other. In the former caſe, leading a ſedentary life, attached to the ſame ſoil, and ſubject to regular governments, the ſocial ſtate in which they live very nearly reſembles our own. Such are the inhabitants of the Yemen; and ſuch alſo are the deſcendants of thoſe ancient conquerors, who have either entirely, or in part, given inhabitants to Syria, Egypt, and the Barbary ſtates. In the ſecond inſtance, having only a tranſient intereſt in the ſoil, perpetually removing their tents from one place to another, and under ſubjection to no laws, their mode of exiſtence is neither that of poliſhed nations nor of ſavages; and therefore more particularly merits our attention. Such are the Bedouins, or inhabitants of the vaſt deſerts which extend from the confines of Perſia to Morocco. Though divided into independent communities or tribes, not unfrequently hoſtile to

each other, they may ſtill be conſidered as forming one nation. The reſemblance of their language is a manifeſt token of this relationſhip. The only difference that exiſts between them is, that the African tribes are of a leſs ancient origin, being poſterior to the conqueſt of theſe countries by the khalifs or ſucceſſors of Mahomet; while the tribes of the deſert of Arabia, properly ſo called, have deſcended by an uninterrupted ſucceſſion from the remoteſt ages. To theſe the orientals are accuſtomed to appropriate the name of *Arabs*, as being the moſt ancient and the pureſt race. The term *Bedaoui* is added as a ſynonimous expreſſion, ſignifying, "inhabitant of the deſert."

It is by no means without reaſon that the inhabitants of the deſert boaſt of being the pureſt and the beſt preſerved race of all the Arab tribes: for never have they been conquered, nor have they mixed with any other people by making conqueſts; for thoſe by which the general name of Arabs has been rendered famous, really belong only to the tribes of the Hedjas and the Yemen. Thoſe who dwelt in the interior of the country, never emigrated at the time of the revolution effected by Mahomet; or if they did take any part in it, it was confined to a few individuals, detached by motives of ambition. Thus we find the prophet in his Koran continually ſtyling the Arabs of the deſert *rebels* and *infidels*; nor has ſo great a length of time produced any very conſiderable change. We may aſſert they have in every reſpect retained their primitive independence and ſimplicity.

That theſe people lead a wandering and vagrant ſort of life ariſes from the very nature of their deſerts. To paint to himſelf theſe deſerts (ſays M. Volney), the reader muſt imagine a ſky almoſt perpetually inflamed, and without clouds, immenſe and boundleſs plains, without houſes, trees, rivulets, or hills, where the eye frequently meets nothing but an extenſive and uniform horizon like the ſea, though in ſome places the ground is uneven and ſtony. Almoſt invariably naked on every ſide, the earth preſents nothing but a few wild plants thinly ſcattered, and thickets, whoſe ſolitude is rarely diſturbed but by antelopes, hares, locuſts, and rats. Such is the nature of nearly the whole country, which extends ſix hundred leagues in length and three hundred in breadth, and ſtretches from Aleppo to the Arabian ſea, and from Egypt to the Perſian gulph. It muſt not, however, be imagined that the ſoil in ſo great an extent is every where the ſame; it varies conſiderably in different places. On the frontiers of Syria, for example, the earth is in general fat and cultivable, nay even fruitful. It is the ſame alſo on the banks of the Euphrates: but in the internal parts of the country, and towards the ſouth, it becomes white and chalky, as in the parallel of Damaſcus; rocky, as in the Tih and the Hedjaz; and a pure ſand, as to the eaſtward of the Yemen. This variety in the qualities of the ſoil is productive of ſome minute differences in the condition of the Bedouins. For inſtance, in the more ſterile countries, that is, thoſe which produce but few plants, the tribes are feeble and very diſtant; which is the caſe in the deſert of Suez, that of the Red Sea, and the interior of the great deſert called the *Najd*. When the ſoil is more fruitful, as between Damaſcus and the Euphrates, the tribes are more numerous and leſs remote from each other; and, laſtly, in the cultivable diſtricts, ſuch as the Pachalics of Aleppo, the Hauran, and the neighbourhood of Gaza, the camps are frequent and contiguous. In the former inſtances, the Bedouins are purely paſtors, and ſubſiſt only on the produce of their herds, and on a few dates and fleſh meat, which they eat either freſh or dried in the ſun and reduced to a powder. In the latter, they ſow ſome land, and add cheeſe, barley, and even rice, to their fleſh and milk.

Wherever the ſoil is ſtony and ſandy, as in the Tih, the Hedjaz, and the Najd, the rains make the ſeeds of the wild plants ſhoot, and revive the thickets, producing ranunculi, wormwood, and kali. They cauſe marſhes in the lower grounds, which produce reeds and graſs; and the plain aſſumes a tolerable degree of verdure. This is the ſeaſon of abundance both for the herds and their maſters; but on the return of the heats, every thing is parched up, and the earth converted into a grey and fine duſt, preſents nothing but dry ſtems as hard as wood, on which neither horſes, oxen, nor even goats, can feed. In this ſtate the deſert would become uninhabitable, and muſt be totally abandoned, had not Nature formed an animal no leſs hardy and frugal than the ſoil is ſterile and ungrateful. No creature ſeems ſo peculiarly fitted to the climate in which it exiſts. Deſigning the camel to dwell in a country where he can find little nouriſhment, Nature (ſays M. Volney) has been ſparing of her materials in the whole of his formation. She has not beſtowed on him the plump fleſhineſs of the ox, horſe, or elephant; but limiting herſelf to what is ſtrictly neceſſary, ſhe has given him a ſmall head without ears at the end of a long neck without fleſh. She has taken from his legs and thighs every muſcle not immediately requiſite for motion; and, in ſhort, has beſtowed on his withered body only the veſſels and tendons neceſſary to connect its frame together. She has furniſhed him with a ſtrong jaw, that he may grind the hardeſt aliments; but leſt he ſhould conſume too much, ſhe has ſtraitened his ſtomach, and obliged him to chew the cud. She has lined his foot with a lump of fleſh, which ſliding in the mud, and being no way adapted to climbing, fits him only for a dry, level, and ſandy ſoil like that of Arabia: ſhe has evidently deſtined him likewiſe to ſlavery, by refuſing him every ſort of defence againſt his enemies. Deſtitute of the horns of the bull, the hoof of the horſe, the tooth of the elephant, and the ſwiftneſs of the ſtag, how can the camel reſiſt or avoid the attacks of the lion, the tiger, or even the wolf? To preſerve the ſpecies, therefore, nature has concealed him in the depth of the vaſt deſerts, where the want of vegetables can attract no game, and whence the want of game repels every voracious animal. Tyranny muſt have expelled man from the habitable parts of the earth before the camel could have loſt his liberty. Become domeſtic, he has rendered habitable the moſt barren ſoil the world contains. He alone ſupplies all his maſter's wants. The milk of the camel nouriſhes the family of the Arab under the varied forms of curd, cheeſe, and butter; and they often feed upon his fleſh. Slippers and harneſs are made of his ſkin, tents and clothing of his hair. Heavy burdens are tranſported by his means; and when the earth denies forage to the horſe, ſo valuable to the Bedouin, the ſhe camel ſupplies that deficiency by her milk—at no other coſt, for ſo many advantages, than a few ſtalks of brambles or wormwood and pounded date kernels. So great is the importance of the camel to the deſert, that were it deprived of that uſeful animal, it muſt infallibly loſe every human inhabitant.

The ſituation in which nature has placed the Bedouins, is ſuch as to make of them a race of men equally ſingular in their phyſical and moral character. This ſingularity is ſo ſtriking, that even their neighbours the Syrians regard them as extraordinary beings; eſpecially thoſe tribes which dwell in the depths of the deſerts, ſuch as the Aniza, Kaibar, Tai, and others, which never approach the towns. When in the time of Shaik Daher, ſome of their horſemen came as far as Acre, they excited the ſame curioſity there, as a viſit from the ſavages of America would among us. Every body viewed with ſurpriſe theſe men, who were more diminutive, meagre, and ſwarthy, than any of the known Bedouins. Their withered legs were only compoſed of tendons, and had no calves. Their bellies ſeemed to cling to their backs, and their hair was frizzled almoſt as much as that of the negroes. They on the other hand were no leſs aſtoniſhed at every thing they ſaw; they could neith-

conceive how the houſes and minarets could ſtand erect, nor how men ventured to dwell beneath them, and always in the ſame ſpot; but above all, they were in an ecſtacy on beholding the ſea, nor could they comprehend what that deſert of water could be.

We may imagine that the Arabs of the frontiers are not ſuch novices; there are even ſeveral ſmall tribes of them, who living in the midſt of the country, as in the valley of Bekaa, that of the Jordan, and in Paleſtine, approach nearer to the condition of the peaſants; but theſe are deſpiſed by the others, who look upon them as baſtard Arabs and Rayas, or ſlaves of the Turks.

In general, the Bedouins are ſmall, meagre, and tawny; more ſo, however, in the heart of the deſert than on the frontiers of the cultivated country; but they are always of a darker hue than the neighbouring peaſants. They alſo differ among themſelves in the ſame camp; and M. Volney remarked, that the ſhaiks, that is, the rich, and their attendants, were always taller and more corpulent than the common claſs. He has ſeen ſome of them above five feet five and ſix inches high; though in general they do not (he ſays) exceed five feet two inches. This difference can only be attributed to their food, with which the former are ſupplied more abundantly than the latter: and the effects of this are equally evident in the Arabian and Turkmen camels; for theſe latter, dwelling in countries rich in forage, are become a ſpecies more robuſt and fleſhy than the former. It may likewiſe be affirmed, that the lower claſs of Bedouins live in a ſtate of habitual wretchedneſs and famine. It will appear almoſt incredible to us, but it is an undoubted fact, that the quantity of food uſually conſumed by the greateſt part of them does not exceed ſix ounces a day. This abſtinence is moſt remarkable among the tribes of the Najd and the Hedjaz. Six or ſeven dates ſoaked in melted butter, a little ſweet milk or curds, ſerve a man a whole day; and he eſteems himſelf happy when he can add a ſmall quantity of coarſe flour or a little ball of rice. Meat is reſerved for the greateſt feſtivals; and they never kill a kid but for a marriage or a funeral. A few wealthy and generous ſhaiks alone can kill young camels, and eat baked rice with their victuals. In times of dearth, the vulgar, always half famiſhed, do not diſdain the moſt wretched kinds of food; and eat locuſts, rats, lizards, and ſerpents broiled on briars. Hence are they ſuch plunderers of the cultivated lands and robbers on the high-roads: hence alſo their delicate conſtitution and their diminutive and meagre bodies, which are rather active than vigorous. It has been idly alleged by ſome, that their evacuations of every kind, even perſpiration, are extremely ſmall; and their blood ſo deſtitute of ſeroſity, that nothing but the greateſt heat can preſerve its fluidity. This, however, does not prevent them from being tolerably healthy to all appearance; for maladies are leſs frequent among them than among the inhabitants of the cultivated parts of the country.

From theſe facts however we are by no means juſtified in concluding that the frugality of the Bedouins is a virtue purely of choice, or even of climate. The extreme heat in which they live unqueſtionably facilitates their abſtinence, by deſtroying that activity which cold gives to the ſtomach. Their being habituated alſo to ſo ſparing a diet, by hindering the dilatation of the ſtomach, becomes doubtleſs a means of their ſupporting ſuch abſtemiouſneſs; but the chief and primary motive of this habit is with them, as with the reſt of mankind, the neceſſity of the circumſtances in which they are placed, whether from the nature of the ſoil, as has been before explained, or that ſtate of ſociety in which they live, and which remains now to be inquired into.

We have already remarked, that the Bedouin Arabs are divided into tribes, which conſtitute ſo many diſtinct nations. Each of theſe tribes appropriates to itſelf a tract of land forming its domain; in this they do not differ from cultivating nations, except that their territory requires a greater extent, in order to furniſh ſubſiſtence for their herds throughout the year. Each tribe is collected in one or more camps which are diſperſed through the country, and which make a ſucceſſive progreſs over the whole, in proportion as it is exhauſted by the cattle; hence it is, that within a great extent a few ſpots only are inhabited, which vary from one day to another; but as the entire ſpace is neceſſary for the annual ſubſiſtence of the tribe, whoever encroaches on it is deemed a violator of property; this is with them the law of nations. If, therefore, a tribe, or any of its ſubjects, enter upon a foreign territory, they are treated as enemies and robbers, and a war breaks out. Now, as all the tribes have affinities with each other by alliances of blood or conventions, leagues are formed, which render theſe wars more or leſs general. The manner of proceeding on ſuch occaſions is very ſimple. The offence made known, they mount their horſes and ſeek the enemy; when they meet, they enter into a parley, and the matter is frequently made up; if not, they attack either in ſmall bodies, or man to man. They encounter each other at full ſpeed with fixed lances, which they ſometimes dart, notwithſtanding their length, at the flying enemy: the victory is rarely conteſted; it is decided by the firſt ſhock, and the vanquiſhed take to flight full gallop over the naked plain of the deſert. Night generally favours their eſcape from the conquerors. The tribe which has loſt the battle ſtrikes its tents, removes to a diſtance by forced marches, and ſeeks an aſylum among its allies. The enemy, ſatisfied with their ſucceſs, drive their herds farther on, and the fugitives ſoon after return to their former ſituation. But the ſlaughter made in theſe engagements frequently ſows the ſeeds of hatred and perpetuates theſe diſſenſions. The intereſt of the common ſafety has for ages eſtabliſhed a law among them, which decrees that the blood of every man who is ſlain muſt be avenged by that of his murderer. This vengeance is called *Tar*, or retaliation; and the right of exacting it devolves on the neareſt of kin to the deceaſed. So nice are the Arabs on this point of honour, that if any one neglects to ſeek his retaliation he is diſgraced for ever. He therefore watches every opportunity of revenge: if his enemy periſhes from any other cauſe, ſtill he is not ſatisfied, and his vengeance is directed againſt the neareſt relation. Theſe animoſities are tranſmitted as an inheritance from father to children, and never ceaſe but by the extinction of one of the families, unleſs they agree to ſacrifice the criminal, or *purchaſe the blood* for a rated price, in money or in flocks. Without this ſatisfaction, there is neither peace, nor truce, nor alliances, between them, nor ſometimes even between whole tribes: *There is blood between us*, ſay they on every occaſion; and this expreſſion is an unſurmountable barrier. Such accidents being neceſſarily numerous in a long courſe of time, the greater part of the tribes have ancient quarrels, and live in an habitual ſtate of war; which, added to their way of life, renders the Bedouins a military people, though they have made no great progreſs in war as an art.

The form of their camps is a kind of irregular circle, compoſed of a ſingle row of tents, with greater or leſs intervals. Theſe tents, made of goat or camel's hair, are black or brown, in which they differ from thoſe of the Turkmen, which are white. They are ſtretched on three or four pickets, only five or ſix feet high, which gives them a very flat appearance; at a diſtance, one of theſe camps ſeems only like a number of black ſpots; but the piercing eye of the Bedouin is not to be deceived. Each tent inhabited by a family is divided by a curtain into two apartments, one of which is appropriated to the women. The empty ſpace within the large circle ſerves to

old their cattle every evening. They never have any intrenchments; their only advanced guards and patroles are dogs; their horses remain saddled and ready to mount on the first alarm; but as there is neither order nor regularity, these camps, always easy to surprise, afford no defence in case of an attack: accidents, therefore, very frequently happen, and cattle are carried off every day; a species of marauding war in which the Arabs are very expert.

Those tribes which live in the vicinity of the Turks, however, are still more accustomed to attacks and alarms; for these strangers, arrogating to themselves, in right of conquest, the property of the whole country, treat the Arabs as rebel vassals, or as turbulent and dangerous enemies. On this principle, they never cease to wage secret or open war against them. The pachas study every occasion to harass them. Sometimes they contest with them a territory which they had let to them, and at others demand a tribute which they never agreed to pay. Should a family of shaiks be divided by interest or ambition, they alternately succour each party, and conclude by the destruction of both. Frequently too they poison or assassinate those chiefs whose courage or abilities they dread, though they should even be their allies. The Arabs, on their side, regarding the Turks as usurpers and treacherous enemies, watch every opportunity to do them injury. Unfortunately, their vengeance falls oftener on the innocent than the guilty. The harmless peasant generally suffers for the offences of the soldier. On the slightest alarm, the Arabs cut their harvests, carry off their flocks, and intercept their communication and commerce. The peasant calls them thieves, and with reason; but the Bedouins claim the right of war, and perhaps they also are not in the wrong. However this may be, these depredations occasion a misunderstanding between the Bedouins and the inhabitants of the cultivated country, which renders them foes to each other.

Such then is the external situation of the Arabs. It is subject to great vicissitudes, according to the good or bad conduct of their chiefs. Sometimes a feeble tribe raises and aggrandizes itself, whilst another, which was powerful, falls into decay, or perhaps is entirely annihilated; not that all its members perish, but they incorporate themselves with some other; and this is the consequence of the internal constitution of the tribes. Each tribe is composed of one or more principal families, the members of which bear the title of shaiks, *i. e.* chiefs or lords. These families have a great resemblance to the patricians of Rome and the nobles of modern Europe. One of the shaiks has the supreme command over the others. He is the general of their little army; and sometimes assumes the title of *emir*, which signifies commander and prince. The more relations, children, and allies, he has, the greater is his strength and power. To these he adds particular adherents, whom he studiously attaches to him, by supplying all their wants. But besides this, a number of small families, who, not being strong enough to live independent, stand in need of protection and alliances, range themselves under the banners of this chief. Such an union is called *kabila*, or tribe. These tribes are distinguished from each other by the name of their respective chiefs, or by that of the ruling family; and when they speak of any of the individuals who compose them, they call them the *children* of such a chief, though they may not be all really of his blood, and he himself may have been long since dead. Thus they say, *Beni Temin*, *Oulad Tai*, the children of Temin and of Tai. This mode of expression is even applied, by metaphor, to the names of countries: the usual phrase for denoting its inhabitants being to call them *the children of such a place*. Thus the Arabs say, *Oulad Masr*, the Egyptians; *Oulad Sham*, the Syrians: they would also say, *Oulad Fransa*, the French; *Oulad Moskou*, the Russians; a remark which to ancient history is of some degree of importance.

This society has a form of government at once republican, aristocratical, and even despotic, without exactly corresponding with any of these forms. It is republican, inasmuch as the people have a great influence in all affairs, and as nothing can be transacted without the consent of a majority. It is aristocratical, because the families of the shaiks possess some of the prerogatives which every where accompany power; and, lastly, it is despotic, because the principal shaik has an indefinite and almost absolute authority, which, when he happens to be a man of credit and influence, he may even abuse; but the state of these tribes confines even this abuse to very narrow limits: for, if a chief should commit an act of injustice; if, for example, he should kill an Arab, it would be almost impossible for him to escape punishment; the resentment of the offended party would pay no respect to his dignity; the law of retaliation would be put in force; and, should he not pay the blood, he would be infallibly assassinated, which, from the simple and private life the shaiks lead in their camps, would be no difficult thing to effect. If he harasses his subjects by severity, they abandon him and go over to another tribe. His own relations take advantage of his misconduct to depose him and advance themselves to his station. He can have no resource in foreign troops; his subjects communicate too easily with each other to render it possible for him to divide their interests and form a faction in his favour. Besides, how is he to pay them, since he receives no kind of taxes from the tribe; the wealth of the greater part of his subjects being limited to absolute necessaries, and his own confined to very moderate possessions, and those too encumbered with heavy expences?

The principal shaik in every tribe, in fact, defrays the charges of all who arrive at or leave the camp. He receives the visits of the allies, and of every person who has business with them. Adjoining to his tent is a large pavilion for the reception of all strangers and passengers. There are held frequent assemblies of the shaiks and principal men, to determine on encampments and removals; on peace and war; on the differences with the Turkish governors and the villages; and the litigations and quarrels of individuals. To this crowd, which enters successively, he must give coffee, bread baked on the ashes, rice, and sometimes roasted kid or camel; in a word, he must keep open table; and it is the more important to him to be generous, as this generosity is closely connected with matters of the greatest consequence. On the exercise of this depend his credit and his power. The famished Arab ranks the liberality which feeds him before every virtue: nor is this prejudice without foundation; for experience has proved that covetous chiefs never were men of enlarged views: hence the proverb, as just as it is brief, *A close fist, a narrow heart.* To provide for these expences, the shaik has nothing but his herds, a few spots of cultivated ground, the profits of his plunder, and the tribute he levies on the high-roads; the total of which is very inconsiderable. The shaik with whom M. Volney resided in the country of Gaza, about the end of 1784, passed for one of the most powerful of those districts; yet it did not appear to our author that his expenditure was greater than that of an opulent farmer. His personal effects, consisting in a few palisses, carpets, arms, horses, and camels, could not be estimated at more than 50,000 livres (a little above 2000l.); and it must be observed, that in this calculation four mares of the breed of racers are valued at 6000 livres (250l.), and each camel at 10l. sterling. We must not therefore, when we speak of the Bedouins, affix to the words *Prince* and *Lord* the ideas they usually convey; we should come nearer the truth by comparing them to substantial farmers in moun-

tainous countries, whoſe ſimplicity they reſemble in their dreſs, as well as in their domeſtic life and manners. A ſhaik who has the command of 500 horſe, does not diſdain to ſaddle and bridle his own, nor to give him barley and chopped ſtraw. In his tent, his wife makes the coffee, kneads the dough, and ſuperintends the dreſſing of the victuals. His daughters and kinſwomen waſh the linen, and go with pitchers on their head and veils over their faces to draw water from the fountain. Theſe manners agree preciſely with the deſcriptions in Homer, and the hiſtory of Abraham recited in Geneſis.

The ſimplicity, or perhaps more properly the poverty, of the lower claſs of the Bedouins is proportionate to that of their chiefs. All the wealth of a family conſiſts of moveables; of which the following is a pretty exact inventory: a few male and female camels; ſome goats and poultry; a mare and her bridle and ſaddle; a tent; a lance 16 feet long; a crooked ſabre; a ruſty muſket with a flint or matchlock; a pipe; a portable mill; a pot for cooking; a leathern bucket; a ſmall coffee roaſter; a mat; ſome clothes; a mantle of black wool; and a few glaſs or ſilver rings, which the women wear upon their legs and arms. If none of theſe are wanting, their furniture is complete. But what the poor man ſtands moſt in need of, and what he takes moſt pleaſure in, is his mare; for this animal is his principal ſupport. With his mare the Bedouin makes his excurſions againſt hoſtile tribes, or ſeeks plunder in the country and on the highways. The mare is preferred to the horſe, becauſe ſhe is more docile, and yields milk, which on occaſion affords her maſter both drink and nouriſhment.

The Arabs, thus confined to the mere neceſſities of life, have as little induſtry as their wants are few; all their arts conſiſt in weaving their clumſy tents, and in making mats and butter. Their whole commerce only extends to the exchanging camels, kids, ſtallions, and milk; for arms, clothing, a little rice or corn, and money which they bury. They are totally ignorant of all ſcience; and have not even any idea of aſtronomy, geometry, or medicine. They have not a ſingle book; and nothing is ſo uncommon among the ſhaiks as to know how to read. All their literature conſiſts in reciting tales and hiſtories in the manner of the Arabian Nights Entertainments. They have a peculiar paſſion for ſuch ſtories, and employ in them almoſt all their leiſure, of which they have a great deal. In the evening they ſeat themſelves on the ground, at the threſhold of their tents, or under cover, if it be cold; and there, ranged in a circle round a little fire of dung, their pipes in their mouths, and their legs croſſed, they ſit a while in ſilent meditation, till on a ſudden one of them breaks forth with, *Once upon a time*,—and continues to recite the adventures of ſome young ſhaik and female Bedouin: he relates in what manner the youth firſt got a ſecret glimpſe of his miſtreſs; and how he became deſperately enamoured of her: he minutely deſcribes the lovely fair; boaſts her black eyes, as large and ſoft as thoſe of the gazelle; her languid and empaſſioned looks, her arched eyebrows, reſembling two bows of ebony; her waiſt ſtraight and ſupple as a lance: he forgets not her ſteps, light as thoſe of the *young filley*; nor her eye-laſhes, blackened with *kohl*; nor her lips painted blue; nor her nails, tinged with the golden coloured *hezna*; nor her breaſts, reſembling two pomegranates; nor her words, ſweet as honey. He recounts the ſufferings of the young lover, *ſo waſted with deſire and paſſion, that his body no longer yields any ſhadow*. At length, after detailing his various attempts to ſee his miſtreſs, the obſtacles of the parents, the invaſions of the enemy, the captivity of the two lovers, &c. he terminates, to the ſatisfaction of the audience, by reſtoring them, united and happy, to the paternal tent, and by receiving the tribute paid to his eloquence, in the *Ma cha allah* (an exclamation of praiſe, equivalent to *admirably well!*) he has merited. The Bedouins have likewiſe their love ſongs, which have more ſentiment and nature in them than thoſe of the Turks and inhabitants of the towns; doubtleſs, becauſe the former, whoſe manners are chaſte, know what love is; while the latter are abandoned to debauchery.

Since the condition of the Bedouins, eſpecially in the depths of the deſert, reſembles in many reſpects that of the ſavages of America, we are naturally inclined to wonder why they have not the ſame ferocity; why, though they ſo often experience the extremity of hunger, the practice of devouring human fleſh was never heard of among them; and why, in ſhort, their manners are ſo much more ſociable and mild. The following reaſons are propoſed by M. Volney as the true ſolution of this difficulty. It ſeems at firſt view (he obſerves), that America, being rich in paſturage, lakes, and foreſts, is more adapted to the paſtoral mode of life than to any other. But if we conſider that theſe foreſts, by affording an eaſy refuge to animals, protect them more ſurely from the power of man, we may conclude that the ſavage has been induced to become a hunter inſtead of a ſhepherd, by the nature of the country. In this ſtate, all his habits have concurred to give him a ferocity of character. The great fatigues of the chace have hardened his body; frequent and extreme hunger, followed by a ſudden abundance of game, has rendered him voracious. The habit of ſhedding blood, and tearing his prey, has familiariſed him to the ſight of death and ſufferings. Tormented by hunger, he has deſired fleſh; and finding it eaſy to obtain that of his fellow-creature, he could not long heſitate to kill him to ſatisfy the cravings of his appetite. The firſt experiment made, this cruelty degenerates into a habit; and his mind acquires all the inſenſibility of his body.

But the ſituation of the Arab is very different. Amidſt his vaſt naked plains, without water and without foreſts, he has not been able, for want of game or fiſh, to become either a hunter or a fiſherman. The camel has determined him to a paſtoral life, the manners of which have influenced his whole character. Finding at hand a light, but conſtant and ſufficient nouriſhment, he has acquired the habit of frugality. Content with his milk and his dates, he has not deſired fleſh; he has ſhed no blood: his hands are not accuſtomed to ſlaughter, nor his ears to the cries of ſuffering creatures; a humane and ſenſible heart ſtill is his.

No ſooner, however, did the ſavage ſhepherd become acquainted with the uſe of the horſe, than his manner of life muſt have undergone a conſiderable change. The facility of paſſing rapidly over extenſive tracts of country, rendered him a wanderer. He was greedy from want, and became a robber from greedineſs; and ſuch is in fact his preſent character. A plunderer, rather than a warrior, the Arab poſſeſſes no ſanguinary courage; he attacks only to deſpoil; and if he meets with reſiſtance, never thinks a ſmall booty is to be put in competition with his life. To irritate him you muſt ſhed his blood; in which caſe he is found to be as obſtinate in his vengeance as he was cautious in avoiding danger in the firſt inſtance.

The Bedouins have often been reproached, and perhaps truly, with this ſpirit of rapine; but it is only exerciſed towards reputed enemies, and is conſequently founded on the acknowledged laws of almoſt all nations. Among themſelves they are remarkable for a good faith, a diſintereſtedneſs, a generoſity, which would do honour to the moſt civilized people. What is there more noble than that right of aſylum ſo reſpected among all the tribes? A ſtranger, nay even an enemy, touches the tent of the Bedouin, and from that inſtant his perſon becomes inviolable. It would be reckoned a diſgraceful meanneſs, an indelible ſhame, to ſatisfy even a juſt vengeance at the expence of hoſpitality. Has the Bedouin conſented to eat bread and ſalt with his gueſt, nothing in the world can induce him to betray him. The power of the Su

tan himſelf would not be able to force a refugee from the protection of a tribe, but by its total extermination. The Bedouin, ſo rapacious without his camp, has no ſooner ſet his foot within it, than he becomes liberal and generous. What little he poſſeſſes he is ever ready to divide. He has even the delicacy not to wait till it is aſked: when he takes his repaſt, he affects to ſeat himſelf at the door of his tent, in order to invite the paſſengers; his generoſity is ſo ſincere, that he does not look upon it as a merit, but merely as a duty; and he therefore readily takes the ſame liberty with others. To obſerve the manner in which the Arabs conduct themſelves towards each other, one would imagine that they poſſeſſed all their goods in common. Nevertheleſs they are no ſtrangers to property; but it has none of that ſelfiſhneſs which the increaſe of the imaginary wants of luxury has given it among poliſhed nations. Deprived of a multitude of enjoyments which nature has laviſhed upon other countries, they are leſs expoſed to temptations which might corrupt and debaſe them. It is more difficult for their Shaiks to form a faction to enſlave and impoveriſh the body of the nation. Each individual, capable of ſupplying all his wants, is better able to preſerve his character and independence; and private poverty becomes at once the foundation and bulwark of public liberty.

It is alſo remarkable that this liberty extends even to matters of religion. We obſerve a ſtriking difference between the Arabs of the towns and thoſe of the deſert; ſince, while the former crouch under the double yoke of political and religious deſpotiſm, the latter live in a ſtate of perfect freedom from both: it is true, that on the frontiers of the Turks, the Bedouins, from policy, preſerve the appearance of Mahometaniſm; but ſo relaxed is their obſervance of its ceremonies, and ſo little fervour has their devotion, that they are generally conſidered as infidels, who have neither law nor prophets. They even make no difficulty in ſaying that the religion of Mahomet was not made for them: "For (add they) how ſhall we make ablutions who have no water? How can we beſtow alms who are not rich? Why ſhould we faſt in the Ramadan, ſince the whole year with us is one continual faſt? And what neceſſity is there for us to make the pilgrimage to Mecca, if God be preſent every where?" In ſhort, every man acts and thinks as he pleaſes, and the moſt perfect toleration exiſts among them.

BEDWIN-MAGNA, a village five miles ſouth of Hungerford in Berkſhire in England. It has neither market nor fair; but is a borough by preſcription, and ſends two members to parliament. It is ſaid to have been a conſiderable place in the time of the Saxons, and that the traces of its fortifications are ſtill extant.

BEE, in natural hiſtory, a genus of inſects, the characters of which are given under the Linnæan name APIS. The principal ſpecies are there alſo deſcribed; excepting the mellifica, or domeſtic honey-bee, the hiſtory and management of which was reſerved for this article.

This ſpecies is furniſhed with downy hairs; has a duſky-coloured breaſt, and browniſh belly; the tibiæ of the hind-legs are ciliated, and tranſverſely ſtreaked on the inſide. Each foot terminates in two hooks, with their points oppoſite to each other; in the middle of theſe hooks there is a little thin appendix, which when unfolded enables the inſects to faſten themſelves to glaſs or the moſt poliſhed bodies. This part they likewiſe employ for tranſmitting the ſmall particles of crude wax which they find upon flowers to the cavity in their thigh, hereafter deſcribed. The queen and drones, who never collect wax in this manner, have no ſuch cavity. This ſpecies is alſo furniſhed with a proboſcis or trunk, which ſerves to extract the honey from flowers; and has, beſides, a real mouth ſituated in the forepart of the head, with which it is able to feed on the farina of flowers, from which afterwards is made wax. The belly is divided into ſix rings or joints, which ſometimes ſhorten the body, by ſlipping the one over the other. In the inſide of the belly there is a ſmall bladder or reſervoir, in which the honey is collected, after having paſſed through the proboſcis and a narrow pipe which runs through the head and breaſt. This bladder, when full of honey, is about the ſize and ſhape of a ſmall pea.

The ſting of the mellifica, which is ſituated at the extremity of the belly, is a very curious weapon; and, when examined by the microſcope, appears of a ſurpriſing ſtructure. It has a horny ſheath or ſcabbard, which includes two bearded darts. This ſheath ends in a ſharp point, near the extremity of which a ſlit opens, through which, at the time of ſtinging, the two bearded darts are protruded beyond the end of the ſheath: one of theſe is a little longer than the other, and fixes its beard firſt; and the other inſtantly following, they penetrate alternately deeper and deeper, taking hold of the fleſh with their beards or hooks, till the whole ſting is buried in the fleſh; and then a venomous juice is injected through the ſame ſheath, from a little bag at the root of the ſting. Hence the wound occaſions an acute pain and ſwelling of the part, which ſometimes continue ſeveral days. Theſe effects are beſt remedied by enlarging the wound directly, to give it ſome diſcharge. This poiſon ſeems to owe its miſchievous efficacy to certain pungent ſalts. Let a bee be provoked to ſtrike its ſting againſt a plate of glaſs, and there will be a drop of the poiſon diſcharged and left upon the glaſs. This being placed under a double microſcope, as the liquor evaporates, the ſalt will be ſeen to concrete, forming oblong, pointed, clear cryſtals.—Mr. Derham counted on the ſting of a waſp eight beards on the ſide of each dart, ſomewhat like the beards of fiſh-hooks: and the ſame number is to be counted on the darts of the bee's ſting. When theſe beards are ſtruck deep in the fleſh, if the wounded perſon ſtarts, or diſcompoſes the bee before it can diſengage them, the ſting is left behind ſticking in the wound: but if he have patience to ſtand quiet, the creature brings the hooks down cloſe to the ſides of the darts, and withdraws the weapon; in which caſe, the wound is always much leſs painful. The danger of being ſtung by bees may be in a great meaſure prevented by a quiet compoſed behaviour. A thouſand bees will fly and buzz about a perſon without hurting him, if he ſtand perfectly ſtill, and forbear diſturbing them even when near his face, in which caſe he may obſerve them for hours together without danger: but if he moleſts or beats them away, he uſually ſuffers for it. It has been lately affirmed, that a perſon is in perfect ſafety in the midſt of myriads of bees, if he but carefully keep his mouth ſhut, and breathe gently through the noſtrils only; the human breath, it would ſeem, being peculiarly offenſive to their delicate organs: and merely with this precaution, it is ſaid, the very hives may be turned up, and even part of the comb cut out, while the bees are at work, though few perſons would be diſpoſed to make ſuch an experiment.

I. *Of the* OECONOMY, INSTINCTS, &c. *of the* HONEY-BEE.

A hive of bees is a well peopled city, in which are commonly found from 15,000 to 18,000 inhabitants. This city is in itſelf a monarchy;—compoſed of a *queen*; of males, which are the *drones*; and of *working bees*, which have been ſuppoſed and called neuters. The combs, which are of pure wax, ſerve as their magazine of ſtores, and for the nurſing places of their young offſpring. There is between the combs a ſpace ſufficient for two bees to march abreaſt, without embarraſſing each other; and in ſome parts it is more ſpacious.

There are alſo holes, or narrow paſſes, which croſs the combs tranſverſely, and are intended to ſhorten the way in paſſing from place to place.

The QUEEN BEE is eaſily diſtinguiſhed from the other bees, by the form of her body. She is longer and larger than they are, and her wings are much ſhorter than theirs in proportion to her body; for the wings of the other bees cover their whole body, whereas thoſe of the queen hardly reach beyond her middle, or end at about the third ring of her belly. Her hinder parts are more taper than thoſe of the other bees, terminating ſharper. Her belly and legs are of a deep yellow, much reſembling the pureſt gold. She is unwieldy in her flight, a reaſon for her ſeldom flying but when ſhe leaves the parent-hive to go and ſettle a colony. All the bees form her retinue, and like dutiful ſubjects repair to the place ſhe chooſes. She is armed with a vigorous ſting. Leſs paſſionate however than her ſubjects, ſhe only uſes her ſting when long provoked, or when in conteſt for imperial ſway. Never more than one remains in a hive, and that is the victor. A hive of bees cannot ſubſiſt without a queen, as ſhe alone produces their numerous poſterity: and on this account their fidelity and attachment to their ſovereign is admirable.

Mr. Wildman, ſo well known for his management of bees, ſome years ago, ſurpriſed the whole kingdom. He cauſed a ſwarm to light where he pleaſed, almoſt inſtantaneouſly. He would order the bees to ſettle on his head, then remove them to his hand; command them to depart and ſettle on a window, table, &c. at pleaſure. We ſhall ſubjoin his method of performing theſe feats, in his own words: "Long experience has taught me (ſays he), that as ſoon as I turn up a hive, and give it ſome taps on the ſides and bottom, the queen immediately appears, to know the cauſe of this alarm; but ſoon retires again among her people. Being accuſtomed to ſee her ſo often, I readily perceive her at the firſt glance; and long practice has enabled me to ſeize her inſtantly, with a tenderneſs that does not in the leaſt endanger her perſon. This is of the utmoſt importance; for the leaſt injury done to her brings immediate deſtruction to the hive, if you have not a ſpare queen to put in her place, as I have too often experienced in my firſt attempts. When poſſeſſed of her, I can without injury to her, or exciting that degree of reſentment that may tempt her to ſting me, ſlip her into my other hand, and, returning the hive to its place, hold her there, till the bees, miſſing her, are all on wing, and in the utmoſt confuſion. When the bees are thus diſtreſſed, I place the queen where-ever I would have the bees to ſettle. The moment a few of them diſcover her, they give notice to thoſe near them, and thoſe to the reſt; the knowledge of which ſoon becomes ſo general, that in a few minutes they all collect themſelves round her; and are ſo happy in having recovered this ſole ſupport of their ſtate, that they will long remain quiet in that ſituation. Nay, the ſcent of her body is ſo attractive of them, that the ſlighteſt touch of her, along any place or ſubſtance, will attach the bees to it, and induce them to purſue any path ſhe takes." This was the only witchcraft uſed by Mr. Wildman, and is that alone which is practiſed by others who have ſince made ſimilar exhibitions. In ſhort, if we only ſeize on the queen, we are ſure of leading all the bees of a hive to any other place we chooſe.

If, by any accident a queen dies, the bees of her hive immediately ceaſe working, conſume their own honey, fly about their own and other hives at unuſual hours when other bees are at reſt, and pine away if not ſoon ſupplied with another ſovereign. Her loſs is proclaimed by a clear and interrupted humming. This ſign ſhould be a warning to the owner of the bees, to take what honey remains in the hive, or to procure them another queen. In this laſt caſe, the flock inſtantly revives; pleaſure and activity are apparent through the whole hive; the preſence of the ſovereign reſtores vigour and exertion, and her voice commands univerſal reſpect and obedience: of ſuch importance is the queen to the exiſtence and proſperity of the other members of this well ordered community.

The queen-bee will lay many thouſands of eggs. It is computed that her ovaria contain more than 5000 at one time; and therefore it is not difficult to conceive that ſhe may produce 10,000 or 12,000 bees, or even more, in the ſpace of four or five weeks.

The common DRONES, though ſmaller than the queen, are larger than the working bees; and in flying make a greater noiſe. The diſſection of the drone gives as great proof of its being the male, as that of the queen does of her being female. In this creature there is no appearance of ovaries or eggs, nor any thing of the ſtructure of the common working bees, but the whole abdomen is filled with tranſparent veſſels, winding about in various ſinuoſities, and containing a white or milky fluid. This is plainly analogous to that fluid in the males of other animals, which is deſtined to render the eggs of the female prolific; and this whole apparatus of veſſels, which much reſembles the turnings and windings of the ſeminal veſſels in other animals, is plainly intended only for the preparation and retention of this matter, till the deſtined time of its being emitted. On ſqueezing the hinder parts, alſo, may be forced out the penis; a ſmall and ſlender fleſhy body, contained between two horns of a ſomewhat harder ſubſtance, which join at their baſe, but gradually part aſunder as they are continued in length. Theſe parts, found in all the drones, and none of them in any other bees except theſe, ſeem to prove very evidently the difference of ſex. If a hive is opened in the beginning of ſpring, not a ſingle drone will be found in it; from the middle of May till the end of June, hundreds of them will be found, commonly from 200 or 300 to 1000; and from thence to the following ſpring it would be in vain to ſeek for them. They go not out till 11 in the morning, and return before ſix in the evening. But their expeditions are not thoſe of induſtry. They have no ſting, their roſtrum and feet are not adapted for collecting wax and honey, nor indeed are they obliged to labour. They only hover upon flowers to extract the ſweets, and all their thoughts are pleaſure. Their office is, to impregnate the eggs of the queen after they are depoſited in the cells. And while their preſence is thus neceſſary, they are ſuffered to enjoy the ſweets of love and life; but as ſoon as they become uſeleſs in the hive, the working bees declare the moſt cruel war againſt them, and make terrible ſlaughter of them. This war affects not only the bees already in life, but even the eggs and maggots; for the law which has pronounced the deſtruction of the males has no exception, it extends equally to thoſe which do not yet breathe and to thoſe which do; the hive is cleared of every egg, maggot, or nymph; the whole is torn away and carried off. After the ſeaſon proper for increaſing the number of bees is paſt, and when they ſhould attend only to the ſupplying of their magazines ſufficiently with winter-ſtores, every veſtige of the drones is deſtroyed to make room for honey. Whenever theſe drones are obſerved to remain in a hive late in the autumn, it is uſually ſuppoſed to indicate an unfavourable condition of the hive.

But Maraldi and Reaumur had long ago diſcovered that beſides theſe larger drones, there were others of a ſize not exceeding that of the common working bees. This fact, however, was not fully aſcertained before the late experiments of Mr. Debraw, to be mentioned hereafter. It is well known, as has been already noticed, that the large drones never appear in the hive before the middle of April; that they are all dead before the end of Auguſt, when the principal breeding ſeaſon

terminates; and that they are deſtroyed, together with all their worms or nymphs, by the working bees, probably by order of the queen, to ſave honey: yet it is equally certain, that the bees begin to breed early in the ſpring, ſometimes in February, if the weather is mild; and that many broods are completed before the drones appear. But if drones of a ſmaller ſize are ſuffered to remain, which in a time of ſcarcity conſume leſs honey than the others, theſe will anſwer the purpoſe of ſupplying the early broods, and the larger drones are produced againſt a time of greater plenty. Some obſervers affirm, that the ſmaller drones are all dead before the end of May, when the larger ſpecies appear, and ſuperſede their uſe. Theſe circumſtances accord with the ſuggeſtion of Abbé Le Pluche in his *Spectacle de la Nature*, That a ſmall number of drones are reſerved to ſupply the neceſſities of the enſuing year; and that theſe drones are very little, if at all, larger than the common bees.

But they are the Working Bees that compoſe the greateſt body of the ſtate. Columella informs us, that the ancients diſtinguiſhed ſeveral kinds of them. He joins in opinion with Virgil, who approves of thoſe which are ſmall, oblong, ſmooth, bright, and ſhining, of a gentle and mild diſpoſition: "for," continues he, "by how much the larger and rounder the bee is, by ſo much the worſe it is; but if it be fierce and cruel, it is the worſt of all. The angry diſpoſition of bees of a better character is eaſily ſoftened by the frequent intercourſe of thoſe who take care of them, for they grow more tame when they are often handled." The experience of ages has now eſtabliſhed the ſort of bees which have been found to anſwer beſt the purpoſes of keeping them. The working bees have the care of the hive, collect the wax and honey, fabricate and work up the wax, build the cells, feed the young, keep the hive clean, drive from thence ſtrangers, and employ themſelves in all other concerns relating to the commonwealth.

A bee has two ſtomachs; one that contains honey, and a ſecond in which is contained the crude wax. The working bees have no parts analogous to the ovaria of the queen, or that reſemble the male organs of the drones. Hence they have generally been ſuppoſed to be neutral, or of neither ſex. But a different doctrine has lately been eſtabliſhed; of which more hereafter.

The ſting is a very neceſſary part of the œconomy of a working bee, both as an offenſive and as a defenſive weapon: for their honey and wax excite the envy of many greedy and lazy inſects; and they have alſo to defend themſelves againſt enemies, who are fonder of eating them than their honey. There is likewiſe a time when the drones muſt be ſacrificed and exterminated for the good of the ſociety; and as they are larger and ſtronger than the working bees, theſe laſt would have a very unequal match, were it not for this formidable weapon.

Among bees, either of the ſame or of different hives, there ſometimes ariſe moſt deadly feuds, in which great ſkill may be diſcerned in their manner of pointing the ſting between the ſcaly rings of their adverſaries' bodies, or to ſome other eaſily vulnerable part. The bee which firſt gains the advantage remains the conqueror: though the victory coſts the victor his life, if he has left his ſting in the body of the enemy; for with the ſting, part of his bowels is torn out, and death inevitably follows. Bees have very ſevere conflicts when whole hives engage in a pitched battle, and many are ſlain on both ſides. Their fighting and plundering one another ought chiefly to be imputed, as Mr. Thorley obſerves, either to their perfect abhorrence of ſloth and idleneſs, or to their inſatiable thirſt for honey; for when, in ſpring or autumn, the weather is fair, but no honey can be collected from plants, and is to be found only in the hives of other bees, they will venture their lives to get at their object. Indeed another cauſe has been aſſigned for their fighting; which is, the neceſſity that the bees are reduced to when their own hive has been plundered, at a ſeaſon when it is too late for them to repair the loſs by any induſtry in the fields.

It ſometimes happens, that one of the queens is killed in battle. In this caſe, the bees of both hives unite as ſoon as her death is generally known among them. All then become one people; the vanquiſhed go off with the robbers, richly laden with their own ſpoils, and return every day with their new aſſociates to pillage their old habitation. This cauſes a throng, unuſual for the ſeaſon, at the door of the hive they are plundering; and if the owner lifts it up at night, when all are gone home, he will find it empty of inhabitants; though there perhaps will remain a ſmall quantity of honey in it.

If two ſwarms happen to take flight at the ſame time, they ſometimes quarrel, and great numbers are deſtroyed on both ſides, till one of the queens is ſlain. This however ends the conteſt, and the bees of both ſides unite under the ſurviving queen.

The regulation of labour amongſt the bees is remarkable. When they begin to work in their hives, they divide themſelves into four companies: one of which roves in the fields in ſearch of materials; another employs itſelf in laying out the bottom and partitions of their cells; a third is employed in making the inſide ſmooth from the corners and angles; and the fourth company brings food for the reſt, or relieves thoſe who return with their reſpective burdens. But they are not kept conſtant to one employment; they often change the taſks aſſigned them: thoſe that have been at work, being permitted to go abroad; while thoſe that have been in the fields already, take their places. They ſeem even to have ſigns, by which they underſtand each other: for when any of them want food, it bends down its trunk to the bee from whom it is expected, which then opens its honey-bag and lets ſome drops fall into the other's mouth, which is at that time opened to receive it. Their diligence and labour are ſo great, that, in a day's time, they are able to make cells which lie upon each other numerous enough to contain 3000 inhabitants.

In the plan and formation of theſe cells they diſcover a moſt wonderful ſagacity. In conſtructing habitations within a limited compaſs, an architect would have three objects in view: firſt, to uſe the ſmalleſt quantity that can be of materials; next, to give to the edifice the greateſt capacity on a determined ſpace; and thirdly, to employ the ſpot in ſuch a manner that none of it may be loſt. On examination, it will be found that the bees have obtained all theſe advantages in the hexagonal form of their cells: for, firſt, there is an œconomy of wax, as the circumference of one cell makes part of the circumferences of thoſe contiguous to it; ſecondly, the œconomy of the ſpot, as theſe cells which join to one another leave no void between them; and thirdly, the greateſt capacity or ſpace; as, of all the figures which can be contiguous, that with ſix ſides gives the largeſt area. This thriftineſs prompts them to make the partitions in their cells thin; yet they are conſtructed ſo as that the ſolidity may compenſate for the ſcantineſs of materials. The parts moſt liable to injury, are the entrance of the cells. Theſe the bees take care to ſtrengthen, by adding quite round the circumference of the apertures a fillet of wax, by which means this mouth is three or four times thicker than the ſides: and they are ſtrengthened at the bottom by the angle formed by the bottom of three cells falling in the middle of an oppoſite cell. The combs lie parallel to each other; and there is left between every one of them a ſpace which ſerves as a ſtreet, broad enough for two bees to paſs by each other. There are holes which go quite through the combs, and ſerve as lanes for the bees to paſs from one comb to another, without being

obliged to go a great way about. When they begin their combs, they form at the top of the hive a root or ſtay to the whole edifice, which is to hang from it. Though they generally lay the foundations of the combs ſo that there ſhall be no more between them than what is ſufficient for two bees to paſs, yet they ſometimes place thoſe beginnings of two combs too far aſunder; and, in this caſe, in order to fill up part of the void ſpace ariſing from that bad diſpoſition, they carry their combs on obliquely, to make them gradually approach each other. This void ſpace is ſometimes ſo conſiderable, that the bees build in it an intermediate comb, which they terminate as ſoon as the original combs have only their due diſtances. As the combs would be apt, when full, to overcome by their weight all the ſecurity which the bees can give them againſt falling; they who prepare hives, ſet in them, croſſwiſe, ſticks, which ſerve as props to the combs, and ſave the bees a great deal of labour. It is not eaſy to diſcover the particular manner of their working; for, notwithſtanding the many contrivances uſed for this purpoſe, there are ſuch numbers in continual motion, and ſucceed one another with ſuch rapidity, that nothing but confuſion appears to the ſight. Some of them, however, have been obſerved carrying pieces of wax in their talons, and running to the places where they are at work upon the combs. Theſe they faſten to the work by means of the ſame talons. Each bee is employed but a very ſhort time in this way: but there is ſo great a number of them that go on in a conſtant ſucceſſion, that the comb increaſes very perceptibly. Beſides theſe, there are others that run about beating the work with their wings and the hinder part of their body, probably with a view to make it more compact and durable.

Whilſt a certain part of the bees are occupied in forming the cells, others are employed in perfecting and poliſhing thoſe that are new modelled. This operation is performed by their talons, taking off every thing that is rough and uneven. Theſe poliſhers are not ſo deſultory in their operations as thoſe that make the cells; they work long and diligently, never intermitting their labour, excepting to carry out of the cell the particles of wax which they take off in poliſhing. Theſe particles are not allowed to be loſt; others are ready to receive them from the poliſhers, and to employ them in ſome other part of the fabric.

The balls which we ſee attached to the legs of bees returning to the hives are not wax, but a powder collected from the ſtamina of flowers, and not yet brought to the ſtate of wax. The ſubſtance of theſe balls, heated in any veſſel, does not melt as wax would do, but becomes dry and hardens: it may even be reduced to a coal. If thrown into water, it will ſink; whereas wax ſwims. To reduce this crude ſubſtance into wax, it muſt undergo another proceſs. In collecting this precious ſtore, the bee enters into the cups of flowers, particularly ſuch as ſeem charged with the greateſt quantities of this yellow farina. As the animal's body is covered with hair, it rolls itſelf within the flower, and quickly becomes quite covered with the duſt, which it ſoon after bruſhes off with its two hind legs, and kneads into two little balls. In the thighs of the hind-legs there are two cavities, edged with hair; and into theſe, as into a baſket, the animal ſticks its pellets. Thus employed, the bee flits from flower to flower increaſing its ſtore, and adding to its ſtock of wax, until the ball upon each thigh becomes as big as a grain of pepper; by this time having got a ſufficient load, it returns, making the beſt of its way home.

When the bees have brought this crude ſubſtance to the hive, they eat it by degrees; or, at other times, three or four bees come and eaſe the loaded bee, by eating each of them a ſhare, the loaded bee giving them a hint ſo to do. Hunger is not the motive of their thus eating the balls of waxy matter, eſpecially when a ſwarm is firſt hived; but it is their deſire to provide a ſpeedy ſupply of real wax for making the combs. At other times, when there is no immediate want of wax, the bees lay this matter up in repoſitories, to keep it in reſerve for another occaſion. When this waxy matter has been ſwallowed for a certain time, it is converted into real wax, which the bees again diſgorge as they work it up into combs; for it is only while thus ſoft and pliant that they can fabricate it properly. That the wax thus employed is taken from their ſtomachs, appears from their making a conſiderable quantity of comb ſoon after they are hived, and even on any tree or ſhrub where they have reſted but a ſhort while before their being hived, though no balls were viſible on their legs, excepting thoſe of a few which may be juſt returned from the field. This is farther confirmed by what happened in a ſwarm newly hived: for two days together from the time of their quitting their former home it rained conſtantly, inſomuch that not one bee was able to ſtir out during that time; yet at the end of the two days they had made a comb 15 or 16 inches long, and thick in proportion.

The crude wax is often of as different colours as are the flowers from which it is collected: but the new combs are always of a white colour, which is afterwards changed only by the impurities ariſing from the ſteam, &c. of the bees. Bees collect crude wax alſo for food; for if this was not the caſe, there would be no want of wax after the combs are made: but they are obſerved, even in old hives, to return in great numbers loaded with ſuch matter, which is depoſited in particular cells, and is known by the name of *bee-bread*. We may gueſs that they conſume a great deal of this ſubſtance in food by the quantity collected; which, by computation, may in ſome hives amount to an hundred weight in a ſeaſon, whilſt the real wax in ſuch an hive does not perhaps exceed two pounds in the whole.

As it is requiſite that the habitation of bees ſhould be very cloſe, what their hives want from the negligence or unſkilfulneſs of man, theſe animals ſupply by their own induſtry: accordingly, it is their principal care, when firſt hived, to ſtop up all the crannies. For this purpoſe they make uſe of a reſinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients called *propolis*. It will grow conſiderably hard in the hive, though it will in ſome meaſure ſoften by heat; and is often found different in conſiſtence, colour, and ſmell. It has generally an agreeable aromatic odour when it is warmed; and by ſome it is conſidered as a moſt grateful perfume. When the bees begin to work with it, it is ſoft; but it acquires a firmer conſiſtence every day, till at length it aſſumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and ſome think it is met with on the birch, the willow, and poplar. However it is procured, it is certain that they plaſter the inſide of their hives with it.

The ſubſtance ſo well known to us under the name of *Honey*, is originally a juice digeſted in plants, which ſweats through their pores, and exiſts chiefly in their flowers, or is contained in reſervoirs in which nature ſtores it. The bees ſometimes penetrate into theſe ſtores, and at other times find the liquor exſuded. This they collect in their ſtomachs; ſo that, when loaded with it, they ſeem, to an inattentive eye, to come home without any booty at all.

But beſides the matter thus obtained from the flowers of plants, another ſubſtance, called *honey-dew*, has been diſcovered, of which the bees are equally fond. Of this there are two kinds, both deriving their origin from vegetables, though in very different ways. The firſt kind, the only one known to huſbandmen, and which paſſes for a dew that falls on trees, is no other than a mild ſweet juice, which having circulated

through the veſſels of vegetables, is ſeparated in proper reſervoirs in the flowers, or on the leaves, where it is properly called the *honey-dew*: ſometimes it is depoſited in the pith, as in the ſugar-cane; and, at other times, in the juice of pulpy ſummer-fruits when ripe. Such is the origin of the manna which is collected on the aſh and maple of Calabria and Briançon, where it flows in great plenty from the leaves and trunks of theſe trees, and thickens into the form in which it is uſually ſeen. The ſecond kind of honey-dew, which is the chief reſource of bees after the ſpring-flowers and dew by tranſpiration on leaves are paſt, owes its origin to a ſmall inſect, for an account of which, ſee the articles APHIS and HONEY-DEW.

From whatever ſource the bees may have collected their honey, the inſtant they return home, they ſeek cells in which they may diſgorge and depoſit their loads. They have two ſorts of ſtores; one of which conſiſts of honey laid up for the winter, and the other of honey intended for accidental uſe in caſe of bad weather, and for ſuch bees as do not go abroad in ſearch of it. Their method of ſecuring each of theſe is different. They have in each cell a thicker ſubſtance, which is placed over the honey, to prevent its running out of the cell; and that ſubſtance is raiſed gradually as the cell is filled, till the bees, finding that the cell cannot contain any more, cloſe it with a covering of wax, not to be opened till times of want, or during the winter ſeaſon.

It has been already ſaid, that the cells are intended for other purpoſes beſides being places of ſtore for honey. One of the chief uſes is, their being nurſeries for the young. The cells for thoſe which are to be working bees, are commonly half an inch deep; thoſe for drones, three quarters of an inch; and thoſe which are intended for keeping of honey only, ſtill deeper. This accounts for the inequalities obſerved on the ſurface of the combs.

The queen-bee generally lies concealed in the moſt ſecret part of the hive, and is never viſible but when ſhe lays her eggs in ſuch combs as are expoſed to light. When ſhe does appear, ſhe is always attended by ten or a dozen of the common ſort, who form a kind of retinue, and follow her wherever ſhe goes with a ſedate and grave tread. Before ſhe lays her eggs, ſhe examines the cells where ſhe deſigns to lay them; and if ſhe finds that they contain neither honey, wax, nor any embryo, ſhe introduces the poſterior part of her body into a cell, and fixes to the bottom of it a ſmall white egg, which is compoſed of a thin membrane, full of a whitiſh liquor. In this manner ſhe goes on, till ſhe fills as many cells as ſhe has eggs to lay, which are generally many thouſands. Sometimes more than one egg has been depoſited in the ſame cell; when this is the caſe, the working bees remove the ſupernumerary eggs, and leave only one in each cell. On the firſt or ſecond day after the egg is lodged in the cell, the drone bee injects a ſmall quantity of whitiſh liquid, which in about a day is abſorbed by the egg. On the third or fourth day is produced a worm or maggot; which, when it is grown ſo as to touch the oppoſite angle, coils itſelf up in the ſhape of a ſemicircle, and floats in a proper liquid, whereby it is nouriſhed and enlarged in its dimenſions. This liquor is of a whitiſh colour, of the thickneſs of cream, and of an inſipid taſte like flour and water. Naturaliſts are not agreed as to the origin and qualities of this liquid. Some have ſuppoſed, that it conſiſts of ſome generative matter, injected by the working bees into each cell, in order to give fecundity to the egg: but the moſt probable opinion is, that it is the ſame with what ſome writers have called the *bee-bread*; and that it is a mixture of water with the juices of plants and flowers collected merely for the nutrition of the young, whilſt they are in their weak and helpleſs ſtate. Whatever be the nature of this aliment, it is certain that the common working bees are very induſtrious in ſupplying the worms with a ſufficient quantity of it. The worm is fed by the working bees for about eight days, till one end touches the other in the form of a ring; and when it begins to feel itſelf uneaſy in its firſt poſture, it ceaſes to eat, and begins to unroll itſelf, thruſting that end forward towards the mouth of the cell which is to be the head. The attendant bees, obſerving theſe ſymptoms of approaching tranſformation, deſiſt from their labours in carrying proper food, and employ themſelves in faſtening up the top of the cell with a lid of wax, formed in concentric circles, and by their natural heat in cheriſhing the brood and haſtening the birth. In this concealed ſtate the worm extends itſelf at full length, and prepares a web of a ſort of ſilk, in the manner of the ſilk-worm. This web forms a complete lining for the cell, and affords a convenient receptacle for the tranſformation of the worm into a nymph or chryſalis. Some naturaliſts ſuppoſe, that as each cell is deſtined to the ſucceſſive breeding of ſeveral worms, the whole web, which is compoſed of many cruſts or doubles, is in reality a collection of as many webs as there have been worms. M. Maraldi apprehends, that this lining is formed of the ſkin of the worm thrown off at its entrance into the nymph ſtate: but it is urged, that if the cells are opened when newly covered by the bees, the worm within will be found in its own form, and detected in the act of ſpinning its web; and by means of glaſſes it will be found compoſed of fine threads regularly woven together, like thoſe of other ſpinning animals. In the ſpace of 18 or 20 days the whole proceſs of transformation is finiſhed, and the bee endeavours to diſcharge itſelf from confinement by forcing an aperture with its teeth through the covering of the cell. The paſſage is gradually dilated; ſo that one horn firſt appears, then the head, and afterwards the whole body. This is uſually the work of three hours, and ſometimes of half a day. The bee, after it has diſengaged itſelf, ſtands on the ſurface of the comb, till it has acquired its natural complexion, and full maturity and ſtrength, ſo as to become fit for labour. The reſt of the bees gather round it in this ſtate, congratulate its birth, and offer it honey out of their own mouths. The exuviæ and ſcattered pieces of wax which are left in the cell are removed by the working bees; and the matrix is no ſooner cleanſed and fit for new fecundation, but the queen depoſits another egg in it; inſomuch that, Mr. Maraldi ſays, he has ſeen five bees produced in the ſame cell in the ſpace of three months. The young bees are eaſily diſtinguiſhed from the others by their colour: they are grey, inſtead of the yelloviſh brown of the common bees. The reaſon of this is, that their body is black, and the hairs that grow upon it are white, from the mixture of which ſeen together reſults a grey; but this forms itſelf into a browniſh yellow by degrees, the rings of the body becoming more brown and the hairs of a more yellow colour.

The eggs which are to produce the drones, are, as we before obſerved, laid in larger cells than thoſe of the working bees. The coverings of theſe cells, when the drones are in the nymph ſtate, are convex or ſwelling outward, whilſt the cells of the working bees are flat. This, with the privilege of leading idle effeminate lives, and not working for the public ſtock, is what diſtinguiſhes the drones.

The bees, when they are to raiſe cells for bringing up ſuch maggots as are deſtined to become queens, do not adhere to their accuſtomed ſtyle of building. On the contrary, theſe cells are conſtructed of a longiſh oblong form, having one end bigger than the other, with their exterior ſurface full of little cavities. Wax, which is employed with ſo geometrical a thriftineſs in the raiſing of hexagonal cells, is expended with profuſion in the cell which is to be the cradle of a royal maggot. They ſometimes fix it in the middle, and at other times on one ſide of a comb. Several common cells are ſacrificed to ſerve as a baſis and ſupport to it. It is placed almoſt perpendicular

to the common cells, the largeſt end being uppermoſt. The lower end is open till the ſeaſon for cloſing it comes, or till the maggot is ready for transformation. It would be difficult to conceive how a tender maggot can remain in a cell turned bottom upmoſt, if we did not find it buried in a ſubſtance ſcarcely fluid, and if it was not in itſelf, at firſt, ſmall and light enough to be ſuſpended in this clammy paſte. As it grows, it fills all the upper and larger part of the cell. As ſoon as the young queen comes out of her cell, that cell is deſtroyed, and its place is ſupplied by common cells; but as the foundation of the royal cell is left, this part of the comb is found thicker than any other. There are ſeveral ſuch cells prepared: for if there was only one reared in each hive, the ſwarms might often want a conductreſs. Many accidents may alſo deſtroy the little maggot before it becomes a bee. It is therefore neceſſary that a number of ſuch cells ſhould be provided; and accordingly there are obſerved ſeveral young queens in the beginning of the ſummer, more than one of which often takes flight when a ſwarm leaves the hive.

The time in which a young queen becomes capable of leading a ſwarm from the hive in which ſhe was born, is four or five days after ſhe has appeared in it with *wings*. The bees of a ſwarm are in a great hurry when they know that their queen is ready to lay. In this caſe, they give to their new cells but part of the depth they are to have, and defer the finiſhing of them till they have traced the number of cells requiſite for the preſent occaſion. The cells firſt made are intended only for working bees; theſe being the moſt neceſſary for immediate ſervice.

When the hive is become too much crowded by the addition of the young brood, a part of the bees think of finding themſelves a more commodious habitation, and with that view ſingle out the moſt forward of the young queens. A new ſwarm is therefore conſtantly compoſed of one queen at leaſt, and of ſeveral thouſand working bees, as well as of ſome hundreds of drones. The working bees conſiſt of ſome old ones and ſome young.

Scarce has the colony arrived at its new habitation, when the working bees labour with the utmoſt diligence to procure materials for food and building. Their principal aim is not only to have cells in which they may depoſit their honey: a ſtronger motive ſeems to animate them. They ſeem to know that their queen is in haſte to lay her eggs. Their induſtry is ſuch, that in twenty-four hours they will have made combs twenty inches long, and wide in proportion. They make more wax during the firſt fortnight, if the ſeaſon is favourable, than they do during all the reſt of the year. Other bees are at the ſame time buſy in ſtopping all the holes and crevices they find in their new hive, in order to guard againſt the entrance of inſects which covet their honey, their wax, or themſelves; and alſo to exclude the cold air, for it is indiſpenſably neceſſary that they be lodged in a warm ſituation.

Whenever the bees ſettle in a ſwarm, or indeed when they at any time reſt themſelves, there is ſomething very particular in their method of taking their repoſe. It is done by collecting themſelves in a heap, and hanging to each other by their feet. They ſometimes extend theſe heaps to a conſiderable length. It would ſeem probable to us, that the bees from which the others hang muſt have a conſiderable weight ſuſpended to them. All that can be ſaid is, that the bees muſt find this to be a ſituation agreeable to themſelves; and it is that dictated to them by nature. See the repreſentation in 2d Plate 47.

When a ſwarm divides into two or more bands, which ſettle ſeparately, this diviſion is a ſure ſign that there are two or more queens among them. One of theſe cluſters is generally larger than the other. The bees of the ſmaller cluſter, or cluſters, detach themſelves by little and little, till at laſt the whole, together with the queen or queens, unite with the larger cluſter. As ſoon as the bees are ſettled, the ſupernumerary queen, or queens, muſt be ſacrificed to the peace and tranquillity of the hive. This execution generally raiſes a conſiderable commotion in the hive; and ſeveral other bees, as well as the queen or queens, loſe their lives, as appears from their bodies being in thoſe caſes obſerved on the ground, near the hive. The queen that is choſen is of a more red colour than thoſe which are deſtroyed: ſo that fruitfulneſs ſeems to be a great motive of preference in bees; for the nearer they are to the time of laying their eggs, the larger and more ſhining are their bodies. The method of hiving theſe ſwarms will be explained in another place.

Beſides the admirable inſtincts above mentioned, bees are poſſeſſed of others, ſome of which are equally neceſſary for their preſervation and happineſs. They anxiouſly provide againſt the entrance of inſects into the hive, by glueing up with wax the ſmalleſt holes in the ſkep. Some ſtand as ſentinels at the mouth of the hive, to prevent inſects of any kind from getting in. But if a ſnail, or other large inſect, ſhould get in, notwithſtanding all reſiſtance, they ſting it to death; and then cover it over with a coat of propolis, to prevent the eſcape of maggots, or of any ſtench which might proceed from the putrefaction of ſuch a large animal. Bees ſeem to be warned of the appearance of bad weather by ſome particular feeling. It ſometimes happens, even when they are very aſſiduous and buſy, that they on a ſudden ceaſe from their work; not a ſingle one ſtirs out; and thoſe that are abroad hurry home in ſuch prodigious crowds, that the doors of their habitations are too ſmall to admit them. On this occaſion, look up to the ſky, and you will ſoon diſcover ſome of thoſe black clouds which denote impending rain. Whether they ſee the clouds gathering for it, as ſome imagine, or whether, as is much more probable, they feel ſome effects of it upon their bodies, is not yet determined; but it is alleged, that no bee is ever caught even in what we call a ſudden ſhower, unleſs it have been at a very great diſtance from the hive, or have been before injured by ſome accident, or be ſickly and unable to fly ſo faſt as the reſt. Cold is a great enemy to them. To defend themſelves againſt its effects during a hard winter, they crowd together in the middle of the hive, and buzz about, and thereby excite a warmth which is often perceptible by laying the hand upon the glaſs-windows of the hive. They ſeem to underſtand one another by the motions of their wings. When the queen wants to quit the hive, ſhe makes a buzzing noiſe, and all the others immediately follow her example, and take their departure along with her.

With regard to the age of bees, the large drones live but a little while, being deſtroyed without mercy by the working bees, probably to ſave honey, as we have already ſaid. But of the other ſort lately diſcovered, no larger than the working bees, and not eaſily to be diſtinguiſhed from them, the age has not yet been aſcertained. Writers are not agreed as to the age of the working bees. Some maintain that they are annual, and others ſuppoſe that they live many years. Many of them, it is well known, die annually of hard labour; and though they may be preſerved by ſucceſſion in hives or colonies for ſeveral years, the moſt accurate obſervers are of opinion that their age is but a year, or no more than two ſummers at the utmoſt.

The ſex and fecundation of bees have been the ſubjects of various experiments. Of late years, indeed, much new light has been thrown upon the ſubject, and ſeveral difficulties which embarraſſed the proceſs of generation among theſe curious inſects ſeem to have been got the better of.

Swammerdam, and after him Miraldi, diſcovered in the ſtructure of the drones ſome reſemblance to the male organs

of generation, as has already been described; and from thence concluded that they were the males: but neither of those accurate and industrious observers could detect them in the act of copulation. Swammerdam, therefore, entertained a notion, that the female or queen-bee was fecundated without copulation; that it was sufficient for her to be near the males; and that her eggs were impregnated by a kind of vivifying aura, exhaled from the body of the males, and absorbed by the female. However, M. Reaumur thought that he had discovered the actual copulation of the drones with the female bee, and he has very minutely described the process of it. A very ingenious naturalist of the present day, without taking any notice of recent discoveries, seems to have given into the same idea. "The office of the males or drones (says he) is to render the queen pregnant. One single female should in the midst of seven or eight hundred males, one would think, be incessantly assailed. But nature has provided against that inconvenience, by making them of a constitution extremely frigid. The female chooses out one that pleases her; she is obliged to make the first advances, and excite him to love by her caresses. But this favour proves fatal to him: scarce has he ceased from amorous dalliance, but he is seen to perish. The pleasure of these observations may be taken, by putting a female with several males into a bottle."

On the contrary, there have been others, as M. Schirach and M. Hattorff, who have denied that drones bear any share at all in the business of propagation, and even assert that the queen-bee is self-prolific. But for what purpose then should wise nature have furnished the drones with that large quantity of seminal liquor; of what use is so large an apparatus of fecundating organs so well described by Reaumur and Miraldi? The fact is, that the above gentlemen have founded their opinion upon observations that hives are peopled at a time of the year when (as they supposed) no drones were in being. But we have already said, that nature has provided drones of different sizes for the purpose of impregnation, adapted to different times, occasions, and circumstances: and the mistake of Messrs. Schirach and Hattorff seems to have proceeded from their missing the large-sized drones, and not being acquainted with or not adverting to the other sort so hardly distinguishable from the working bees.

Lastly, many of the ancient as well as modern writers have supposed, that the eggs of the female bee are not impregnated with the male sperm, while in the body of the animal; but that they are deposited unimpregnated in the cells, and that the male afterwards ejects the male sperm on them as they lie in the cells, in the same manner as the generation of fishes is supposed to be performed by the males impregnating the spawn after it is cast out by the females. M. Miraldi long since conjectured that this might be the case; and he was confirmed in his opinion, by observing a liquid whitish substance surrounding each egg at the bottom of the cell a little while after it had been laid, and that a great number of eggs, which were not encompassed by this liquor, remained barren in the cells. But this method of impregnation has been established beyond all contradiction by the observations of Mr. Debraw (Philos. Trans. vol. 67. part i. art. 3.) Having put some bees into glass-hives with a large number of drones, he observed on the first or second day (always before the third) from the time in which the eggs were placed in the cells, which the queen generally lays on the fourth or fifth day after they are put into the hive, that a great number of bees fastened themselves to one another, and formed a kind of curtain from the top to the bottom of the hive, probably in order to conceal the process of generation. Mr. Debraw, however, could soon perceive several bees, whose size he was not able to distinguish, inserting the posterior part of their bodies each into a cell, and sinking into it; after a little while they retired, and he could see with the naked eye a small quantity of whitish liquor left in the angle of the base of each cell, containing an egg; this liquor was less liquid than honey, and had no sweetness when tasted.

But with a view of proving further that the eggs are fecundated by the males, and that their presence is necessary at the time of breeding, Mr. Debraw made a number of experiments. He left in a hive the queen, with only the common or working bees, without any drones, to see whether the eggs she laid would be prolific. To this end, he took a swarm, and shook all the bees into a tub of water, leaving them there till they were quite senseless; by which means he could distinguish the drones, without any danger of being stung: leaving these out, therefore, he restored the queen and working-bees to their former state, by spreading them on a brown paper in the sun; after this he replaced them in a glass hive, where they soon began to work as usual. The queen laid eggs, which, to his great surprise, were impregnated; for he imagined he had separated all the drones or males, and therefore omitted watching them; at the end of twenty days he found several of his eggs had, in the usual course of changes, produced bees, while some had withered away, and others were covered with honey. Hence he inferred, that some of the males had escaped his notice, and impregnated part of the eggs. To convince himself of this, he took away all the brood comb that was in the hive, in order to oblige the bees to provide a fresh quantity, being determined to watch narrowly their motions after new eggs should be laid in the cells. On the second day after the eggs were placed in the cells, he perceived the same operation that was mentioned before, namely, that of the bees hanging down in the form of a curtain, while others thrust the posterior part of the body into the cells. He then introduced his hand into the hive, and broke off a piece of the comb, in which there were two of these insects: he found in neither of them any sting, a circumstance peculiar to the drones. Upon dissection, with the assistance of a microscope, he discovered the four cylindrical bodies which contain the glutinous liquor, of a whitish colour, as observed by Miraldi in the large drones. He was therefore now under a necessity of repeating his experiments, in destroying the males, and even those which might be suspected to be males.

He once more immersed the same bees in water; and when they appeared in a senseless state, he gently pressed every one, in order to distinguish those armed with stings from those which had none, and which of course he supposed to be males: of these last he found fifty-seven, and replaced the swarm in a glass hive, where they immediately applied again to the work of making cells; and on the fourth or fifth day, very early in the morning, he had the pleasure to see the queen-bee deposit her eggs in those cells: he continued watching most part of the ensuing days, but could discover nothing of what he had seen in the former case. The eggs after the fourth day, instead of changing in the manner of caterpillars, were found in the same state they were the first day, except that some were covered with honey. A singular event happened the next day about noon: all the bees left their own hive, and attempted to get into a neighbouring hive, probably in search of males; but the queen was found dead, having been killed in battle.

To be further satisfied, Mr. Debraw took the brood-comb, which had not been impregnated, and divided it into two parts: one he placed under a glass bell, N°. 1. with honey-comb for the bees food, taking care to leave a queen, but no drones, among the bees confined in it: the other piece of brood comb he placed under another glass bell, N°. 2. with a few drones, a queen, and a proportionable number of common bees. The result was, that in the glass N°. 1. there was

no impregnation, the eggs remained in the ſame ſtate they were in when put into the glaſs; and on giving the bees their liberty on the ſeventh day, they all flew away, as was found to be the caſe in the former experiment: whereas in the glaſs N°. 2. the very day after the bees had been put into it, the eggs were impregnated by the drones, the bees did not leave their hives on receiving their liberty, the eggs at the uſual time underwent the neceſſary transformations, and produced a numerous young colony.

It has been ſaid by naturaliſts, that the queen bees are produced in a manner peculiar to themſelves, and different from the drones and working bees. Some have ſuppoſed, that the eggs laid by the queen in a hive, and deſtined for the production of queen bees, are of a peculiar kind: but though this is not the caſe, as M. Schirach has lately diſcovered, yet there are particular cells appropriated for this purpoſe. Theſe cells are generally near the edges, and at the bottom of the combs, and ſometimes on the ſides of a honey-comb: they are of an oblong orbicular form, and very ſtrong; and are more or leſs numerous in different hives as occaſion ſeems to require. It has been alſo ſuppoſed, that the matter with which they are nouriſhed is of a different kind and quality from that employed for the nouriſhment of the other bees; that which has been collected out of the royal cells being of a gummy glutinous nature, of a deep tranſparent red, and diſſolving in the fire rather than crumbling to powder.

It is a prevailing notion, that the queen-bee is the only female contained in the hive; and that the working bees are of neither ſex. But M. Schirach has eſtabliſhed a different doctrine, which has been alſo confirmed by the later obſervations of Mr. Debraw (Philoſ. Tranſ. vol. 67. part i.) According to M. Schirach, all the working or common bees are females in diſguiſe; and the queen-bee lays only two kinds of eggs, viz. thoſe which are to produce the drones, and thoſe from which the working bees are to proceed: and from any one or more of theſe, one or more queens may be produced; ſo that every worm of the latter or common kind which has been hatched about three days, is capable, under certain circumſtances, of becoming the queen, or mother of a hive. In proof of this doctrine, new and ſingular as it may ſeem, he alleges a number of ſatisfactory and deciſive experiments, which have been ſince verified by thoſe of Mr. Debraw. In the early months of the ſpring, and in any preceding month, even ſo late as November, he cut off from an old hive, a piece of that part of the comb which contains the eggs of the working bees; taking care, however, that it contained likewiſe worms which had been hatched about three days. He fixed this in an empty hive, or box, together with a portion of honey-comb, &c. or in other words, with a ſufficiency of food and building materials, or wax, for the uſe of the intended colony. He then put into, and confined within, the ſame box, a ſufficient number of common working bees, taken from the ſame or any other hive. As ſoon as the members of this ſmall community found themſelves deprived of their liberty, and without a queen, a dreadful uproar enſued, which continued generally, with ſome ſhort intervals of ſilence, for the ſpace of about twenty-four hours; during which time it is to be ſuppoſed they were alternately meditating and holding council on the future ſupport of the new republic. On the final ceſſation of this tumult, the general and almoſt conſtant reſult was, that they betook themſelves to work; firſt proceeding to the conſtruction of a royal cell, and then taking the proper meaſures for hatching and feeding the brood incloſed with them. Sometimes even on the ſecond day the foundations of one or more royal cells were to be perceived; the view of which furniſhed certain indications that they had elected one of the incloſed animals to the ſovereignty.

The operation has been hitherto conducted in the houſe, but this new colony may now be ſafely truſted in the garden, if the weather be warm; and may have the liberty allowed them of paſſing out of the box, of which they inſtantly avail themſelves, and are ſeen in a ſhort time almoſt totally to deſert their new habitation. In about two hours, however, they begin to re-enter it. We ſhould not neglect to obſerve, however, that if they be placed near the old hive, from which they were taken, they will very often attempt to enter it, but are as conſtantly repulſed by their former companions and brethren. It is prudent, therefore, to place them at a diſtance from the mother ſtate, in order to avoid the inconveniences of a civil war. The final reſult of the experiment is, that the colony of working bees thus ſhut up, with a morſel of common brood, not only hatch it, but are found, at the end of eighteen or twenty days, to have produced from thence one or two queens; which have apparently proceeded from worms of the common ſort, pitched upon by them for that purpoſe; and which, under other circumſtances, that is, if they had remained in the old hive, there is reaſon to ſuppoſe would have been changed into common working bees. In the preſent inſtance, the common worm appears to be converted by them into a queen-bee, merely becauſe the hive was in want of one. Hence we may juſtly infer, that the kingdom of the bees is not, if the expreſſion may be uſed, a *jure divino* or hereditary monarchy, but an elective kingdom; in which the choice of their future ruler is made by the body of the people, while ſhe is yet in the cradle, or in embryo; and who are determined by motives of preference which will perhaps for ever elude the penetration of the moſt ſagacious enquirers.

The reſults from experiments of the preceding kind, often repeated by M. Schirach and others with the ſame ſucceſs, are, that all the common or working bees were originally of the female ſex; but that when they have undergone their laſt metamorphoſis, they are condemned to a ſtate of perpetual virginity, and the organs of generation are obliterated; merely becauſe they have not been lodged, fed, and brought up in a particular manner, while they were in the worm ſtate. He ſuppoſes that the worm, deſigned by the community to be a queen, or mother, owes its metamorphoſis into a queen, partly to the extraordinary ſize of its cell, and its peculiar poſition in it; but principally to a certain appropriate nouriſhment found there, and carefully adminiſtered to it by the working bees while it was in the worm ſtate; by which, and poſſibly other means unknown, the development and extenſion of the germ of the female organs, previouſly exiſting in the embryo, is effected; and thoſe differences in its form and ſize are produced, which afterwards ſo remarkably diſtinguiſh it from the common working bees. This diſcovery is capable of being applied towards forming artificial ſwarms or new colonies of bees, by which means their number might be multiplied and their produce in honey and wax proportionably increaſed.

Explanation of 2d Plate 47. Fig. 1. is the queen-bee. 2. Is the drone. 3. Is the working bee. 4. Repreſents the bees hanging to each other by the feet, which is the method of taking their repoſe. 5. The proboſcis or trunk, which is one of the principal organs of the bees, wherewith they gather the honey and take their nouriſhment. 6. One of the hind-legs of a working-bee, loaded with wax. 7. A comb, in which the working bees are bred. The cells are the ſmalleſt of any. Two of them have the young bees incloſed. A royal cell is ſuſpended on one ſide. 8. A comb in which the drones are bred, being larger than the former; the young drones being included in ſeveral of them; with two royal cells ſuſpended on one ſide. 9. A ſimilar comb, in which the royal cell is fixed in the middle of the comb; and ſeveral common cells are ſacrificed to ſerve as a baſis and ſupport to it. In general, the

royal cells are ſuſpended on the ſide of a comb, as in fig. 7, 8. To the ſide of fig. 9. two royal cells are begun, when they reſemble pretty much the cup in which an acorn lies. The other royal cells have the young queens included in them. Fig. 10. Six eggs drawn after nature, and placed on their ends: theſe eggs are oblong, very ſlender, but ſomewhat thicker on their upper parts.—Fig. 11. An egg viewed with a microſcope: it reſembles the ſkin of a fiſh, diveſted of its ſcale, but ſtill retaining the marks of their inſertion.—Fig. 12. Worms of bees of different ſizes, drawn after nature. *a*, A worm newly hatched. *b*, *c*, *d*, *e*, Four worms that received more nouriſhment, and are more grown. *f*, *g*, Two worms ſtill bigger than the former, having had more time to make uſe of the nouriſhment provided for them. They are here repreſented as they lie doubled in their cells. *h*, A worm placed on its belly, ſo as to ſhow on its back a black line, inclining to a light blue or grey. This line denotes the ſtomach, which appears in this place through the tranſparent parts that lie over it. *i*, A worm lying on its back, and beginning to draw in the hinder part of its body, and move its head. Fig. 13. The worm forming its web. *a a*, The ſides of the cell that contain it. *b*, The bottom of the cell. *c*, The entrance or door of the cell. The worm is here repreſented as making its web in the propereſt manner to ſhut up this entrance.—Fig. 14. A worm taken out of the web in which it had incloſed itſelf, and juſt ready to caſt its ſkin.—Fig. 15. A cell containing the worm changed into a nymph, and perfectly lined with the worm's web. The web is exhibited entire, with the nymph contained in it, as they appear on opening the cell. *a a*, The ſides of the cell, lined with the worm's web. *b*, The mouth of the cell, perfectly cloſed by the web. *c*, The bottom of the cell. *d*, The web entire, as it appears on opening the cell, which it greatly reſembles in form. *e*, The upper part of the web, of a convex form. This part ſhows its filaments pretty diſtinctly. *f*, The incloſed nymph appearing through the tranſparent ſides of the web. *g*, The bottom of the web, anſwering to that of the wax-cell.—Fig. 16. A worm changed to a nymph, of its natural ſize and form, yet ſo as to exhibit its limbs, which are folded up in a moſt convenient manner.—Fig. 17. *a*, A cell full of bees-bread, placed in layers. *b*, Little grains, of which that ſubſtance, viewed with a microſcope, appears to be compoſed.

II. *Of the* MANAGEMENT *of* BEES, *and the Means of ſaving their Lives while we take their Honey and Wax.*

1. *Of the Apiary, and Hives.* We are told by Columella, that the apiary ſhould face the ſouth, and be ſituated in a place neither too hot nor too much expoſed to the cold: that it ſhould be in a valley, in order that the loaded bees may with the greater eaſe deſcend to their homes: that it ſhould be near the manſion-houſe, on account of the conveniency of watching them; but ſo ſituated as not to be expoſed to noiſome ſmells, or to the din of men or cattle. It is alſo requiſite that it be ſurrounded with a wall, which however ſhould not riſe above three feet high: that, if poſſible, a running ſtream be near them; or, if that cannot be, that water be brought near them in troughs, with pebbles or ſmall ſtones in the water, for the bees to reſt on while they drink; or that the water be confined within gently declining banks, in order that the bees may have ſafe acceſs to it; they not being able to produce either combs, honey, or food for their maggots, without water: that the neighbourhood of rivers or baſons of water with high banks be avoided, becauſe winds may whirl the bees into them, and they cannot eaſily get on ſhore from thence to dry themſelves; and that the garden in which the apiary ſtands be well furniſhed with ſuch plants as afford the bees plenty of good paſture. The trees in this garden ſhould be of the dwarf kind, and their heads buſhy, in order that the ſwarms which ſettle on them may be the more eaſily directed into the hive.

Particular attention ſhould alſo be paid, that the bees have in their neighbourhood ſuch plants as yield plenty of food. Columella enumerates many of theſe fitted to a warm climate: among them he mentions thyme, the oak, the pine, the ſweet-ſmelling cedar, and all fruit-trees. Experience has taught us, that furze, broom, muſtard, clover, heath, &c. are excellent for this purpoſe. Pliny recommends broom, in particular, as a plant exceedingly grateful and very profitable to bees.

Hives made of ſtraw are generally preferred, on ſeveral accounts: they are not liable to be over-heated by the rays of the ſun; they keep out cold better than wood or any other materials; and the cheapneſs renders the purchaſe of them eaſy. As the ingenious Mr. Wildman's hives are reckoned to be of a preferable conſtruction to any other, we ſhall give an account of them in his own words. "My hives (ſays he) are ſeven inches in height and ten in width. The ſides are upright, ſo that the top and bottom are of the ſame diameter. A hive holds nearly a peck. In the upper row of ſtraw there is a hoop of about half an inch in breadth; to which are nailed five bars of deal, full a quarter of an inch in thickneſs, an inch and a quarter wide, and half an inch aſunder from one another; a narrow ſhort bar is nailed at each ſide, half an inch diſtant from the bars next them, in order to fill up the remaining parts of the circle; ſo that there are in all ſeven bars of deal; to which the bees fix their combs. The ſpace of half an inch between the bars allows a ſufficient and eaſy paſſage for the bees from one comb to another. In order to give great ſteadineſs to the combs, ſo that, upon moving the hive, the combs may not fall off, or incline out of their places, a ſtick ſhould be run through the middle of the hive, in a direction exactly acroſs the bars, or at right angles with them. When the hives are made, a piece of wood ſhould be worked into the lower row of ſtraw, long enough to allow a door for the bees, of four inches in length, and half an inch in height.

"The proprietor of the bees ſhould provide himſelf with ſeveral flat covers of ſtraw, worked of the ſame thickneſs as the hives, and a foot in diameter, that ſo it may be of the ſame width as the outſide of the hives. Before the cover is applied to the hive, a piece of clean paper, of the ſize of the top of the hive, ſhould be laid over it; and a coat of cow dung, which is the leaſt apt to crack of any cement eaſily to be obtained, ſhould be laid all round the circumference of the hive. Let the cover be laid upon this, and made faſt to the hive with a packing-needle and pack-thread, ſo that neither cold nor vermin may enter.

"Each hive ſhould ſtand ſingle on a piece of deal, or other wood, ſomewhat larger than the bottom of the hive: That part of the ſtand which is at the mouth of the hive ſhould project ſome inches, for the bees to reſt on when they return from the field. This ſtand ſhould be ſupported upon a ſingle poſt, two and a half feet high; to which it ſhould be ſcrewed very ſecurely, that high winds, or other accidents, may not blow down both ſtand and hive. A quantity of ſoot mixed with barley-chaff ſhould be ſtrewed on the ground round the poſt; which will effectually prevent ants, ſlugs, and other vermin, from riſing up to the hive. The ſoot and chaff ſhould from time to time be renewed as it is blown or waſhed away; though, as it is ſheltered by the ſtand, it remains a conſiderable time, eſpecially if care be taken that no weeds riſe through it. Weeds, indeed, ſhould not be permitted to riſe near the hive; for they may give ſhelter to vermin which may be hurtful to the bees.

" The ſtands for bees ſhould be four yards aſunder; or, if the apiary will not admit of ſo much, as far aſunder as may be, that the bees of one hive may not interfere with thoſe of another hive, as is ſometimes the caſe when the hives are near one another or on the ſame ſtand; for the bees, miſtaking their own hives, light ſometimes at the wrong door, and a fray enſues, in which one or more may loſe their lives.

" The perſon who intends to erect an apiary ſhould purchaſe a proper number of hives at the latter part of the year, when they are cheapeſt. The hives ſhould be full of combs, and well ſtored with bees. The purchaſer ſhould examine the combs, in order to know the age of the hives. The combs of that ſeaſon are white, thoſe of the former year are of a darkiſh yellow; and where the combs are black, the hives ſhould be rejected, becauſe old hives are moſt liable to vermin and other accidents.

" If the number of hives wanted were not purchaſed in the autumn, it will be neceſſary to remedy this neglect after the ſeverity of the cold is paſt in the ſpring. At this ſeaſon, bees which are in good condition will get into the fields early in the morning, return loaded, enter boldly, and do not come out of the hive in bad weather; for, when they do, this indicates they are in great want of proviſions. They are alert on the leaſt diſturbance, and by the loudneſs of their humming we judge of their ſtrength. They preſerve their hives free from all filth, and are ready to defend it againſt every enemy that approaches.

" The ſummer is an improper time for buying bees, becauſe the heat of the weather ſoftens the wax, and thereby renders the combs liable to break, if they are not very well ſecured. The honey, too, being then thinner than at other times, is more apt to run out of the cells; which is attended with a double diſadvantage, namely, the loſs of the honey, and the daubing of the bees, whereby many of them may be deſtroyed. A firſt and ſtrong ſwarm may indeed be purchaſed; and if leave can be obtained, permitted to ſtand in the ſame garden till the autumn; but, if leave is not obtained, it may be carried away in the night after it has been hived.

" I ſuppoſe, that, in the ſtocks purchaſed, the bees are in hives of the old conſtruction. The only direction here neceſſary is, that the firſt ſwarm from theſe ſtocks ſhould be put into one of my hives; and that another of my hives ſhould in a few days be put under the old ſtock, in order to prevent its ſwarming again."

2. *Of Hiving.* Bees never ſwarm till their hive becomes too much crowded by the young brood. They begin generally in May, or about the end of April, but earlier or later according to the warmth of the ſeaſon. They ſeldom ſwarm before ten in the morning, and ſeldom later than three in the afternoon. We may know when they are about to ſwarm, by cluſters of them hanging on the outſide of the hive, and by the drones appearing abroad more than uſual: but the moſt certain ſign is, when the bees refrain from flying into the fields, though the ſeaſon be inviting. Juſt before they take flight, there is an uncommon ſilence in the hive: after this, as ſoon as one takes flight, they all follow. Before the ſubſequent ſwarming, there is a great noiſe in the hive, which is ſuppoſed to be occaſioned by a conteſt whether the young or the old queen ſhall go out. When the bees of a ſwarm fly too high, they are made to deſcend lower, by throwing handfuls of ſand or duſt among them, which they probably miſtake for rain. For the ſame purpoſe, it is uſual to beat a kettle or frying-pan; a practice which may have taken its riſe from obſerving that thunder or any great noiſe prompts ſuch bees as are in the fields to return home.

Whenever the ſwarm is once ſettled, the bees which compoſe it ſhould be got into a hive with all convenient ſpeed, to prevent their taking wing again. If they ſettle on a ſmal branch of a tree, eaſy to come at, it may be cut off, and laid upon a cloth; the hive being ready immediately to put over them. If the branch cannot be conveniently cut, the bees may be ſwept from off it into a hive. Lodge but the queen into the hive, and the reſt will ſoon follow. If the bees muſt be conſiderably diſturbed, in order to get them into a hive, the moſt adviſeable way is to let them remain in the place where they have pitched till the evening, when there is leſs danger of their taking wing. If it be obſerved that they ſtill hover about the place they firſt alighted upon, the branches there may be rubbed with rue, or elder leaves, or any other thing diſtaſteful to them, in order to diſguſt them.

The hive deſtined for their habitation ſhould be cleaned with the utmoſt care, and its inſide be rubbed very hard with a coarſe cloth, to get off the looſe ſtraws, or other impurities which might coſt them a great deal of time and labour to gnaw away. It may then be rubbed with fragrant herbs or flowers, the ſmell of which is agreeable to the bees; or with honey, which is ſtill better. The hive ſhould not be immediately ſet on the ſtool where it is to remain; but ſhould be kept near the place at which the bees ſettled, till the evening leſt ſome ſtragglers ſhould be loſt. It ſhould be ſhaded either with boughs or with a cloth, that the too great heat of the ſun may not prove inconvenient.

It now and then happens, that a ſwarm of bees, after having left their hive, and even alighted upon a tree, will return to their firſt abode. This never takes place but when the young queen did not come forth with them, for want of ſtrength, or perhaps courage to truſt to her wings for the firſt time; or poſſibly from a conſciouſneſs of her not being impregnated.

When a ſwarm is too few in number for a hive, it becomes neceſſary to unite another with it, which is very eaſily effected by the following means. Spread a cloth at night upon the ground cloſe to the hive in which the two caſts or ſwarms are to be united; lay a ſtick acroſs this cloth; then fetch the hive with the new ſwarm, ſet it over the ſtick, give a ſmart ſtroke on the top of the hive, and all the bees will drop down on the cloth in a cluſter. This done, throw aſide the empty hive, take the other from off the ſtool, and ſet this laſt over the bees, who will ſoon aſcend into it, mix with thoſe already there, and become one and the ſame family. Others, inſtead of ſtriking the bees down upon the cloth, place with its bottom upmoſt the hive in which the united ſwarms are to live, and ſtrike the bees of the other hive down into it. The former of theſe hives is then reſtored to its natural ſituation, and the bees of both hives ſoon unite. If ſome bees ſtill adhere to the other hive, they may be bruſhed off on the cloth, and they will ſoon join their brethren. Or we may take the following method, which gives leſs diſturbance to the bees. Set with its mouth upmoſt the hive into which the young ſwarm has been put, and ſet upon it the other hive. The bees in the lower hive finding themſelves in an inverted ſituation, will ſoon aſcend into the upper hive.

Almoſt all writers acknowledge, that one of the queens is conſtantly ſlain on theſe occaſions, and generally a conſiderable number of the working bees: yet none of them, Columella excepted, has propoſed the eaſy remedy of killing the queen of the latter caſt or ſwarm before the union is made; a means by which the lives of the working bees may be preſerved. This may be done either by intoxicating them and then picking her out, or by ſearching her out when the bees are beaten down upon the cloth; for this being done in the night, to prevent the battle which might otherwiſe enſue, there will be no great difficulty in ſecuring her.

In weight a large ſwarm may be about eight pounds, and ſo gradually downwards to one pound: conſequently it is a good

one if it weigh five or ſix pounds. All ſuch as weigh leſs than four pounds ſhould be ſtrengthened, by uniting to each of them a leſs numerous ſwarm. The ſize of the hive ſhould be proportioned to the number of the bees; and, as a general rule, it ſhould be rather under than over ſized, becauſe bees require to be kept warmer than a large hive will admit of.

3. *Of ſhifting the Abode of Bees.* In the eſſential article of providing paſture for bees, great improvements may certainly be made, whenever this ſubject ſhall be more carefully attended to than has hitherto been the caſe. A rich corn country is known to be a barren deſert to them during the moſt conſiderable part of the year; and therefore the practice of other nations, in ſhifting their bees into ſituations where they can have ſufficient nouriſhment, well deſerves our imitation.

Columella informs us, that, as few places are ſo happily ſituated as to afford the bees proper paſture both in the beginning of the ſeaſon and alſo in the autumn, it was the advice of Celſus, that, after the vernal paſtures are conſumed, the bees ſhould be tranſported to places abounding with autumnal flowers; as was practiſed by conveying the bees from Achaia to Attica, from Eubœa and the Cyclad iſlands to Scyrus; and alſo in Sicily, where they were brought to Hybla from other parts of the iſland. We alſo learn from Pliny, that this was the practice of Italy in his time. "As ſoon," ſays he, "as the ſpring-food for bees has failed in the valleys near our towns, the hives of bees are put into boats, and carried up againſt the ſtream of the river, in the night, in ſearch of better paſture. The bees go out in the morning in queſt of proviſions, and return regularly to their hives in the boats, with the ſtores they have collected. This method is continued, till the ſinking of the boats to a certain depth in the water ſhows that the hives are ſufficiently full; and they are then carried back to their former homes, where their honey is taken out of them." And this is ſtill the practice of the Italians who live near the banks of the Po, the river which Pliny inſtanced particularly in the paſſage we have juſt cited.

M. Mailliet, in his curious deſcription of Egypt, obſerves, that "in ſpite of the ignorance and ruſticity which have got poſſeſſion of that country, there yet remain in it ſeveral footſteps of the induſtry and ſkill of the ancient Egyptians. One of their moſt admirable contrivances is, their ſending their bees annually into diſtant countries, in order to procure them ſuſtenance there, at a time when they could not find any at home; and their afterwards bringing them back, like ſhepherds who ſhould travel with their flocks, and make them feed as they go. It was obſerved by the ancient inhabitants of Lower Egypt, that all plants bloſſomed, and the fruits of the earth ripened, above ſix weeks earlier in Upper Egypt than with them. They applied this remark to their bees; and the means then made uſe of by them, to enable theſe uſefully induſtrious inſects to reap advantage from the more forward ſtate of nature there, were exactly the ſame as are now practiſed, for the like purpoſe, in that country. About the end of October, all ſuch inhabitants of the Lower Egypt as have hives of bees, embark them on the Nile, and convey them up that river quite into Upper Egypt; obſerving to time it ſo that they arrive there juſt when the inundation is withdrawn, the lands have been ſown, and the flowers begin to bud. The hives thus ſent are marked and numbered by their reſpective owners, and placed pyramidically in boats prepared for the purpoſe. After they have remained ſome days at their fartheſt ſtation, and are ſuppoſed to have gathered all the wax and honey they could find in the fields within two or three leagues around; their conductors convey them in the ſame boats two or three leagues lower down, and there leave the laborious inſects ſo long time as is neceſſary for them to collect all the riches of this ſpot. Thus, the nearer they come to the place of their more permanent abode, they find the productions of the earth, and the plants which afford them food, forward in proportion. In fine, about the beginning of February, after having travelled through the whole length of Egypt, gathering all the rich produce of the delightful banks of the Nile, they arrive at the mouth of that river, towards the ocean; from whence they ſet out, and from whence they are now returned to their ſeveral homes: for care is taken to keep an exact regiſter of every diſtrict from whence the hives were ſent in the beginning of the ſeaſon, of their numbers, of the names of the perſons who ſent them, and likewiſe of the mark or number of the boat in which they were placed."

It is not unuſual in many parts of France to ſee floating bee-houſes. They have on board one barge, three-ſcore or an hundred bee-hives, well defended from the inclemency of an accidental ſtorm. With theſe the owners ſuffer themſelves to float gently down the river, the bees continually chooſing their flowery paſture along the banks of the ſtream; and thus a ſingle floating bee-houſe yields the proprietor a conſiderable income. They have alſo a method of tranſporting their bees by land, well worth our imitation in many parts of this kingdom. Their firſt care is, to examine thoſe hives, ſome of whoſe honey-combs might be broken or ſeparated by the jolting of the vehicle; they are made faſt one to the other, and againſt the ſides of the hive, by means of ſmall ſticks, which may be diſpoſed differently as occaſion will point out. This being done, every hive is ſet upon a packing-cloth, or ſomething like it, the threads of which are very wide; the ſides of this cloth are then turned up and laid on the outſide of each hive, in which ſtate they are tied together with a piece of ſmall pack-thread wound ſeveral times round the hive. As many hives as a cart built for that purpoſe will hold, are afterwards placed in this vehicle. The hives are ſet two and two, the whole length of the cart. Over theſe are placed others; which make, as it were, a ſecond ſtory or bed of hives. Thoſe which are ſtored with combs ſhould always be turned topſy-turvy. It is for the ſake of their combs, and to fix them the better, that they are diſpoſed in this manner; for ſuch as have but a ſmall quantity of combs in them, are placed in their natural ſituation. Care is taken in this ſtowage not to let one hive ſtop up another, it being eſſentially neceſſary for the bees to have air: and it is for this reaſon they are wrapped up in a coarſe cloth, the threads of which are wove very wide, in order that the air may have a free paſſage, and leſſen the heat which theſe inſects raiſe in their hives, eſpecially when they move about very tumultuouſly, as often happens in theſe carts. Thoſe uſed for this purpoſe in Yevre, hold from 30 to 48 hives. As ſoon as all are thus ſtowed, the caravan ſets out. If the ſeaſon is ſultry, they travel only in the night; but a proper advantage is made of cool days. Theſe caravans do not go faſt. The horſes muſt not be permitted even to trot: they are led ſlowly, and through the ſmoothеſt roads. When there are not combs in the hives ſufficient to ſupport the bees during their journey, the owner takes the earlieſt opportunity of reſting them wherever they can collect wax. The hives are taken out of the cart, then ſet upon the ground, and after removing the cloth from over them, the bees go forth in ſearch of food. The firſt field they come to ſerves them as an inn. In the evening, as ſoon as they are all returned, the hives are ſhut up; and being placed again in the cart, they proceed in their journey. When the caravan is arrived at the journey's end, the hives are diſtributed in the gardens, or in the fields adjacent to the houſes of different peaſants, who, for a very ſmall reward, undertake to look after them. Thus it is that, in ſuch ſpots as do not abound in flowers at all ſeaſons, means are found to ſupply the bees with food all through the year.

The very ſtriking advantages which thus attend the ſhifting

of bees in ſearch of paſture, afford an excellent leſſon to many places in this kingdom. They intereſt more particularly the inhabitants of the rich vales, where the harveſt for bees ends early, to remove their ſtocks to places which abound in heath, this plant continuing in bloom during a conſiderable part of autumn, and yielding great plenty of food to bees. Thoſe alſo in the neighbourhood of hills and mountains will ſave the bees a great deal of labour, by taking advantage of theſe hints.

4. *Methods of feeding and defending Bees in Winter.* Providence has ordained, that inſects which feed on leaves, flowers, and green ſucculent plants, ſhould be in an inſenſible or torpid ſtate from the time that the winter's cold has deprived them of the means of ſubſiſtence. But though bees during the winter are in a ſort of inactive ſtate, and little food ſupports them, yet as every warm or ſunny day revives them, and prompts them to return to exerciſe, food becomes indiſpenſably neceſſary to them. Many hives of bees, which are thought to die of cold in the winter, in fact die of famine; when a rainy ſummer has hindered the bees from laying in a ſufficient ſtore of proviſions. The hives ſhould therefore be carefully examined in the autumn, and ſhould then weigh 18 pounds at the leaſt.

Columella deſcribes an annual diſtemper which ſeizes bees in the ſpring, when the ſpurge bloſſoms, and the elm diſcloſes its ſeeds; for they, being much allured by the firſt flowers, feed ſo greedily upon them, that they diſorder themſelves, and die if they are not ſpeedily relieved. The authors of the *Maiſon Ruſtique* impute this purging to the bees feeding on pure honey, which does not form a food ſufficiently ſubſtantial for them, unleſs they have bee-bread to eat at the ſame time; and adviſe giving them a honey-comb taken from another hive, the cells of which are filled with crude wax or bee-bread.

Still, however, it muſt be confeſſed, there is a great want of experiments to aſcertain both the time and the manner in which bees ſhould be fed. The common practice is to feed them in the autumn, giving them as much honey as will bring the whole weight of the hive to near 20 pounds. To this end, the honey is diluted with water, and then put into an empty comb, on ſplit reeds, or, as Columella directs, upon clean wool, which the bees will ſuck perfectly dry. But the dilution with water makes the honey apt to be candied, and honey in that ſtate is prejudicial to bees. The following directions given in the *Maiſon Ruſtique* ſeem to be very judicious. Repleniſh the weak hives in September with ſuch a portion of combs full of honey taken from other hives as ſhall be judged to be a ſufficient ſupply for them. In order to do this, turn up the weak hive, after taking the precaution of defending yourſelf with the ſmoke of rags, cut out the empty combs, and put the full ones in their place; where ſecure them with pieces of wood run acroſs, in ſuch manner that they may not fall down when the hive is returned to its place. The bees will ſoon fix them more effectually. If this method be thought too troubleſome, ſet under the hive a plate of liquid honey, unmixed with water, with ſtraws laid acroſs it, and over theſe a paper pierced full of holes, through which the bees will ſuck the honey without daubing themſelves. This ſhould be done in cloudy or rainy weather, when the bees ſtir leaſt abroad; and the hive ſhould be covered, to protect the bees from robbers, who might be allured to it by the honey.

There is another circumſtance alſo, which may render it very neceſſary to feed the bees, and that is, when ſeveral days of bad weather enſue immediately after they have ſwarmed; for then, being deſtitute of every ſupply beyond what they carried with them, they may be in great danger of ſtarving. In this caſe, honey ſhould be given them in proportion to the time that the bad weather happens to continue.

What degree of cold bees can endure without injury, has not yet been aſcertained. We find that they live in the cold parts of Ruſſia, and often in hollow trees, without any care being taken of them. Their hives are frequently made of the bark of trees, which does not afford them much protection from cold. Mr. White, therefore, judiciouſly obſerves, that bees which ſtand on the north ſide of a building whoſe height intercepts the ſun's beams all the winter, will waſte leſs of their proviſions, almoſt by half, than others which ſtand in the ſun: for coming ſeldom forth, they eat little; and yet in the ſpring are as forward to work and ſwarm as thoſe which had twice as much honey in the autumn before. The owner ſhould, however, examine their ſtate in the winter; and if he find that, inſtead of being cluſtered between the combs, they fall down in numbers on the ſtool or bottom of the hive, the hive ſhould be carried to a warmer place, where they will ſoon recover. He muſt be cautious in returning them again to the cold, leſt the honey become candied.

In thoſe regions where the winters are extremely ſevere, we are adviſed to lay on the bottom of an old caſk the depth of half a foot of very dry earth, powdered, and preſſed down hard, and to ſet on this the ſtool with the hive; then, to preſerve a communication with the air, which is abſolutely neceſſary, to cut a hole in the caſk, oppoſite to the mouth of the hive, and place a piece of reed, or of alder made hollow, from the mouth of the hive to the hole in the caſk; and after this to cover the hive with more of the ſame dry earth. If there be any room to fear that the bees will not have a ſufficiency of food, a plate with honey, covered as before directed, may be put under the hive. If the number of hives be great, boxes may be made of deals nailed together, deep enough to contain the hives when covered with dry earth. The bees will thus remain all the winter free from any danger from cold, hunger, or the depredations of vermin.

5. *Of the Methods of taking the Honey and Wax.* In England it is uſual, in ſeizing the ſtores of theſe little animals, to rob them alſo of their lives. When thoſe which are doomed for ſlaughter have been marked out, which is generally done in September, a hole is dug near the hive, and a ſtick, at the end of which is a rag that has been dipped in melted brimſtone, being ſtuck in that hole, the rag is ſet on fire, the hive is immediately ſet over it, and the earth is inſtantly thrown up all around, ſo that none of the ſmoke can eſcape. In a quarter of an hour, all the bees are ſeemingly dead; and they will ſoon after be irrecoverably ſo, by being buried in the earth that is returned back into the hole. By this laſt means it is that they are abſolutely killed: for it has been found by experiment, that all the bees which have been affected only by the fume of the brimſtone, recover again, excepting ſuch as have been ſinged or hurt by the flame. Hence it is evident, that the fume of brimſtone might be uſed for overpowering the bees, with ſome few precautions. The heavieſt and the lighteſt hives are alike treated in this manner: the former, becauſe they yield the moſt profit, with an immediate return; and the latter, becauſe they would not be able to ſurvive the winter. Thoſe hives which weigh from 15 to 20 pounds, are indeed the fitteſt to be kept.

More humane and judicious methods were practiſed by the ancients; and the following ſimple method is at this day practiſed in Greece, that fallen country. Mount Hymethus is celebrated for the beſt honey in thoſe parts. In Wheeler's Journey into Greece, p. 411, we have the following account. "The hives they keep their bees in are made of willows or oſiers, faſhioned like our common duſt-baſkets, wide at top and narrow at the bottom, and plaſtered with clay or loam within and without. They are ſet as in 2d Plate 47, fig. 1. with the wide end uppermoſt. The tops are covered with broad flat ſticks, which are alſo plaſtered over with clay; and, to ſecure them from the weather, they cover them with a tuft of ſtraw, as wa

do. Along each of theſe ſticks, the bees faſten their combs; ſo that a comb may be taken out whole, without the leaſt bruiſing, and with the greateſt eaſe imaginable. To increaſe them in ſpring-time, that is in March or April, until the beginning of May, they divide them; firſt ſeparating the ſticks on which the combs and bees are faſtened, from one another, with a knife: ſo, taking out the firſt comb and bees together on each ſide, they put them into another baſket, in the ſame order as they were taken out, until they have equally divided them. After this, when they are both again accommodated with ſticks and plaſter, they ſet the new baſket in the place of the old one, and the old one in ſome new place. And all this they do in the middle of the day, at ſuch time as the greateſt part of the bees are abroad; who, at their coming home, without much difficulty, by this means divide themſelves equally. This device hinders them from ſwarming and flying away. In Auguſt, they take out their honey. This they do in the day-time alſo, while they are abroad; the bees being thereby, ſay they, leaſt diſturbed. At this time they take out the combs laden with honey, as before; that is, beginning at each outſide, and ſo taking away, until they have left only ſuch a quantity of combs, in the middle, as they judge will be ſufficient to maintain the bees in winter; ſweeping thoſe bees that are on the combs into the baſket again, and then covering it with new ſticks and plaſter." This method was introduced into France in 1754, as we are informed by M. de Reaumur and Du Hamel, in the Memoirs of the Royal Academy for that year.

Attempts have been made in our own country, to attain the deſirable end of getting the honey and wax without deſtroying the bees; the moſt approved of which we ſhall now briefly relate. Mr. Thorley, in his *Inquiry into the Nature, Order, and Government of Bees*, thinks colonies preferable to hives, for the following reaſons: *Firſt*, For the more certain preſervation of very many thouſands of theſe uſeful creatures; *ſecondly*, Their greater ſtrength, which conſiſts in numbers, and conſequently their greater ſafety from robbers; *thirdly*, Their greater wealth, ariſing from the united labours of the greater number. He tells us, that he has in ſome ſummers taken two boxes filled with honey from one colony; and yet ſufficient ſtore has been left for their maintenance during the winter; each box weighing 40 pounds. Add to theſe advantages, the pleaſure of viewing them, with the greateſt ſafety, at all ſeaſons, even in their buſieſt time of gathering, and their requiring a much leſs attendance in ſwarming time. The bees thus managed are alſo more effectually ſecured from wet and cold, and from mice and other vermin.

The boxes he recommends are made of deal, which, being ſpongy, ſucks up the vapour of the bees ſooner than a more ſolid wood would do. Yellow dram-deal thoroughly ſeaſoned is the beſt. An octagon, being nearer to a ſphere, is better than a ſquare form; for as the bees, in winter, lie in a round body near the centre of the hive, a due heat is then conveyed to all the out-parts, and the honey is kept from candying. The dimenſions recommended for the boxes, are ten inches depth, and 12 or 14 inches breadth in the inſide. Boxes containing a buſhel or more have been tried, and found not to anſwer the end like thoſe of a leſſer ſize. The large ones are much longer in filling; ſo that it is later ere you come to reap the fruits of the labour of the bees: nor is the honey there ſo good and fine, the effluvia even of their own bodies being hurtful to it.

The beſt and pureſt honey is that which is gathered in the firſt five or ſix weeks; and in boxes of leſs dimenſions you may take, in a month or little more, provided the ſeaſon be favourable, a box full of the fineſt honey. The top of the box ſhould be made of an entire board a full inch thick after it has been planed; and it ſhould project on all ſides at leaſt an inch beyond the dimenſions of the box. In the middle of this top there muſt be a hole five inches ſquare, for a communication between the boxes; and this hole ſhould be covered with a ſliding ſhutter, of deal or elm, running eaſily in a groove over the back window. The eight pannels, nine inches deep, and three quarters of an inch thick when planed, are to be let into the top ſo far as to keep them in their proper places; to be ſecured at the corners with plates of braſs, and to be cramped with wires at the bottom to keep them firm; for the heat in ſummer will try their ſtrength. There ſhould be a glaſs-window behind, fixed in a frame, with a thin deal-cover, two ſmall braſs hinges, and a button to faſten it. This window will be ſufficient for inſpecting the progreſs of the bees. Two braſs handles, one on each ſide, are neceſſary to lift up the box: theſe ſhould be fixed in with two thin plates of iron, near three inches long, ſo as to turn up and down, and put three inches below the top-board, which is nailed cloſe down with ſprigs to the other parts of the box.

Thoſe who chooſe a frame within, to which the bees may faſten their combs, need only uſe a couple of deal ſticks of an inch ſquare, placed acroſs the box, and ſupported by two pins of braſs; one an inch and half below the top, and the other two inches below it; by which means the combs will quickly find a reſt. One thing more, which perfects the work, is, a paſſage, four or five inches long, and leſs than half an inch deep, for the bees to go in and out at the bottom of the box. Mr. Hunter in his Paper on Bees, publiſhed in vol. 82 of the Phil. Tranſ. recommends *ridges* of wood to be laid in ſuch a direction as we would wiſh the comb to run in. For the management of bees in colonies, and the methods of taking their honey and wax, we are to attend to the following particulars.

1. In keeping bees in colonies, an houſe is neceſſary, or at leaſt a ſhade; without which the weather, eſpecially the heat of the ſun, would ſoon ſplit the boxes to pieces. The houſe may be made of any boards you pleaſe, but deal is the beſt. Of whatever ſort the materials are, they muſt be painted, to keep out the weather. The length of this houſe, we will ſuppoſe for ſix colonies, ſhould be full 12 feet and an half, and each colony ſhould ſtand a foot diſtance from the other. It ſhould be three feet and an half high, to admit four boxes one upon another; but if only three boxes are employed, two feet eight inches will be ſufficient. Its breadth in the inſide ſhould be two feet. The four corner-poſts ſhould be made of oak, and well fixed in the ground, that no ſtormy winds may overturn it; and all the rails ſhould be of oak, ſupported by ſeveral uprights of the ſame, before and behind, that they may not yield or ſink under 6, 7, or 800 weight, or upwards. The floor of the houſe (about two feet from the ground) ſhould be ſtrong and ſmooth, that the loweſt box may ſtand cloſe to it. This floor may be made with boards or planks of deal the full length of the bee-houſe; or, which is preferable, with a board or plank to each colony, of two feet four inches long, and fixed down to the rails; and that part which appears at the front of the houſe may be cut into a ſemicircle, as a proper alighting place for the bees. Plane it to a ſlope, that the wet may fall off. When this floor to a ſingle colony wants to be repaired, it may eaſily be removed, and another be placed in its room, without diſturbing the other colonies, or touching any other part of the floor.

Upon this floor, at equal diſtances, all your colonies muſt be placed, againſt a door or paſſage cut in the front of the houſe. Only obſerve farther, to prevent any falſe ſtep, that as the top-board of the box (being a full inch broader than the other part) will not permit the two mouths to come together, you muſt cut a third in a piece of deal of a ſufficient breadth, and place it between the other two, ſo cloſe that not a bee may get that way into the houſe. And fixing the ſaid piece of deal

down to the floor with two lath-nails, you will find afterwards to be of ſervice, when you have occaſion either to raiſe a colony, or take a box of honey, and may prove a means of preventing a great deal of damage.

The houſe being in this ſtate of forwardneſs, you may cover it to your own mind, with boards, fine ſlates, or tiles, placed ſo as to carry off the wet, and keep out the cold, &c. The back-doors may be made of half-inch deal, two of them to ſhut cloſe in a rabbet, cut in an upright pillar, which may be ſo contrived, as to take in and out, by a mortiſe in the bottom rail, and a notch in the inſide of the upper rail, and faſtened with a ſtrong haſp. Place theſe pillars in the ſpaces between the colonies.

Suppoſing the houſe made after this model, without front doors, a weather-board will be very neceſſary to carry the water off from the places where the bees ſettle and reſt. By obſerving theſe precautions, the bees are kept warm in the coldeſt winter; and in the hotteſt ſummer greatly refreſhed by the cool air, the back-doors being ſet open, without any air-holes made in the boxes themſelves.

The beſt time to plant the colonies is, either in ſpring with new ſtocks full of bees, or in ſummer with ſwarms. If ſwarms are uſed, procure if poſſible two of the ſame day: hive them either in two boxes, or in a hive and a box: at night, place them in the bee-houſe, one over the other; and with a knife and a little lime and hair, ſtop cloſe the mouth of the hive or upper box, ſo that not a bee may be able to go in or out but at the front-door. This done, you will in a week or ten days with pleaſure ſee the combs appear in the boxes; but if it be an hive, nothing can be ſeen till the bees have wrought down into the box. Never plant a colony with a ſingle ſwarm; as the experiment will not anſwer.

When the ſecond box, or the box under the hive, appears full of bees and combs, it is time to raiſe your colony. This ſhould be done in the duſk of the evening, and in the following manner: Place your empty box, with the ſliding ſhutter drawn back, behind the houſe, near the colony that is to be raiſed, and at nearly the height of the floor: then lifting up the colony with what expedition you can, let the empty box be put in the place where it is to ſtand, and the colony upon it; and ſhut up the mouth of the then upper box with lime and hair, as before directed. When, by the help of the windows in the back of the boxes, you find the middle box full of combs, and a quantity of honey ſealed up in it, the loweſt box half full of combs, and few bees in the uppermoſt box, proceed thus: About five o'clock in the afternoon, drive cloſe with a mallet the ſliding ſhutter under the hive or box that is to be taken from the colony. If the combs are new, the ſhutter may be forced home without a mallet; but be ſure it be cloſe, that no bees may aſcend into the hive or box to be removed. After this, ſhut cloſe the doors of your houſe, and leave the bees thus cut off from the reſt of their companions, for the ſpace of half an hour or more. In this ſpace of time, having loſt their queen, they will fill themſelves with honey, and be impatient to get abroad.

If, in this interval, the box or boxes beneath are examined, and it appears all is quiet in them, you may be confident that the queen is there, and in ſafety. Hereupon raiſe the back part of the hive or box ſo far, by a piece of wood ſlipped under it, as to give the priſoners room to come out, and they will return to their fellows: then lifting the box from off the colony, and turning its bottom upmoſt, cover it with a cloth all night; and the next morning, when this cloth is removed, the bees that have remained in it will return to the colony. Thus you have a hive or box of honey, and all your bees remain alive.

But if the bees do not all come out in this manner, it will be neceſſary to place the hive with the ſmall end downward in a pail, peck, or flower-pot, ſo as to make it ſtand firm: then take an empty hive, and ſet it upon the former, and draw a cloth tight round the joining of the two hives, ſo that none of the bees may be able to get out. After this, ſtrike the full hive ſo ſmartly as to diſturb the bees that are in it, but with ſuch pauſes between the ſtrokes as to allow them time to aſcend into the empty hive, which muſt be held faſt whilſt this is doing, leſt it fall off by the ſhaking of the other. When you perceive by the noiſe of the bees in the upper hive, that they are got into this laſt, carry it to a cloth ſpread for this purpoſe before the colony, with one end faſtened to the landing-place, and knock them out upon it: they will ſoon crawl up the cloth, and join their fellows, who will gladly welcome them.

Mr. Thorley next gives an account of his narcotic, and of the manner of uſing it. The method which he has purſued with great ſucceſs for many years, and which he recommends to the public as the moſt effectual for preſerving bees in common hives, is incorporation, or uniting two ſtocks into one by the help of a peculiar fume or opiate, which will put them entirely in your power for a time to divide and diſpoſe of at pleaſure. But as that dominion over them will be of ſhort duration, you muſt be expeditious in this buſineſs. The queen is immediately to be ſought for, and killed. Hives which have ſwarmed twice, and are conſequently reduced in their numbers, are the fitteſt to be joined together, as this will greatly ſtrengthen and improve them. If a hive which you would take is both rich in honey and full of bees, it is but dividing the bees into two parts, and putting them into two boxes inſtead of one. Examine whether the ſtock to which you intend to join the bees of another, have honey enough in it to maintain the bees of both: it ſhould be full 20 pounds in weight.

The narcotic, or ſtupefying fume, is made with the *fungus maximus* or *pulverulentus*, the large muſhroom, commonly known by the name of *lunt*, *puckfiſt*, or *frog-cheeſe*. It is as big as a man's head, or bigger, when ripe; it is of a brown colour, turns to powder, and is exceeding light. Put one of theſe pucks into a large paper, preſs it therein to two-thirds or near half the bulk of its former ſize, and tie it up very cloſe; then put it into an oven ſome time after the houſhold bread has been drawn, and let it remain there all night: when it is dry enough to hold fire, it is fit for uſe. The manner of uſing it is thus: Cut off a piece of the puck, as large as a hen's egg, and fix it in the end of a ſmall ſtick ſlit for that purpoſe, and ſharpened at the other end; which place ſo that the puck may hang near the middle of an empty hive. This hive muſt be ſet with the mouth upward, in a pail or bucket which ſhould hold it ſteady, near the ſtock you intend to take. This done, ſet fire to the puck, and immediately place the ſtock of bees over it, tying a cloth round the hives, that no ſmoke may come forth. In a minute's time, or little more, you will hear the bees fall like drops of hail into the empty hive. You may then beat the top of the full hive gently with your hand, to get out as many of them as you can: after this, looſing the cloth, lift the hive off to a table, knock it ſeveral times againſt the table, ſeveral more bees will tumble out, and perhaps the queen among them. She often is one of the laſt that falls. If ſhe is not there, ſearch for her among the main body in the empty hive, ſpreading them for this purpoſe on a large table.

You muſt proceed in the ſame manner with the other hive with the bees of which theſe are to be united. One of the queens being ſecured, you muſt put the bees of both hives together, mingle them thoroughly, and drop them among the combs of the hive which they are intended to inhabit. When

they are all in, cover it with a packing or other coarſe cloth which will admit air, and let them remain ſhut up all that night and the next day. You will ſoon be ſenſible that they are awaked from this ſleep. The ſecond night after their union, in the duſk of the evening, gently remove the cloth from off the mouth of the hive (taking care of yourſelf), and the bees will immediately ſally forth with a great noiſe; but being too late, they will ſoon return: then inſerting two pieces of tobacco-pipe to let in air, keep them confined for three or four days, after which the door may be left open. The beſt time for uniting bees is, after their young brood are all out, and before they begin to lodge in the empty cells. As to the hour of the day, he adviſes young practitioners to do it early in the afternoon, in order that, having the longer light, they may the more eaſily find out the queen. He never knew ſuch combined ſtocks conquered by robbers. They will either ſwarm in the next ſummer, or yield an hive full of honey.

To the publication we have quoted, the author's ſon has latterly annexed a poſtſcript, purporting, that perſons who chooſe to keep bees in glaſs-hives may, after uncovering the hole at the top of a flat-topped ſtraw-hive, or box, place the glaſs over it ſo cloſe that no bee can go in or out but at the bottom of the hive or box. The glaſs-hive muſt be covered with an empty hive or with a cloth, that too much light may not prevent the bees from working. As ſoon as they have filled the ſtraw-hive or box, they will begin to work up into the glaſs-hive. He tells us, that he himſelf has had one of theſe glaſs-hives filled by the bees in 30 days in a fine ſeaſon; and that it contained 38 pounds of fine honey. When the glaſs is completely filled, ſlide a tin-plate between it and the hive or box, ſo as to cover the paſſage, and in half an hour the glaſs may be taken off with ſafety. What few bees remain in it, will readily go to their companions. He has added a glaſs window to his ſtraw-hives, in order to ſee what progreſs bees make; which is of ſome importance, eſpecially if one hive is to be taken away whilſt the ſeaſon continues favourable for their collecting of honey: for when the combs are filled with honey, the cells are ſealed up, and the bees forſake them, and reſide moſtly in the hive in which their works are chiefly carried on. Obſerving alſo that the bees were apt to extend their combs through the paſſage of communication in the upper hive, whether glaſs or other, which rendered it neceſſary to divide the comb when the upper hive was taken away, he now puts in that paſſage a wire ſcreen or netting, the meſhes of which are large enough for a loaded bee to go eaſily through them. This prevents the joining of the combs from one box to the other, and conſequently obviates the neceſſity of cutting them, and of ſpilling ſome of the honey, which running down among a crowd of bees, uſed before to incommode them much, it being difficult for them to clear their wings of it. Fig. 2. in 2d Plate 47. is a drawing of one of his colonies.

2. In the directions Mr. White has given for making bee-boxes of his own invention, he tells us, ſpeaking of the conſtruction of a *ſingle* one, that it may be made of deal or any other well-ſeaſoned boards which are not apt to warp or ſplit. The boards ſhould be near an inch thick; the figure of the box ſquare, and its height and breadth nine inches and five eighths, every way meaſuring within. With theſe dimenſions it will contain near a peck and an half. The front-part muſt have a door cut in the middle of the bottom edge, three inches wide, and near half an inch in height, which will give free liberty to the bees to paſs through, yet not be large enough for their enemy the mouſe to enter. In the back-part you muſt cut a hole with a rabbet in it, in which you are to fix a pane of the cleareſt and beſt crown-glaſs, about five inches in length and three in breadth, and faſten it with putty: let the top of the glaſs be placed as high as the roof within-ſide, that you may ſee the upper part of the combs, where the bees with their riches are moſtly placed. You will by this means be better able to judge of their ſtate and ſtrength, than if your glaſs was fixed in the middle. The glaſs muſt be covered with a thin piece of board, by way of ſhutter, which may be made to hang by a ſtring, or turn upon a nail, or ſlide ſideways between two mouldings. Such as are deſirous of ſeeing more of the bees' works, may make the glaſs as large as the box will admit without weakening it too much; or they may add a pane of glaſs on the top, which muſt likewiſe be covered with a ſhutter, faſtened down with pegs, to guard againſt accidents.

The ſide of the box, which is to be joined to another box of the ſame form and dimenſions, as it will not be expoſed to the internal air, may be made of a piece of ſlit deal not half an inch thick. This he calls the *ſide of communication*, becauſe it is not to be wholly incloſed: a ſpace is to be left at the bottom the whole breadth of the box, and a little more than an inch in height; and a hole or paſſage is to be made at top, three inches long, and more than half an inch wide. Through theſe the bees are to have a communication from one box to the other. The lower communication being on the floor, our labourers, with their burdens, may readily and eaſily aſcend into either of the boxes. The upper communication is only intended as a paſſage between the boxes, reſembling the little holes or narrow paſſes which may be obſerved in the combs formed by our ſagacious architects, to ſave time and ſhorten the way when they have occaſion to paſs from one comb to another; juſt as in populous cities, there are narrow lanes and alleys paſſing tranſverſely from one large ſtreet to another.

It is requiſite, in the next place, to provide a looſe board, half an inch thick, and large enough to cover the ſide where you have made the communications. You are likewiſe to have in readineſs ſeveral little iron ſtaples, an inch and half long, with the two points or ends bended down more than half an inch. The uſe of theſe will be ſeen preſently. You have now only to fix two ſticks croſſing the box from ſide to ſide, and croſſing each other, to be a ſtay to the combs; one about three inches from the bottom, the other the ſame diſtance from the top; and when you have painted the whole, to make it more durable, your box is finiſhed.

The judicious bee-maſter will here obſerve, that the form of the box now deſcribed is as plain as poſſible. No directions are neceſſary for making the other box, which muſt be of the ſame form and dimenſions. The two boxes differ from each other only in this, that the ſide of communication of the one muſt be on your right hand; of the other, on your left. Fig. 3. repreſents two of theſe boxes, with their openings of communication, ready to join to each other.

The manner of hiving a ſwarm into one or both of theſe boxes, is thus deſcribed by our author:—You are to take the looſe board, and faſten it to one of the boxes, ſo as to ſtop the communications. This may be done by three of the ſtaples before mentioned; one on the top of the box near the front; the two others on the back, near the top and near the bottom. Let one end of the ſtaple be thruſt into a gimlet-hole made in the box, ſo that the other end may go as tight as can be over the looſe board, to keep it from ſlipping when it is handled. The next morning, after the bees have been hived in this box, the other box ſhould be added, and the looſe board ſhould be taken away. This will prevent a great deal of labour to the bees, and ſome to yourſelf.

The ſhutter ſhould be ſo cloſed as that no light may enter through it; for the bees ſeem to look upon ſuch light as a hole or breach in their houſe, and on that account may not

ſo well like their new habitation. But the principal thing to be obſerved at this time is, to cover the box, as ſoon as the bees are hived, with a linen cloth thrown looſely over it, or with green boughs to protect it from the piercing heat of the ſun. Boxes will admit the heat much ſooner than ſtraw-hives; and if the bees find their houſe too hot for them, they will be wiſe enough to leave it. If the ſwarm be larger than uſual, inſtead of faſtening the looſe board to one box, you may join two boxes together with three ſtaples, leaving the communication open from one to the other, and then hive your bees into both. In all other reſpects, they are to be hived in boxes after the ſame manner as in common hives. The door of the ſecond box ſhould be carefully ſtopped up, and be kept conſtantly cloſed, in order that the bees may not have an entrance but through the firſt box.

When the boxes are fixed in the places where they are to remain, they muſt be ſcreened from the ſummer's ſun, becauſe the wood will otherwiſe be heated to a greater degree than either the bees or their works can bear; and they ſhould likewiſe be ſcreened from the winter's ſun, becauſe the warmth of this will draw the bees from that lethargic ſtate which is natural to them as well as many other inſects in the winter-ſeaſon. For this purpoſe, and alſo to ſhelter the boxes from rain, Mr. White contrived the following frame. Fig. 4. repreſents the front of a frame for twelve colonies. *a*, *a*, are two cells of oak lying flat on the ground, more than four feet long. In theſe cells are fixed four oaken poſts, about the thickneſs of ſuch as are uſed for drying linen. The two poſts *b*, *b*, in the front, are about ſix feet two inches above the cells: the other two, ſtanding backward, five feet eight inches. You are next to nail ſome boards of ſlit deal horizontally from one of the fore-poſts to the other, to ſcreen the bees from the ſun. Let theſe boards be ſeven feet ſeven inches in length, and nailed to the inſide of the poſts; and be well ſeaſoned, that they may not ſhrink or gape in the joints. *c*, *c*, are two ſplints of deal, to keep the boards even, and ſtrengthen them. Fig. 5. repreſents the back of the frame. *d*, *d*, *d*, *d*, are four ſtrong boards of the ſame length with the frame, on which you are to place the boxes. Let the upper ſide of them be very ſmooth and even, that the boxes may ſtand true upon them: or it may be ſtill more adviſable, to place under every pair of boxes a ſmooth thin board, as long as the boxes, and about a quarter of an inch wider. The bees will ſoon faſten the boxes to this board in ſuch a manner that you may move or weigh the boxes and board together, without breaking the wax or reſin, which for many reaſons ought to be avoided. Theſe floors muſt be ſupported by pieces of wood or bearers, which are nailed from poſt to poſt at each end. They are likewiſe to be well nailed to the frame, to keep them from ſinking with the weight of the boxes. *f* repreſents the roof, which projects backward about ſeven or eight inches beyond the boxes, to ſhelter them from rain. You have now only to cut niches or holes in the frame, over againſt each mouth or entrance into the boxes, at *h*, *h*, *h*, &c. in fig. 4. Let theſe niches be near four inches long; and under each you muſt nail a ſmall piece of wood for the bees to alight upon. The morning or evening ſun will ſhine upon one or both ends of the frame, let its aſpect be what it will: but you may prevent its overheating the boxes, by a looſe board ſet up between the poſts, and kept in by two or three pegs.

The ſame gentleman, with equal ingenuity and humanity, has demonſtrated that it is evidently more to our advantage, to ſpare our bees, and be content with part of their ſtores, than to kill and take poſſeſſion of the whole. About the latter end of Auguſt, ſays he, by a little inſpection through your glaſſes, you may eaſily diſcover which of your colonies you may lay under contribution. Such as have filled a box and an half with their works, will pretty readily yield you the half box. But you are not to depend upon the quantity of combs without examining how they are ſtored with honey. The bees ſhould, according to him, have eight or nine pounds left them, by way of wages for their ſummer's work.

The moſt proper time for this buſineſs is the middle of the day; and as you ſtand behind the frame, you will need no armour, except a pair of gloves. The operation itſelf is very ſimple, and eaſily performed, thus: Open the mouth of the box you intend to take; then with a thin knife cut through the reſin with which the bees have joined the boxes to each other, till you find that you have ſeparated them; and after this, thruſt a ſheet of tin gently in between the boxes. The communication being hereby ſtopped, the bees in the fulleſt box, where it is moſt likely the queen is, will be a little diſturbed at the operation; but thoſe in the other box where we ſuppoſe the queen is not, will run to and fro in the utmoſt hurry and confuſion, and ſend forth a mournful cry, eaſily diſtinguiſhed from their other notes. They will iſſue out at the newly opened door; not in a body as when they ſwarm, nor with ſuch calm and cheerful activity as when they go forth to their labours; but by one or two at a time, with a wild flutter and viſible rage and diſorder. This, however, is ſoon over: for as ſoon as they get abroad and ſpy their fellows, they fly to them inſtantly and join them at the mouth of the other box. By this means, in an hour or two, for they go out ſlowly, you will have a box of pure honey, without leaving a bee in it to moleſt you; and likewiſe without dead bees, which, when you burn them, are often mixed with your honey, and both waſte and damage it.

Mr. White, however, acknowledges, that he has ſometimes found this method fail, when the mouth of the box to be taken away has not been conſtantly and carefully cloſed: the bees will in this caſe get acquainted with it as an entrance; and when you open the mouth in order to their leaving this box, many of them will be apt to return, and the communication being ſtopped, will in a ſhort time carry away all the honey from this to the other box; ſo much do they abhor a ſeparation. When this happens, he has recourſe to the following expedient, which he thinks infallible. He takes a piece of deal, a little larger than will cover the mouth of the box, and cuts in it a ſquare nich ſomewhat more than half an inch wide. In this nich he hangs a little trap-door, made of a thin piece of tin, turning upon a pin, with another pin croſſing the nich a little lower ſo as to prevent the hanging door from opening both ways. This being placed cloſe to the mouth, the bees which want to get out will eaſily thruſt open the door outwards, but cannot open it the other way to get in again; ſo muſt, and will readily, make to the other box, leaving this in about the ſpace of two hours, with all its ſtore, juſtly due to the tender-hearted bee-maſter as a ranſom for their lives.

What led our author to prefer collateral boxes to thoſe before in uſe, was, to uſe his own words, his "compaſſion for the poor bees, who, after traverſing the fields, return home weary and heavy laden, and muſt perhaps depoſit their burden up two pair of ſtairs, or in the garret. The lower room, it is likely, is not yet furniſhed with ſtairs: for, as is well known, our little architects lay the foundation of their ſtructures at the top, and build downward. In this caſe, the weary little labourer is to drag her load up the ſides of the walls: and when ſhe has done this, ſhe will travel many times backward and forward, as I have frequently ſeen, along the roof, before ſhe finds the door or paſſage into the ſecond ſtory; and here again ſhe is perplexed with a like puzzling labyrinth, before ſhe gets into the third. What a waſte is here of that precious time which our bees value ſo much, and which they employ ſo well! and what an expence of ſtrength and ſpirits, on

which their ſupport and ſuſtenance depend! In the collateral boxes, the rooms are all on the ground-floor; and becauſe I know my bees are wiſe enough to value convenience more than ſtate, I have made them of ſuch a moderate, though decent, height, that the bees have much leſs way to climb to the top of them than they have to the crown of a common hive."

The hives recommended by Mr. Wildman have been already deſcribed. A good ſwarm will ſoon fill one of theſe hives, and therefore another hive may be put under it the next morning. The larger ſpace allowed to the bees will excite their induſtry in filling them with combs. The queen will lay ſome eggs in the upper hive; but ſo ſoon as the lower hive is filled with combs, ſhe will lay moſt of them in it. In little more than three weeks, all the eggs laid in the upper hive will be turned into bees; and if the ſeaſon is favourable, their cells will be ſoon filled with honey. As ſoon as they want room, a third hive ſhould be placed under the two former; and in a few days after the end of three weeks from the time the ſwarm was put into the hive, the top hive may be taken away at noon of a fair day; and if any bees remain in it, carry it to a little diſtance from the ſtand, and turning its bottom up, and ſtriking it on the ſides, the bees will be alarmed, take wing, and join their companions in the ſecond and third hives. If it is found that the bees are very unwilling to quit it, it is probable that the queen remains among them. In this caſe, the bees muſt be treated in the manner that ſhall be directed when we deſcribe Mr. Wildman's method of taking the honey and the wax. The upper hive now taken away ſhould be put in a cool place, in which no vermin, mice, &c. can come at the combs, or other damage can happen to them, and be thus kept in reſerve.

When the hives ſeem to be again crowded, and the upper hive is well ſtored or filled with honey, a fourth hive ſhould be placed under the third, and the upper hive be taken off the next fair day at noon, and treated as already directed. As the honey made during the ſummer is the beſt, and as it is needleſs to keep many full hives in ſtore, the honey may be taken out of the combs of this ſecond hive for uſe. If the ſeaſon is very favourable, the bees may ſtill fill a third hive. In this caſe, a fifth hive muſt be put under the fourth, and the third taken away as before. The bees will then fill the fourth for their winter ſtore.

The honey of the firſt hive being of a better quality than the honey collected ſo late as that in the third, the honey may be taken out of the combs of the firſt, and the third may be preſerved with the ſame care as directed for that.

In September, the uppermoſt hive ſhould be examined: if full, it will be a ſufficient proviſion for the winter; but if light, that is, not containing 20 pounds of honey, the more the better, then, in the month of October, the fifth hive ſhould be taken away, and the hive kept in reſerve ſhould be put upon the remaining one, to ſupply the bees with abundant proviſions for the winter. Nor need the owner grudge them this ample ſtore; for they are faithful ſtewards, and will be proportionably richer and more forward in the ſpring and ſummer, when he will reap an abundant profit. The fifth hive, which was taken away, ſhould be carefully preſerved during the winter, that it may be reſtored to the ſame ſtock of bees, when an additional hive is wanted next ſummer; or the firſt ſwarm that comes off may be put into it. The combs in it, if kept free from dirt and vermin, will ſave much labour, and they will at once proceed to depoſit their honey in them.

When the hives are changed, a cover, as already directed, ſhould be put upon every upper hive: and when a lower hive becomes an upper hive, the door of it ſhould be ſhut up, that ſo their only paſſage out ſhall be by the lower hive; for otherwiſe the queen would be apt to lay eggs in both indiſcriminately. The whole of the above detail of the management of one hive may be extended to any number. It may be proper to keep a regiſter to each ſet; becauſe, in reſtoring hives to the bees, they may be better pleaſed at receiving their own labours than that of other ſtocks.

If it appears in the autumn, that there are ſome weak hives, which have neither proviſion nor numbers ſufficient for the winter, it is adviſeable to join the bees to richer hives: for the greater number of bees will be a mutual advantage to one another during the winter, and accelerate their labours much in the ſpring. For this purpoſe, carry a poor and a richer hive into a room a little before night: then force the bees out of both hives into two ſeparate empty hives, in a manner that ſhall be hereafter directed: ſhake upon a cloth the bees out of the hive which contains the feweſt; ſearch for the queen; and as ſoon as you have ſecured her with a ſufficient retinue, bring the other hive which contains the greater number, and place it on the cloth on which the other bees are, with a ſupport under one ſide, and with a ſpoon ſhovel the bees under it. They will ſoon aſcend; and, while under this impreſſion of fear, will unite peaceably with the other bees; whereas, had they been added to the bees of the richer hive, while in poſſeſſion of their caſtle, many of the new-comers muſt have been killed.

From the account of the management of bees in Mr. Wildman's hives, it appears, that there is very little art wanting to cauſe the bees to quit the hives which are taken away, unleſs a queen happens by chance to be among them. In that caſe, the ſame means may be uſed as are neceſſary when we would rob one of the common hives of part of its wealth. The method is as follows: Remove the hive from whence you would take the wax and honey into a room, into which admit but little light, that it may at firſt appear to the bees as if it was late in the evening. Gently invert the hive, placing it between the frames of a chair or other ſteady ſupport, and cover it with an empty hive, keeping that ſide of the empty hive raiſed a little, which is next the window, to give the bees ſufficient light to get up into it. While you hold the empty hive ſteadily ſupported on the edge of the full hive, between your ſide and your left arm, keep ſtriking with the other hand all round the full hive from top to bottom, in the manner of beating a drum, ſo that the bees may be frightened by the continued noiſe from all quarters; and they will in conſequence mount out of the full hive into the empty one. Repeat the ſtrokes rather quick than ſtrong round the hive, till all the bees are got out of it, which in general will be in about five minutes. It is obſerved, that the fuller the hive is of bees, the ſooner they will have left it. As ſoon as a number of them have got into the empty hive, it ſhould be raiſed a little from the full one, that the bees may not continue to run from the one to the other, but rather keep aſcending upon one another. So ſoon as all the bees are out of the full hive, the hive in which the bees are muſt be placed on the ſtand from which the other hive was taken, in order to receive the abſent bees as they return home.

If this is done early in the ſeaſon, the royal cells ſhould be examined, in order that any of them that have young in them may be ſaved, as well as the combs which have young bees in them, which ſhould on no account be touched, even though by ſparing them a good deal of honey be left behind. The other combs ſhould be removed with a long, broad, and pliable knife, ſuch as a painter's palette knife. The combs ſhould be cut from the ſides and crown as clean as poſſible, to ſave the future labour of the bees, who muſt lick up the honey ſpilt, and remove every part of the wax; and then the ſides of the hive ſhould be ſcraped with a table-ſpoon, to clear away what was left by the knife. During the whole of this operation, the

hive ſhould be placed inclined to the ſide from which the combs are taken, that the honey which is ſpilt may not daub the remaining combs. If ſome combs were unavoidably taken away, in which there are young bees, the parts of the combs in which they are ſhould be returned into the hive, and ſecured by ſticks in the beſt manner poſſible. Place the hive then for ſome time upright, that any remaining honey may drain out. If the combs are built in a direction oppoſite to the entrance, or at right angles with it, thoſe which are the furtheſt from the entrance are to be preferred; becauſe there they are beſt ſtored with honey, and have the feweſt young bees in them.

Having thus taken the wax and honey, the next buſineſs is to return the bees to their old hive; and for this purpoſe place a table covered with a clean cloth near the ſtand, and giving the hive in which the bees are a ſudden ſhake, at the ſame time ſtriking it pretty forcibly, the bees will be ſhaken on the cloth. Put their own hive over them immediately, raiſed a little on one ſide, that the bees may the more eaſily enter; and when all are entered, place it on the ſtand as before. If the hive in which the bees are be turned bottom uppermoſt, and their own hive be placed over it, the bees will immediately aſcend into it, eſpecially if the lower hive is ſtruck on the ſides to alarm them.

Since it is evident the chief object of the bees during the ſpring and beginning of the ſummer is the propagation of their kind, honey during that time is not collected in ſuch quantity as it is afterwards: and on this account it is ſcarcely worth while to rob a hive before the latter end of June; nor is it ſafe to do it after the middle of July, leſt rainy weather may prevent their reſtoring the combs they have loſt, and laying in a ſtock of honey ſufficient for the winter, unleſs there is a chance of carrying them to a rich paſture.

Hitherto we have deſcribed the bee, its œconomy and wonderful operations according to received opinions on the ſubject. We cannot however cloſe this article, without detailing in a conciſe way the opinions of Mr. Hunter, as ſet forth in vol. 82 of the Phil. Tranſ. With regard to the farina collected by bees, and ſuppoſed by Reaumur and others to be the ſubſtance of which wax is made, Mr. Hunter aſſerts, that it is nothing more than the bee-bread, or that ſubſtance intended for the nouriſhment of the young animal when it eſcapes from the egg. The wax, he ſays, is an external ſecretion from the body of the bee, and diſcoverable between each of the ſcales of the under ſide of its belly. A quantity of theſe thin portions collected together, and held to a candle on a pin's point, immediately melted into a little globe; whilſt no ſuch effect followed the expoſure of farina from the hind legs of the bee. Thoſe cells in which the queen bee is ſuppoſed to be bred, Mr. Hunter is diſpoſed to conſider as intended for a different purpoſe. In ſome caſes he found 12 or 13 in the ſame hive, whilſt he thinks he has met with other hives without any of them at all. He aſſerts too, that their depth is not adapted to the length of body which diſtinguiſhes the queen, being only equally deep with thoſe cells that have contained the male bees. But indeed this is not the only ground on which he founds this conjecture, for the mouth of the royal cell is always placed downwards, nor is there to be found in it the ſilken covering of the chryſalis, as in the caſe of the males and labourers. The comb is evidently, he thinks, formed in the firſt inſtance for propagation, the reception of honey being only ſecondary; for if bees loſe their queen, they make no combs; and the waſp, hornet, &c. make combs, though they collect no honey, while the humble bee collects honey, and ſtores it in cells ſhe never made. Riem aſſerts, that when the queen is taken from a hive, the labourers lay eggs; but Mr. Hunter thinks the queen is the only one that propagates. Her firſt eggs produce labourers, then the males, and probably the queen. He conſiders Mr. Debraw's notion of the exiſtence of males of a ſmaller ſize unfounded, and as an idea merely calculated to furniſh a convenient link in the chain of a favourite hypotheſis. For a variety of novel remarks on this ſubject, the reader will do well to conſult the paper from whence we have drawn theſe particulars.

Bee is alſo uſed figuratively to denote ſweetneſs, induſtry, &c. Thus Xenophon is called the *Attic bee*, on account of the great ſweetneſs of his ſtyle. Antonius got the denomination *Meliſſa* or *Bee*, on account of his collection of commonplaces.—Leo Allatius gave the appellation *apes urbanæ* to the illuſtrious men at Rome from the year 1630 to the year 1632.

Bee's-*Bread*. The farina collected from flower cups by the working bee, brought to the hive in the hollows of his hind-legs, and depoſited in the cells with the egg, to ſupply food for the young maggot. See Bee.

Bee-*Eater*, in zoology. See Merops.

Bee-*Flower*. See Ophrys.

Bee-*Glue*, called by the ancients *propolis*, is a ſoft, unctuous, glutinous matter, employed by bees to cement the combs to the hives, and to cloſe up the cells. See Bee.

Bee-*Hives*. See the article Bee and 2d Plate 47.

BEECH tree, in botany. See Fagus.

Beech-*Maſt*, the fruit of the beech-tree, ſaid to be good for fattening hogs, deer, &c.—It has ſometimes, even to men, proved an uſeful ſubſtitute for bread. Chios is ſaid to have endured a memorable ſiege, through the aſſiſtanee derived from it.

Beech-*Oil*, an oil drawn by expreſſion from the maſt of the beech-tree, after it has been ſhelled and pounded. This oil is uſed in many parts of France inſtead of butter; but moſt of thoſe who take a great deal of it find it inconvenient to the ſtomach.

BEEF, the fleſh of black-cattle prepared for food. According to Dr. Cullen, beef, though of a more firm texture and leſs ſoluble than mutton, is equally alkaleſcent, perſpirable, and nutritious; and if, in the ſouthern countries, it is not eſteemed ſo, it is on account of its imperfection there.

BEELE, a kind of pick-axe, uſed by the miners for ſeparating the ores from the rocks in which they lie: this inſtrument is called a *tubber* by the miners of Cornwall.

BEER, is a ſpirituous liquor made from any farinaceous grain, but generally from barley. It is, properly ſpeaking, the wine of barley. The meals of any of theſe grains being extracted by a ſufficient quantity of water, and remaining at reſt in a degree of heat requiſite for the ſpirituous fermentation, naturally undergo this fermentation, and are changed into a vinous liquor. But as all theſe matters render the water mucilaginous, fermentation proceeds ſlowly and imperfectly in ſuch liquors. On the other hand, if the quantity of farinaceous matter be ſo diminiſhed that its extract or decoction may have a convenient degree of fluidity, this liquor will be impregnated with ſo ſmall a quantity of fermentable matter, that the beer or wine of the grain will be too weak, and have too little taſte.

Theſe inconveniencies are remedied by preliminary operations which the grain is made to undergo.—Theſe preparations conſiſt in ſteeping it in cold water, that it may ſoak and ſwell to a certain degree; and in laying it in a heap with a ſuitable degree of heat, by means of which, and of the imbibed moiſture, a germination begins, which is to be ſtopped by a quick drying, as ſoon as the bud ſhows itſelf. To accelerate this drying, and to prevent the farther vegetation of the grain which would impair its ſaccharine qualities, the grain is ſlightly roaſted, by making it paſs down an inclined canal ſufficiently heated. This germination, and this ſlight roaſting, change conſiderably the nature of the mucilaginous fermentable matter of the grain.

The germination attenuates much, and in ſome meaſure totally deſtroys, the viſcoſity of the mucilage; and it does this, when not carried too far, without depriving the grain of any of its diſpoſition to ferment. On the contrary, it changes the grain into a ſaccharine ſubſtance, as may be perceived by maſhing grains beginning to germinate. The ſlight roaſting contributes alſo to attenuate the mucilaginous fermentable matter of the grain. When the grain is thus prepared, it is fit to be ground, and to impregnate water with much of its ſubſtance without forming a gluey or viſcous maſs. The grain thus prepared is called *malt*. This malt is then to be ground; and all its ſubſtance, which is fermentable and ſoluble in water, is to be extricated by means of hot water. This extract or infuſion is ſufficiently evaporated by boiling in caldrons; and ſome plant of an agreeable bitterneſs, ſuch as hops, is at that time added, to heighten the taſte of the beer, and to render it capable of being longer preſerved. Laſtly, this liquor is put into caſks, and allowed to ferment; nature performs the reſt of the work, and is only to be aſſiſted. See the articles Brewing and Fermentation.

Foreigners are greatly at a loſs to account for the excellence of the Britiſh beer, and its ſuperiority to that of other countries, even of Bremen, Mons, and Roſtoch. *Sour* beer may be reſtored, by adding to it at the time it is to be drunk, juſt ſo much alkali as will neutralize the acid and no more. Beer that is become flat or dead, may be reſtored by impregnating it with fixed air.

BEESTINGS, or Breastings, a term uſed by country-people for the firſt milk taken from a cow after calving.—The beeſtings are of a thick conſiſtence, and yellow colour. Medical authors have imagined them peculiarly fitted and intended by nature to cleanſe the young animal from the recrements gathered in its ſtomach and inteſtines during its long habitation *in utero*. The like quality and virtue is ſuppoſed alſo to reſide in women's firſt milk after delivery; and hence the neceſſity of the mother's ſuckling her own child, rather than committing it to a nurſe whoſe firſt milk is gone.

BEET, in botany. See Beta.

BEETLE, in the hiſtory of inſects. See Scarabæus.

Beetle alſo denotes a wooden inſtrument for driving piles, &c. It is likewiſe called a *ſtamper*, and by paviours a *rammer*.

BEEVES, a general name for oxen. See Bos.

BEFORT, a ſmall but ſtrong town of France, in the department of Upper Rhine, and late province of Alſace. It was ceded to France by the treaty of Weſtphalia in 1648. There are not above 100 houſes in this town, but it is important on account of the great road by this place from the ci-devant Franche Comté. The fortifications were greatly augmented by Louis XIV. It is ſeated at the foot of a mountain, 28 miles weſt of Baſil. E. long. 6. 2. N. lat. 47. 38.

BEG, or Bey, in the Turkiſh affairs. *Beg* is a term more particularly applied to the lord of a banner, called alſo in the ſame language *ſangiak-beg*. A beg has the command of a certain number of the ſpahis, or horſe, maintained by the province under the denomination of *timariots*. All the begs of a province obey one governor-general called *begler-beg*, or *beyler-beg*, q. d. lord of lords, or of the beys of the province. See Bey.

Begs, or Beghs, of Egypt, denote twelve generals, who have the command of the militia or ſtanding forces of the kingdom; and are to ſecure the country from the inſults of Arabs, as well as to protect the pilgrims in their annual expeditions to Mecca. The begs, ſeveral of whom are deſcended from the ancient race of the Mamalukes, are very rich and powerful, maintaining each 500 fighting men for their own guard, and the ſervice of their court. On diſcontents, they have frequently riſen in rebellion. They are often at variance with the baſhaw, whom they have more than once plundered and impriſoned.

BEGA (Cornelius), painter of landſcape, cattle, and converſations, was born at Haerlem in 1620, and was the diſciple of Adrian Oſtade. Falling into a diſſipated way of life, he was diſinherited by his father, for which reaſon he caſt off his father's name, which was Begeyn, and aſſumed that of Bega; his early pictures being marked with the former, and his latter works with the other. He had a fine pencil, and a delicate manner of handling his colours, ſo as to give them a look of neatneſs and tranſparence; and his performances are ſo much eſteemed in the Low Countries as to be placed among the works of the beſt artiſts. He took the plague from a woman with whom he was deeply enamoured; and he ſhowed ſo much ſincerity of affection, that, notwithſtanding the expoſtulations of all his friends and phyſicians, he would attend her to the laſt moments of her life, and died a few days after, aged 44.

BEGHARDS. See Beguards.

BEGLERBEG, a governor of one of the principal governments in the Turkiſh empire, and next in dignity to the grand vizier. To every beglerbeg the grand ſignior gives three enſigns or ſtaves, trimmed with a horſe-tail; to diſtinguiſh them from the baſhaws, who have but two; and from ſimple begs, or ſangiac begs, who have but one.

The province or government of beglerbeg is called *beglerbeglik*, or *beglierbeglik*. Theſe are of two ſorts; the firſt called *baſilo beglerbeglik*, which have a certain rent aſſigned out of the cities, countries, and ſignories allotted to the principality; the ſecond called *ſalianæ beglerbeglik*, for maintenance of which is annexed ſalary or rent, collected by the grand ſignior's officers with the treaſure of the empire. The beglerbegs of the firſt ſort are in number 22, *viz.* thoſe of Anatolia, Caramania, Diarbekir, Damaſcus, Aleppo, Tripoli, Trebizond, Buda, Temiſwar, &c. The beglerbegs of the ſecond ſort are in number ſix, *viz.* thoſe of Cairo, Babylon, &c. Five of the beglerbegs have the title of *viziers*, viz. thoſe of Anatolia, Babylon, Cairo, Romania, and Buda.

The beglerbegs appear with great ſtate, and a large retinue, eſpecially in the camp, being obliged to bring a ſoldier for every 5000 aſpers of rent which they enjoy. Thoſe of Romania brought 10,000 effective men into the field. The beglerbegs are become almoſt independent, and have under their juriſdiction ſeveral ſangiacs or particular governments, and begs, agas, and other officers who act under their orders.

BEGUARDS, or Beghards, religious of the third order of St. Francis in Flanders. They were eſtabliſhed at Antwerp in the year 1228, and took St. Begghe for their patroneſs, whence they had their name. From their firſt inſtitution they employed themſelves in making linen cloth, each ſupporting himſelf by his own labour, and united only by the bonds of charity, without having any particular rule. But, when Pope Nicholas IV. had confirmed that of the third order of St. Francis in 1289, they embraced it the year following. They were greatly favoured by the Dukes of Brabant, particularly John II. and John III. who exempted them from all contributions and taxes. In the year 1425, they began to live in common, and made ſolemn vows in 1467, after having taken the habit of the Terciaries (or religious of the third order of St. Francis) of Liege. At laſt, in 1472, they became ſubject to the general of the congregation of Zepperen in the dioceſe of Liege, to which they were united by Pope Sixtus IV. As the convent of Antwerp is ſince become very conſiderable, the name of *Beguards* has been given to all the other religious of the ſame congregation. But, in 1650, Pope Innocent X. having ſuppreſſed the general of the congregation of Zepperen, all the convents of the third order of St. Francis, in the

dioceſes of Liege, Malines, and Antwerp, were ſubmitted to the viſitation, juriſdiction, and correction, of the general of Italy, and erected into a province, under the title of *the province of Flanders*.

BEGUINES, a congregation of religious or nuns founded either by St. Begghe, founder likewiſe of the Beguards, or by Lambert le Begue; of whom the former died about the end of the ſeventh century, the latter about the end of the 12th. They were eſtabliſhed firſt at Liege, and afterwards at Neville, in 1207; and from this laſt ſettlement ſprang the great number of Beguinages, which ſpread themſelves over all Flanders, and which have paſſed from Flanders into Germany. In the latter country, ſome of theſe religious fell into extravagant errors, perſuading themſelves that it was poſſible, in the preſent life, to arrive at the higheſt perfection, even to impeccability, and a clear view of God; in ſhort, to ſo eminent a degree of contemplation, that there was no neceſſity, after this, either to obſerve the faſts of the church, or ſubmit to the direction and laws of mortal men. The council of Vienna, in 1113, condemned theſe errors, and aboliſhed the order of Beguines; permitting, nevertheleſs, thoſe among them, who continued in the true faith, to live in chaſtity and penitence, either with or without vows. It is by favour of this latter clauſe, that there ſtill ſubſiſt ſo many communities of Beguines in Flanders; who, ſince the council of Vienna, have conducted themſelves with ſo much wiſdom and piety, that Pope John XXII. by his decretal, which explains that of his predeceſſor made in the council of Vienna, took them under his protection; and Boniface VIII. in another, exempted them from the ſecular tribunal, and put them under the juriſdiction of the biſhops.

There is ſcarce a town in the Low-Countries, in which there is not a ſociety of Beguines; and, notwithſtanding the change of religion at Amſterdam, there is a very flouriſhing one in that city. Theſe ſocieties conſiſt of ſeveral houſes placed together in one incloſure, with one or more churches, according to the number of Beguines. There is in every houſe a prioreſs, or miſtreſs, without whoſe leave they dare not ſtir out. They make a ſort of vow, which is conceived in the following terms: "I, N. promiſe to be obedient and chaſte as long as I continue in this Beguinage." They obſerve a three years noviciate before they take the habit. The rector of the pariſh is ſuperior of the Beguinage; and he does nothing without the advice of eight Beguines. They were formerly habited in different manners; ſome in grey, others in blue; but latterly they have dreſſed in black. When they go abroad, in Amſterdam, they put on a black veil. Formerly they had as many different ſtatutes as there were ſocieties. In the viſitations of the year 1600 and 1601, by the archbiſhop Matthias Hovius, they were forbidden, under the penalty of a fine, to have lap-dogs. The fineſt Beguinage in Flanders is that of Malines. That of Antwerp likewiſe is very ſpacious, and has two ſeparate churches.

BEHEADING, a capital puniſhment, wherein the head is ſevered from the body by the ſtroke of an axe, ſword, or other cutting inſtrument. Beheading was a military puniſhment among the Romans, known by the name of *decollatio*. Among them the head was laid on a *cippus* or block, placed in a pit dug for the purpoſe; in the army, without the *vallum*; in the city, without the walls, at a place near the *porta decumana*. Preparatory to the ſtroke, the criminal was tied to a ſtake, and whipped with rods. In the early ages the blow was given with an axe; but in after-times with a ſword, which was thought the more reputable manner of dying. The execution was but clumſily performed in the firſt times; but afterwards they grew more expert, and took the head off clean, with one circular ſtroke.

In England, beheading is the puniſhment of nobles; being reputed not to derogate from nobility, as hanging does. In France during the revolutionary government, the practice of beheading by means of an inſtrument called a *Guillotine* (ſo denominated from the name of its inventor) was exceedingly general. It reſembles a kind of inſtrument long ſince uſed for the ſame purpoſe in Scotland, and called a *Maiden*. See GUILLOTINE.

BEHEMOTH, the hippopotamus, or river-horſe. See HIPPOPOTAMUS.

BEHEN, in botany. See CUCUBALUS.

BEHMEN. See BOEHMEN.

BEHN (Aphra), a celebrated authoreſs, deſcended from a good family in the city of Canterbury, was born ſome time in Charles I.'s reign, but in what year is uncertain. Her father's name was *Johnſon*, who, through the intereſt of the Lord Willoughby, to whom he was related, being appointed lieutenant-general of Surinam and 36 iſlands, undertook a journey to the Weſt-Indies, taking with him his whole family, among whom was our poeteſs, at that time very young. Mr. Johnſon died in the voyage; but his family reaching Surinam, ſettled there for ſome years. Here it was that ſhe learned the hiſtory of, and acquired a perſonal intimacy with, the American prince Oroonoko and his beloved Imoinda, whoſe adventures ſhe has ſo pathetically related in her celebrated novel of that name, and which Mr. Southerne afterwards made ſuch an admirable uſe of in adopting it as the ground-work of one of the beſt tragedies in the Engliſh language.

On this lady's return to London, ſhe became the wife of one Mr. Behn, a merchant, reſiding in that city, but of Dutch extraction. How long he lived after their marriage, is not very apparent, probably not very long; for her wit and abilities having brought her into high eſtimation at court, king Charles II. fixed on her as a proper perſon to tranſact ſome affairs of importance abroad during the courſe of the Dutch war. To this purpoſe ſhe went over to Antwerp, where, by her intrigues and gallantries, ſhe ſo far crept into the ſecrets of ſtate, as to anſwer the ends propoſed by ſending her over. Nay, in the latter end of 1666, by means of the influence ſhe had over one Vander Albert, a Dutchman of eminence, whoſe heart was warmly attached to her, ſhe wormed out of him the deſign formed by De Ruyter, in conjunction with the family of the De Wits, of ſailing up the Thames and burning the Engliſh ſhips in their harbours, which they afterwards put in execution at Rocheſter. This ſhe immediately communicated to the Engliſh court: but though the event proved her intelligence to be well grounded, yet it was at that time only laughed at; which, together probably with no great inclination ſhown to reward her for the pains ſhe had been at, determined her to drop all further thoughts of political affairs, and during the remainder of her ſtay at Antwerp to give herſelf up entirely to the gaiety and gallantries of the place. Vander Albert continued his addreſſes, and, after having made ſome unſucceſsful attempts to obtain the poſſeſſion of her perſon on eaſier terms than matrimony, at length conſented to make her his wife; but while he was preparing at Amſterdam for a journey to England with that intent, a fever carried him off, and left her free from any amorous engagements. In her voyage back to England, ſhe was very near being loſt, the veſſel ſhe was in being driven on the coaſt by a ſtorm; but happening to founder within ſight of land, the paſſengers were, by the timely aſſiſtance of boats from the ſhore, all fortunately reſcued from drowning.

From this period ſhe devoted her life entirely to pleaſure and the muſes. Her works are extremely numerous, and all of them have a lively and amorous turn. It is no wonder then that her wit ſhould have gained her the eſteem of Dryden,

Southerne, and other men of genius, as her beauty, of which in her younger part of life she possessed a great share, did the love of those of gallantry. Nor does she appear to have been any stranger to the delicate sensations of that passion, as appears from some of her letters to a gentleman, with whom she corresponded under the name of Lycida, and who seems not to have returned her flame with equal ardour, or received it with that rapture her charms might well have been expected to command.

She published three volumes of Miscellaneous Poems; two volumes of Histories and Novels; translated Fontenelle's Plurality of Worlds, and annexed a Criticism on it; and her Plays make four volumes. In dramatic writing, the turn of her genius was chiefly to comedy. As to the character her plays should maintain in the records of dramatic history, it will be difficult to determine, since their faults and perfections stand in strong opposition to each other. In all, even the most indifferent of her pieces, there are strong marks of genius and understanding. Her plots are full of business and ingenuity, and her dialogue sparkles with wit, which every where glitters among it. But then she has been accused, and that not without great justice, of disgracing her comedies with the most indecent allusions, and giving an indulgence in her wit to the most indelicate expressions. To this accusation she has herself made some reply in the Preface to the Lucky Chance; but the retorting the charge of prudery and precisenes on her accusers, is far from being a sufficient exculpation of herself. The best and perhaps the only true excuse that can be made for it is, that, as she wrote for a livelihood, she was obliged to comply with the corrupt taste of the times. After a life intermingled with numerous disappointments, she departed from this world on the 16th of April 1689, and lies interred in the cloysters of West-minster-Abbey.

BEJA, an ancient town of Portugal, in the province of Alentejo. It is seated in a very agreeable and fruitful plain, remarkable for excellent wine. There are three gates remaining, which are of Roman architecture, and a great many Roman antiquities are dug out of the earth. The town has a strong castle for its defence, and is situated W. long. 7. 20. N. lat. 37. 58. It was taken from the Moors in 1162.

BEJAR, a town of Estremadura in Spain, famous for its baths. It is seated in a very agreeable valley surrounded with high mountains whose tops are always covered with snow. Here the dukes of Bejar have an handsome palace. In this neighbourhood are forests filled with game, and watered by fine springs; also a lake abounding with excellent fish, particularly trout. They pretend that this lake makes such a noise before a storm, that it may be heard 15 miles off.

BEICHLINGEN, a town of Thuringia in Upper Saxony, in E. long. 11. 50. N. lat. 51. 20.

BEILA, a town of Italy, in Piedmont. E. long. 7. 45. N. lat. 45. 2.

BEILSTEIN, a town of the landgraviate of Hesse in Germany, in E. long. 8. 0. N. lat. 50. 30.

BEINASCHI (Giovanni Battista), called *Cavalier Beinaschi*, history painter, was a Piedmontese, and born in 1634. He studied in Rome, under the direction of Pietro del Po; and some authors affirm, that he was afterwards the disciple of Lanfranc. It is certain that he was peculiarly fond of the works of Lanfranc, and at last became so thoroughly acquainted with the style, manner, and touch of that excellent master, that many of the pictures of Beinaschi are at this day accounted the work of Lanfranc's own hand. He was an admirable designer; his lively invention furnished him with a surprising variety; his thought was noble; he was not only expeditious, but correct; and as a public acknowledgment of his merit, the honour of knighthood was conferred upon him.

BEINHEIM, a fort of Alsace in France, seated on the river Sur, near its confluence with the Rhine, in E. long. 8. 12. N. lat. 45. 2.

BEIRA, a province of Portugal, bounded on the west by the ocean, on the south by the Portuguese Estremadura, on the south-east by the Spanish province of the same name, on the east by the province of Tralos Montos, and on the north by the river Douro. It extends in length about 34 leagues, and in breadth about 30 leagues, and is divided into six commarcas. Within this province lies Lamego, where the first assembly of the states was held; the chief episcopal city of Conimbra, or Coimbra, which is likewise an university; and Viseo, also a bishopric, and formerly the capital of a dukedom. The country is equally agreeable and fruitful, producing corn, wines, &c. in abundance, and the hills affording excellent pasture to cattle and sheep. The settled militia consists of about 10,000 men.

BEIRAM, or Bairam. See Bairam.

BEIRALSTON, a town of Devonshire, in England, which sends two members to parliament.

BEIZA, or Beizath, in Hebrew antiquity, a word signifying an *egg*; as also a certain measure in use among the Jews. The beiza was likewise a gold coin, weighing 40 drachms, among the Persians, who gave out, that Philip of Macedon owed their king Darius 1000 beizaths or golden eggs, for tribute-money; and that Alexander the Great refused to pay them, saying, that the bird which laid these eggs was flown into the other world.

BEKKER (Balthazar), one of the most famous Dutch divines, and author of the celebrated book, The World bewitched, an ingenious piece against the vulgar notion of spirits. This raised a terrible clamour against him. He was deposed from the office of minister; but the magistrates of Amsterdam continued him his pension. He died in 1698.

BEL (Mathias), was born in Hungary, and became a Lutheran minister at Presburg, and historiographer to the emperor Charles VI. He wrote, among other works, a History of Hungary, which was so much admired, that the emperor sent him letters of nobility; and notwithstanding his being a Lutheran, the Pope, in 1736, sent him his picture, and many large gold medals. He was a member of the Royal Society of London, and of the academies of Berlin and Petersburg; and died in 1749, at 66 years of age.

Bel, or *Belus*, the supreme god of the ancient Chaldeans, or Babylonians. He was the founder of the Babylonian empire; and is supposed to be the Nimrod of Scripture, and the same as the Phœnician Baal. This god had a temple erected to him in the city of Babylon, on the very uppermost range of the famous tower of Babel, or Babylon, wherein were many statues of this deity; and one, among the rest, of massy gold, 40 feet high. The whole furniture of this magnificent temple was of the same metal, and valued at 800 talents of gold. This temple, with its riches, was in being till the time of Xerxes, who, returning from his unfortunate expedition into Greece, demolished it, and carried off the immense wealth which it contained. It was the statue of this god which Nebuchadnezzar, being returned to Babylon after the end of the Jewish war, set up and dedicated in the plain of Dura; the story of which is related at large in the third chapter of Daniel.

Bel *and the Dragon* (the history of), an apocryphal and uncanonical book of Scripture. It was always rejected by the Jewish church, and is extant neither in the Hebrew nor the Chaldee language, nor is there any proof that it ever was so. St. Jerom gives it no better title than *the Fable of Bel and the Dragon*. It is however permitted to be read, as well as the other apocryphal writings, for the instruction and improvement of manners.

BELAY, on board a ſhip, ſignifies the ſame as faſten. Thus they ſay, *belay the ſheet*, or *tack*, that is, faſten it to the bevel, by winding it ſeveral times round a laſt, &c.

BELCASTRO, an epiſcopal city of Italy in the farther Calabria, and kingdom of Naples. It is ſeated on a mountain, in E. long. 17. 15. N. lat. 39. 6.

BELCHITE, a town of Spain, in the kingdom of Arragon, ſeated on the river Almonazir, in W. long. 0. 30. N. lat. 41. 19.

BELCHOE, a town of Ireland, in the province of Ulſter, and county of Fermanagh, ſeated on Lough Nilly, in W. long. 6. 6. N. lat. 54. 2.

BELEM, a town of Eſtremadura in Portugal, about a mile from Liſbon. It is ſeated on the north ſide of the river Tajo, and is deſigned to defend the entrance to Liſbon; and here all the ſhips that ſail up the river muſt bring to. In this place they inter the kings and queens of Portugal.

BELEMNITES, vulgarly called *thunder-bolts* or *thunder-ſtones*. They are compoſed of ſeveral cruſts of ſtone encircling each other, of a conical form, and various ſizes; uſually a little hollow, and ſomewhat tranſparent, formed of ſeveral ſtriæ radiating from the axis to the ſurface of the ſtone; and when burnt or rubbed againſt one another, or ſcraped with a knife, yield an odour like raſped horn. Their ſize is various, from a quarter of an inch to eight inches; and their colour and ſhape differ. They are ſuppoſed to be originally either a part of ſome ſea production; or a ſtone formed in the cavity of ſome worm-ſhell, which being of a tender and brittle nature, has periſhed, after giving its form to the ſtone. They are very frequently found in many parts of England; and the common people have a notion, that they are always to be met with after a ſtorm. They are often incloſed in, or adhere to, other ſtones; and are moſt frequent amongſt gravel, or in clay: they abound in Glouceſterſhire; and are found near Dedington in Oxfordſhire, where they ſometimes contain the ſilver marcaſite.

BELESIS, or NANYBRUS, ſaid to have been the founder of the ancient Babyloniſh empire, and in conjunction with Arbaces the Mede to have put an end to the kingdom of the Aſſyrians by the defeat and death of Sardanapalus. This firſt prince is repreſented as a crafty and mean-ſpirited knave; and at the ſame time, as nothing leſs than an hero. It is ſaid, he was baſe enough to circumvent Arbaces his colleague and friend in the moſt ſhameful manner; by pretending a vow he had, in the midſt of the war, made to his god Belus, That if ſucceſs was the event of it, and the palace of Sardanapalus was conſumed, as it was, he would be at the charge and trouble of removing the aſhes that were left, to Babylon; where he would heap them up into a mount near the temple of his god; there to ſtand as a monument to all who ſhould navigate the Euphrates, of the ſubverſion of the Aſſyrian empire. He, it ſeems, had been privately informed, by an eunuch, of the immenſe treaſure which had been conſumed in the conflagration at Nineveh; and knowing it to be a ſecret to Arbaces, his avarice ſuggeſted to him this artifice. Arbaces not only granted him his requeſt; but appointed him king of Babylon, with an exemption from all tribute. Beleſis, by this artifice, carried a prodigious treaſure with him to Babylon; but when the ſecret was diſcovered, he was called to an account for it, and tried by the other chiefs who had been aſſiſtant in the war, and who, upon his confeſſion of the crime, condemned him to loſe his head. But Arbaces, a magnificent and generous prince, freely forgave him, left him in poſſeſſion of the treaſure, and alſo in the independent government of Babylon, ſaying, The good he had done ought to ſerve as a veil to his crime; and thus he became at once a prince of great wealth and conſequence.

In proceſs of time, and under the ſucceſſor of Arbaces, he became a man of dreſs, ſhew, and effeminacy, unworthy of the kingdom or province he held. Nanybrus, for ſo we muſt now call Beleſis, underſtanding a certain robuſt Mede, called *Parſondas*, held him in the utmoſt contempt, and had ſolicited the emperor of the Medes to diveſt him of his dominions, and to confer them upon himſelf, offered a very great reward to the man who ſhould take Parſondas, and bring him to him. Parſondas hunting ſomewhere near Babylon with the king of the Medes, and ſtraggling from the company, happened to fall in with ſome of the ſervants of the Babylonian Nanybrus, who had been tempted with the promiſed reward. They were purveyors to the king; and Parſondas being very thirſty, aſked them for a draught of wine; which they not only granted, but prevailed upon him to take a meal with them. As he drank freely, ſuſpecting no treachery; he was eaſily perſuaded to paſs that night in company with ſome beautiful women, brought on purpoſe to detain him. But, while he was in a profound ſleep, the ſervants of Nanybrus ruſhing upon him, bound him, and carried him to their prince; who bitterly reproached him for endeavouring to eſtrange his maſter the king of the Medes from him, and by that means place himſelf in his room on the throne of Babylon. Parſondas did not deny the charge; but with great intrepidity owned, that he thought himſelf more worthy of a crown than ſuch an indolent and effeminate prince as he was. Nanybrus, highly provoked at the liberty he took, ſwore by the gods Belus and Molis, or rather Mylitta, that Parſondas himſelf ſhould in a ſhort time become ſo effeminate as to reproach none with effeminacy. Accordingly, he ordered the eunuch who had the charge of his muſic-women, to ſhave, paint, and dreſs him after the manner of thoſe women, to teach him the art, and in ſhort to transform him by all poſſible means into a woman. His orders were obeyed; and the manly Parſondas ſoon exceeded the faireſt female in ſinging, playing, and other alluring arts.

In the interim the king of the Medes, having in vain ſought after his favourite ſervant, and in vain offered great rewards to ſuch as ſhould communicate any information concerning him, concluded he had been deſtroyed by ſome wild beaſt in the chace. At length, after ſeven years, the Mede was informed of his ſtate and condition by an eunuch, who, being cruelly ſcourged by Nanybrus's order, fled, at the inſtigation of Parſondas, into Media; and there diſcloſed the whole to the king, who immediately diſpatched an officer to demand him. Nanybrus pretended to know nothing of any ſuch perſon; upon which another officer was ſent by the Mede, with a peremptory order to ſeize on Nanybrus if he perſiſted in the denial, to bind him with his girdle, and lead him to immediate execution. This order had the deſired effect: the Babylonian owned what he had before denied, promiſing to comply, without farther delay, with the king's demand; and in the mean time invited the officer to a banquet, at which 150 women, among whom was Parſondas, made their appearance, ſinging and playing upon various inſtruments. But, of all, Parſondas appeared by far the moſt charming; inſomuch, that Nanybrus inquiring of the Mede which he liked beſt, he immediately pointed at him. At this the Babylonian clapped his hands; and, falling into an immoderate fit of laughter, told him who the perſon was whom he thus preferred to all the reſt; adding, that he could anſwer what he had done before the king of the Medes. The officer was no leſs ſurpriſed at ſuch an aſtoniſhing change than his maſter was afterwards, when Parſondas appeared before him. The only favour Parſondas begged of the king for all his paſt ſervices, was, that he would avenge on the Babylonian the baſe and highly injurious treatment he had met with at his hands. The Mede marched accordingly at his inſtigation to Babylon; and, notwithſtanding the remonſtrances of Nanybrus, urging, that Parſondas had,

without the leaſt provocation, endeavoured to deprive him of both his life and kingdom, declared that in ten days time he would paſs the ſentence on him which he deſerved, for preſuming to act as judge in his own cauſe, inſtead of appealing to him. But Nanybrus having in the mean time gained with a large bribe Mitraphernes the Mede's favourite eunuch, the king was by him prevailed upon to ſentence the Babylonian only to a fine; which made Parſondas curſe the man who firſt found out gold, for the ſake of which he was to live the ſport and deriſion of an effeminate Babylonian.

BELEZERO, a town of Ruſſia, and capital of a province of the ſame name. It is ſituated on the ſouth-eaſt ſhore of the White ſea, in E. long. 36. 10. N. lat. 61. 50.

BELFAST, a town of Ireland, in the county of Antrim. It is ſeated at the bottom of Carrickfergus bay, and is the chief town and port in this part of Ireland, as well for beauty and the number of its inhabitants, as for its wealth, trade, and ſhipping. It has a conſiderable trade with Glaſgow, and the inhabitants are moſtly Scots, and of the preſbyterian religion. W. long. 6. 15. N. lat. 54. 38.

BELFRY, Belfredus, is uſed by military writers of the middle age for a ſort of tower erected by beſiegers to overlook and command the place beſieged. Belfry originally denoted a high tower, whereon ſentinels were placed to watch the avenues of a place, and prevent ſurpriſe from parties of the enemy, or to give notice of fires by ringing a bell. In the cities of Flanders, where there is no belfry on purpoſe, the tower of the chief church ſerves the ſame end. The word *belfry* is compounded of the Teutonic *bell*, and *freid* "peace," becauſe the bells were hung for preſerving the peace.

Belfry is alſo uſed for that part of a ſteeple wherein the bells are hung. This is ſometimes called by middle-age writers *campanile, clocaria, and triſtegum*.

Belfry is more particularly uſed for the timber-work which ſuſtains the bells in a ſteeple, or that wooden ſtructure to which the bells in church ſteeples are faſtened.

BELGARDEN, a town of Germany, in Eaſt Pomerania, in the province of Caſſubia, and ſubject to Pruſſia. E. long. 16. 5. N. lat. 54. 10.

BELGIUM, manifeſtly diſtinguiſhed from Belgica, as a part from the whole by Cæſar; who makes Belgium the country of the Bellovaci; Hirtius adding the Atrebates. But as the Ambiani lay between the Bellovaci and Atrebates, we muſt alſo add theſe; and thus Belgium reached to the ſea, becauſe the Ambiani lay upon it: and theſe three people conſtituted the proper and genuine Belgæ (all the reſt being adventitious, or foreigners); and they were the people of the ci-devant Beauvais, Amiens, and Artois.

BELGOROD, a town of Ruſſia, and capital of a province of the ſame name. It is ſeated on the river Donnets, in E. long. 18. 5. N. lat. 51. 20.

Belgorod, a ſtrong town of Beſſarabia in European Turkey, ſeated at the mouth of the river Neiſter, on the Black Sea, 80 miles ſouth-eaſt of Bender. E. long. 31. 0. N. lat. 46. 30.

BELGRADE, a city of Turkey in Europe, and capital of Servia, ſeated at the confluence of the Save and the Danube, in E. long. 21. 2. N. lat. 45. 10. The Danube is very rapid near this city, and its waters look whitiſh. Belgrade is built on a hill, and was once large, ſtrong, and populous. It was ſurrounded with a double wall, flanked with a great number of towers, and had a caſtle ſituated on a riſing ground, and built with ſquare ſtones. The ſuburbs are very extenſive; and reſorted to by Turkiſh, Jewiſh, Greek, Hungarian, and Sclavonian merchants. The ſtreets where the greateſt trade is carried on are ſheltered with wood, to protect the dealers from the ſun and rain. The rivers render it very convenient for commerce; and as the Danube falls into the Black Sea, the trade is eaſily extended to diſtant countries, which renders it the ſtaple town in theſe parts; and as the Danube runs up to Vienna, they ſend goods from thence with a great deal of eaſe. The Armenians have a church here, and the Jews a ſynagogue, both theſe being employed as factors. The ſhops are but ſmall; and the ſellers ſit on tables, diſpoſing of their commodities out of a window, for the buyers never go on the inſide. The richeſt merchandize is expoſed to ſale in two bezeſteins or bazars, built croſſwiſe. There are two exchanges, built with ſtone, and ſupported with pillars not unlike the Royal Exchange at London. There is likewiſe a caravanſera or public inn, and a college for young ſtudents. It has been taken by the Turks and Imperialiſts alternately ſeveral times; but was ceded to the Turks in 1739, and the fine fortifications demoliſhed.

BELGRADO, a town of Friuli, in the Venetian territories in Italy. It ſtands near the river Tejamento, in E. long. 13. 5. N. lat. 46. 0.

BELIAL, בליעל a Hebrew word which ſignifies a wicked worthleſs man, one who is reſolved to endure no ſubjection. Thus the inhabitants of Gibeah, who abuſed the Levite's wife (Judges xix. 22.) have the name of Belial given them. Hophni and Phineas, the high prieſt Eli's ſons, are likewiſe called ſons of Belial (1 Sam. ii. 12.) upon account of the ſeveral crimes they had committed, and the unbecoming manner in which they behaved themſelves in the temple of the Lord. Sometimes the name Belial is taken to denote the devil. Thus St. Paul ſays (2 Cor. vi. 15) "What concord hath Chriſt with Belial?" Whence it appears, that in his time the Jews, under the name of Belial, commonly underſtood the devil in the places where this term occurs in the Old Teſtament.

BELIDOR (Bernard Foreſt de), a Catalonian engineer in the ſervice of France, and member of the academies of ſciences at Paris and Berlin, and of the royal ſociety at London; a celebrated mathematician, and author of a number of military tracts in which the ſcience of mathematics is applied to military uſes. He died in 1765, aged 70.

BELIEF, in its general and natural ſenſe, denotes a perſuaſion, or a ſtrong aſſent of the mind to the truth of any propoſition. In this ſenſe, belief has no relation to any particular kind of means, or arguments, but may be produced by any means whatever. Thus we are ſaid to believe our ſenſes, to believe our reaſon, to believe a witneſs, &c. And hence, in rhetoric, all ſorts of proofs, from whatever topics deduced, are called πιστεις, becauſe apt to get belief or perſuaſion touching the matter in queſtion.

Belief, in its more reſtrained and technical ſenſe, invented by the ſchoolmen, denotes that kind of aſſent which is grounded only on the authority or teſtimony of ſome perſon or perſons aſſerting or atteſting the truth of any matter propoſed. In this ſenſe, belief ſtands oppoſed to knowledge and ſcience. We do not ſay we believe that ſnow is white, or that the whole is equal to its parts; but we ſee and know them to be ſo. That the three angles of a triangle are equal to two right angles, or that all motion is naturally rectilinear, are not ſaid to be things credible, but ſcientifical; and the comprehenſion of ſuch truths is not belief, but ſcience. But when a thing propounded to us is neither apparent to our ſenſe, nor evident to our underſtanding; neither certainly to be collected from any clear and neceſſary connection with the cauſe from which it proceeds, nor with the effects which it naturally produces; nor is taken up upon any real arguments, or relation thereof to other acknowledged truths; and yet, notwithſtanding, ap-

pears as true, not by manifeſtation, but by an atteſtation of the truth, and moves us to aſſent, not of itſelf, but in virtue of a teſtimony given to it—this is ſaid to be properly credible: and an aſſent to this is the proper notion of belief or faith.

BELIEVERS, an appellation given toward the cloſe of the firſt century to thoſe Chriſtians who had been admitted into the church by baptiſm, and inſtructed in all the myſteries of religion. They had alſo acceſs to all the parts of divine worſhip, and were authoriſed to vote in the eccleſiaſtical aſſemblies. They were thus called in contradiſtinction to the catechumens, who had not been baptized, and were debarred from theſe privileges.

BELISARIUS, general of the emperor Juſtinian's army, who overthrew the Perſians in the Eaſt, the Vandals in Africa, and the Goths in Italy. But after all his great ſucceſſes and exploits, he was falſely accuſed of a conſpiracy againſt the emperor. The real conſpirators had been detected and ſeized, with daggers hidden under their garments. One of them died by his own hand, and the other was dragged from the ſanctuary. Preſſed by remorſe, or tempted by the hopes of ſafety, he accuſed two officers of the houſehold of Beliſarius; and torture forced them to declare that they had acted according to the ſecret inſtructions of their patron. Poſterity will not haſtily believe, that an hero who in the vigour of life had diſdained the faireſt offers of ambition and revenge, ſhould ſtoop to the murder of his prince, whom he could not long expect to ſurvive. His followers were impatient to fly; but flight muſt have been ſupported by rebellion, and he had lived enough for nature and for glory. Beliſarius appeared before the council with leſs fear than indignation: after 40 years ſervice, the emperor had prejudged his guilt; and injuſtice was ſanctified by the preſence and authority of the patriarch. The life of Beliſarius was graciouſly ſpared: but his fortunes were ſequeſtered; and, from December to July, he was guarded as a priſoner in his own palace. At length his innocence was acknowledged; his freedom and honours were reſtored; and death, which might be haſtened by reſentment and grief, removed him from the world about eight months after his deliverance. That he was deprived of his eyes, and reduced by envy to beg his bread, "Give a penny to Beliſarius the general!" is a fiction of later times; which has obtained credit, or rather favour, as a ſtrange example of the viciſſitudes of fortune—The ſource of this idle fable may be derived from a miſcellaneous work of the 12th century, the Chiliads of John Tzetzes, a monk. He relates the blindneſs and beggary of Beliſarius in ten vulgar or political verſes (Chiliad iii. N°. 88. 339—348. in Corp. Poet. Græc. tom. ii. p. 311.)

Επωμα ξυλινον κρατων εβοα τω μιλιω
Βελισαριω οβολον δοτε τω στρατηλατη
Ον τυχη μεν εδοξασει, αποτυφλοι δ' ὁ φθονος.

This moral or romantic tale was imported into Italy with the language and manuſcripts of Greece; repeated before the end of the 15th century by Crinitus, Pontanus, and Volaterranus; attacked by Alciat for the honour of the law, and defended by Baronius (A. D. 561. N°. 2. &c.) for the honour of the church. Yet Tzetzes himſelf had read in other chronicles, that Beliſarius did not loſe his ſight, and that he recovered his fame and fortunes.—The ſtatue in the Villa Borgheſe at Rome, in a ſitting poſture, with an open hand, which is vulgarly given to Beliſarius, may be aſcribed with more dignity to Auguſtus in the act of propitiating Nemeſis (*Winckelman, Hiſt. de l'Art*, tom. iii. p. 266.): "Ex nocturno viſu etiam ſtipem, quotannis, die certo, emendicabat a populo, cavam manum aſſes porrigentibus prebens." (*Sueton. in Aug.* c. 91.)

BELL, a well known machine ranked by muſicians among the muſical inſtruments of percuſſion.—The conſtituent parts of a bell are the body or *barrel*, the *clapper* on the inſide, and the ear or *cannon* by which it hangs to a large beam of wood. The matter of which it is uſually made is a compoſition called *bell-metal*. The thickneſs of a bell's edges is uſually $\frac{1}{11}$ of the diameter, and its height 12 times its thickneſs. The bell-founders have a diapaſon or bell-ſcale, wherewith they meaſure the ſize, thickneſs, weight and tone of their bells. For the method of caſting bells, ſee FOUNDERY.

The ſound of a bell is generally conjectured to conſiſt in a vibratory motion of its parts, much like that of a muſical chord. The ſtroke of the clapper muſt neceſſarily change the figure of the bell, and of a round make it oval: but the metal having a great degree of elaſticity, that part will return back again which the ſtroke drove fartheſt off from the centre, and that even ſome ſmall matter nearer the centre than before; ſo that the two parts which before were extremes of the longeſt diameter, do then become thoſe of the ſhorteſt; and thus the external ſurface of the bell undergoes alternate changes of figure, and by that means gives that tremulous motion to the air in which the ſound conſiſts. M. Perrault maintains, that the ſound of the ſame bell or chord is a compound of the ſounds of the ſeveral parts thereof, ſo that where the parts are homogeneous, and the dimenſions of the figure uniform, there is ſuch a perfect mixture of all theſe ſounds as conſtitutes one uniform, ſmooth, even ſound; and the contrary circumſtances produce harſhneſs. This he proves from the bells differing in tone according to the part you ſtrike; and yet ſtrike it any where, there is a motion of all the parts. He therefore conſiders bells as a compound of an infinite number of rings, which according to their different dimenſions have different tones, as chords of different lengths have; and when ſtruck, the vibrations of the parts immediately ſtruck determine the tone, being ſupported by a ſufficient number of conſonant tones in the other parts of the inſtrument.

The ſound of a bell is obſerved to be heard farther if the bell is ſituated on a plain than on a hill; and ſtill farther in a valley than on a plain. The reaſon of this will not be difficult to aſſign, if it be conſidered that the higher the ſonorous body is, the rarer is its medium; conſequently, the leſs impulſe it receives, and the leſs proper vehicle it is to convey it to a diſtance.

In the Memoirs of the Paris Academy, Mr. Reaumur has the following obſervations relating to the ſhape moſt proper for bells, to give them the loudeſt and cleareſt ſound. He obſerves, "that as pots and other veſſels more immediately neceſſary to the ſervice of life were doubtleſs made before bells, it probably happened that the obſerving theſe veſſels to have a ſound when ſtruck, gave occaſion to making bells, intended only for ſound, in that form; but that it does not appear that this is the moſt eligible figure; for lead, a metal which is in its common ſtate not at all ſonorous, yet becomes greatly ſo on its being caſt into a particular form, and that very different from the common ſhape of bells. In melting lead for the common occaſions of caſting in ſmall quantities, it is uſually done in an iron ladle: and as the whole is ſeldom poured out, the remainder, which falls to the bottom of the ladle, cools into a maſs of the ſhape of that bottom. This is conſequently a ſegment of a ſphere, thickeſt in the middle, and thinner towards the edges; nor is the ladle any neceſſary part of the operation, ſince if a maſs of lead be caſt in that form in a mould of earth or ſand, in any of theſe caſes it is found to be very ſonorous. Now if this ſhape alone can give ſound to a metal which in other forms is perfectly mute, how much more muſt it neceſſarily give it to other metals naturally

ſonorous in whatever form? It ſhould ſeem, that bells would much better perform their office in this than in any other form: and that it muſt particularly be a thing of great advantage to the ſmall bells of common houſe-clocks, which are required to have a ſhrill note, and yet are not allowed any great ſize." He adds, "that had our forefathers had opportunities of being acquainted with the ſound of metals in this ſhape, we ſhould probably have had all our bells at preſent of this form."

Bells are of very ancient, as well as extenſive uſe. We find them among Jews, Greeks, Romans, Chriſtians, and Heathens, variouſly applied; as on the necks of men, beaſts, birds, horſes, ſheep: but chiefly hung in buildings, either religious, as in churches, temples, and monaſteries; or civil, as houſes, markets, baths; or military, as in camps and frontier towns, &c.

Among the Jews it was ordained, that the lower part of the blue tunic which the high prieſt wore when he performed religious ceremonies, ſhould be adorned with pomegranates and gold bells, intermixed equally and at equal diſtances. As to the number of the bells worn by the high prieſt, the ſcripture is ſilent; and authors are not very well agreed: but the ſacred hiſtorian has let us into the uſe and intent of them in theſe words (Exod. xxviii. 33—35.) "And it ſhall be upon Aaron to miniſter, and his ſound ſhall be heard when he goeth into the holy place before the Lord, and when he cometh out, that he die not." The kings of Perſia are ſaid to have the hem of their robes adorned like the Jewiſh high-prieſts with pomegranates and gold bells. It was, in the opinion of Calmet, with a deſign of giving notice that the high-prieſt was paſſing by, that he wore little bells on the hem of his robe; or rather it was as it were a kind of public notice that he was going to the ſanctuary: for as, in the king of Perſia's court, no one was ſuffered to enter the apartments without giving notice thereof by the ſound of ſomething; ſo the high prieſt, out of reſpect to the divine preſence reſiding in the holy of holies, did, by the ſound of little bells faſtened to the bottom of his robe, deſire as it were permiſſion to enter, that the ſound of the bells might be heard, and he not be puniſhed with death for an unmannerly intruſion. The figure of theſe bells is not known to us. The prophet Zachariah (xiv. 20.) ſpeaks of bells hung to war horſes. "In that day (ſays the prophet) there ſhall be upon the bells of horſes, Holineſs unto the Lord."

The Greeks, when they went the nightly rounds in camps or garriſons, carried with them a little bell, which they rung at each ſentry-box to ſee that the ſoldiers on watch were awake. A κωδωνοφορος, or bell-man, alſo walked in funeral proceſſions, at a diſtance before the corpſe, not only to keep off the crowd, but to adverti ſe the *flamen dialis* to keep out of the way, for fear of being polluted by the ſight, or by the funerary muſic. The prieſt of Proſerpine at Athens, called *hierophantus*, rung a bell to call the people to ſacrifice. As with us in ſome inſtances, there were alſo bells in great houſes to call up the ſervants in a morning. Zonaras aſſures us, that bells were hung with whips on the triumphal chariots of their victorious generals, to put them in mind that they were ſtill liable to public juſtice.

Bells were put on the necks of criminals going to execution, that perſons might be warned by the noiſe to get out of the way of ſo ill an omen as the ſight of the hangman or the condemned criminal, who was devoted and juſt going to be ſacrificed to the *dii manes*. For bells on the necks of brutes, expreſs mention is made of them in Phædras,—*Celſa cervice eminens, Clarumque collo jactans tintinnabulum.* Taking theſe bells away was conſtrued by the civil law, theft; and if the beaſt was loſt by this means, the perſon who took away the bells was to make ſatisfaction.

As to the origin of *church-bells*, Mr. Whitaker obſerves, That bells being uſed, among other purpoſes, by the Romans to ſignify the times of bathing, were naturally applied by the Chriſtians of Italy to denote the hours of devotion, and ſummon the people to church. The firſt application of them to this purpoſe is by Polydore Vergil and others, aſcribed to Paulinus biſhop of Nola, a city of Campania, about the year 400. Hence, it is ſaid, the names *nolæ* and *campanæ* were given them; the one referring to the city, the other to the country. Though others ſay they took the latter of theſe names, not from their being invented in Campania, but becauſe it was here that the manner of hanging and balancing them, now in uſe, was firſt practiſed; at leaſt that they were hung on the model of a ſort of balance invented or uſed in Campania; for in Latin writers we find *campana ſtatera*, for a ſteel-yard; and in the Greek καμπανιζειν, and *ponderare*, "to weigh." In Britain, bells were applied to church-purpoſes, before the concluſion of the ſeventh century, in the monaſtic ſocieties of Northumbria, and as early as the ſixth even in thoſe of Caledonia. And they were therefore uſed from the firſt erection of pariſh-churches among us.—Thoſe of France and England appear to have been furniſhed with ſeveral bells. In the time of Clothair II. king of France, and in the year 610, the army of that king was frighted from the ſiege of the city of Sens, by ringing the bells of St. Stephen's church. The ſecond excerption of Egbert, about the year 750, which is adopted in a French Capitulary of 801, commands every prieſt, at the proper hours, to ſound the bells of his church, and then to go through the ſacred offices to God. And the council of Enham, in 1011, requires all the mulcts for ſins to be expended in the reparation of the church, clothing and feeding the miniſter of God, and the purchaſe of church-veſtments, church-books, and church-bells. Theſe were ſometimes compoſed of iron in France: in England, as formerly at Rome, they were often made of braſs; and as early as the ninth century, there were many caſt of a large ſize and deep note.

Ingulphus mentions, that Turketulus abbot of Croyland, who died about the year 870, gave a great bell to the church of that abbey, which he named *Guthlac;* and afterwards ſix others, viz. two which he called *Bartholomew* and *Bettelin*, two called *Turketul* and *Tatwin*, and two named *Pega* and *Bega*, all which rang together. The ſame author ſays, *Non erat tunc tanta conſonantia campanarum in tota Anglia.* Not long after, Kinſeus archbiſhop of York gave two great bells to the church of St. John at Beverly, and at the ſame time provided that other churches in his dioceſe ſhould be furniſhed with bells. Mention is made by St. Aldhem, and William of Malmeſbury, of bells given by St. Dunſtan to the churches in the weſt. The number of bells in every church gave occaſion to the curious and ſingular piece of architecture in the campanile or bell-tower; an addition, which is more ſuſceptible of the grander beauties of architecture than any other part of the edifice, and is generally therefore the principle or rudiments of it. It was the conſtant appendage to every pariſh-church of the Saxons, and in the laws of Athelſtan it is actually mentioned as ſuch.

It has uſually been ſaid, that the Greek Chriſtians were unacquainted with bells till the ninth century, when their conſtruction was firſt taught them by a Venetian. Indeed, it is not true that the uſe of bells was entirely unknown in the ancient eaſtern churches, and that they called the people to church, at ſtated times, with wooden mallets. Leo Allatius, in his diſſertation on the Greek temples, proves the contrary from ſeveral ancient writers. It is his opinion, that bells firſt began to be diſuſed among them after the taking of Conſtantinople by the Turks; who, it ſeems, prohibited them, leſt

their ſound ſhould diſturb the repoſe of ſouls, which, according to them, wander in the air. He adds, that they ſtill retain the uſe of bells in places remote from the intercourſe of the Turks; particularly, very ancient ones in Mount Athos. F. Simon thinks the Turks prohibited the Chriſtians the uſe of bells, rather for political than religious reaſons; inaſmuch as the ringing of bells might ſerve as a ſignal for the execution of revolts, conſpiracies, &c.

Durandus, in ſpeaking of the ancient monaſteries, enumerates ſix kinds of bells, viz. *Squilla*, rung in the refectory; *cymbalum*, in the cloiſter; *nola*, in the choir; *nolula* or *dupla*, in the clock; *campana*, in the ſteeple; and *ſignum* in the tower. Belethus has much the ſame; only that for *ſquilla* he puts *tintinnabulum*, and places the *campana* in the tower, and *campanella* in the cloiſter. Others place the *tintinnabulum* or *tinniolum* in the refectory or dormitory; and add another bell called *corrigiuncula*, rung at the time of giving diſcipline, to call the monks to be flogged. The *cymbalum* is ſometimes alſo ſaid to have been rung in the cloiſter, to call the monks to their repaſts.

We find, in the funeral monuments of Weever, the following particulars relating to bells: "Bells (he ſays) had frequently theſe inſcriptions on them:

"*Funera plango, Fulgura frango, Sabbata pango,*
"*Excito lentos, Diſſipo ventos, Paco cruentos.*

"In the Little Sanctuary at Weſtminſter King Edward III. erected a clochier, and placed therein three bells for the uſe of St. Stephen's chapel: about the biggeſt of them were caſt in the metal theſe words:

"King Edward made mee thirtie thouſand weight and three.
"Take me down and wey mee, and more you ſhall fynd mee.

"But theſe bells being to be taken down in the reign of King Henry VIII. ſome one wrote underneath with a coal:

"But Henry the eight
"Will bait me of my weight." *Ibid.* 492.

This laſt diſtich alludes to a fact mentioned by Stow in his Survey of London, ward of Farringdon Within, to wit, that near to St. Paul's ſchool ſtood a clochier, in which were four bells called *Jeſus's bells*, the greateſt in all England, againſt which Sir Miles Partridge ſtaked an hundred pounds, and won them of King Henry VIII. at a caſt of dice. Nevertheleſs it appears that abroad there are bells of greater magnitude. In the ſteeple of the great church at Rouen in Normandy is a bell with this inſcription:

Je ſuis George de Ambois,
Qui trente cinque mille pois.
Mes lui qui me peſera,
Trente ſix mille me trouera.

I am George of Ambois,
Thirtie five thouſand in pois:
But he that ſhall weigh me,
Thirtie ſix thouſand ſhall find me. *Ibid.*

It is a common tradition, that the bells of King's-college chapel, in the univerſity of Cambridge, were taken by Henry V. from ſome church in France, after the battle of Agincourt. They were taken down ſome years ago, and ſold to Phelps the bell-founder in White-chapel, who melted them. The uſes of bells were ſummed up in the following diſtich, as well as that above mentioned:

Laudo Deum verum, plebem voco, conjugo clerum,
Defunctos ploro, peſtem fugo, feſta decoro.

Matthew Paris obſerves, that anciently the uſe of bells was prohibited in time of mourning; though at preſent they make one of the principal ceremonies of mourning. Mabillon adds, that it was an ancient cuſtom to ring the bells for perſons about to expire, to advertiſe the people to pray for them; whence our paſſing-bells. The paſſing-bell, indeed, was anciently rung for two purpoſes: one, to beſpeak the prayers of all good Chriſtians for a ſoul juſt departing; the other, to drive away the evil ſpirits who ſtood at the bed's foot, and about the houſe, ready to ſeize their prey, or at leaſt to moleſt and terrify the ſoul in its paſſage: but by the ringing of that bell (for Durandus informs us, evil ſpirits are much afraid of bells), they were kept aloof; and the ſoul, like a hunted hare, gained the ſtart, or had what is by ſportſmen called *law*. Hence, perhaps, excluſive of the additional labour, was occaſioned the high price demanded for tolling the greateſt bell of the church; for, that being louder, the evil ſpirits muſt go farther off to be clear of its ſound, by which the poor ſoul got ſo much more the ſtart of them: beſides, being heard farther off, it would likewiſe procure the dying man a greater number of prayers. This diſlike of ſpirits to bells is mentioned in the Golden Legend, by W. de Worde. "It is ſaid, the evil ſpirytes that ben in the regyon of thayre, doubte moche when they here the belles rongen: and this is the cauſe why the bells ben rongen whan it thundreth, and whan grete tempeſte and outrages of wether happen to the ende that the feinds and wycked ſpyrites ſhold be abaſhed and flee, and ceaſe of the movynge of tempeſte." Lobineau obſerves, that the cuſtom of ringing bells at the approach of thunder is of ſome antiquity; but that the deſign was not ſo much to ſhake the air, and ſo diſſipate the thunder, as to call the people to church, to pray that the pariſh might be preſerved from its dreadful effects.

In popiſh times, bells were baptized and anointed *oleo chriſmatis*: they were exorciſed, and bleſſed by the biſhop; from a belief, that, when theſe ceremonies were performed, they had power to drive the devil out of the air, to calm tempeſts, to extinguiſh fire, and to recreate even the dead. The ritual for theſe ceremonies is contained in the Roman pontifical; and it was uſual in their baptiſm to give to bells the name of ſome ſaint. In Chauncy's Hiſtory of Hertfordſhire, page 383, is a relation of the baptiſm of a ſet of bells in Italy, with great ceremony, a ſhort time before the writing of that book. The bells of the pariſh church of Winnington in Bedfordſhire had their names caſt about the verge of every one in particular, with theſe rhiming hexameters:

Nomina Campanis hæc indita ſunt quoque noſtris.
1. *Hoc ſignum Petri pulſatur nomine Chriſti.*
2. *Nomen Magdalene campana ſonat melode.*
3. *Sit nomen Domini benedictum ſemper in eum.*
4. *Muſa Raphaelis ſonat auribus Immanuelis.*
5. *Sum Roſa pulſata mundique Maria vocata.*

Weev. Fun. 122.

By an old chartulary, once in the poſſeſſion of Weever the antiquary, it appears that the bells of the priory of Little Dunmow in Eſſex were, anno 1501, new caſt, and baptized by the following names:

Prima in honore Sancti Michaelis Archangeli.
Secunda in honore S. Johannis Evangeliſti.
Tertia in honore S. Johannis Baptiſti.

Quarta in honore Aſſumptionis beatæ Mariæ.
Quinta in honore ſancti Trinitatis, et omnium ſanctorum.
Ib. 633.

Oſney abbey near Oxford was very famous for its bells, whoſe ſeveral names were Douce, Clement, Auſtin, Hautecter [potius Hautcleri], Gabriel, and John.

The city of Nankin in China was anciently famous for the largeneſs of its bells; but their enormous weight brought down the tower, the whole building fell to ruin, and the bells have ever ſince lain on the ground. One of theſe bells is near 12 Engliſh feet high, the diameter ſeven and a half, and its circumference 23; its figure almoſt cylindric, except for a ſwelling in the middle; and the thickneſs of the metal about the edges ſeven inches. From the dimenſions of this bell, its weight is computed at 50,000 pounds, which is more than double the weight of that of Erfort, ſaid by Father Kircher to be the greateſt bell in the world. Theſe bells were caſt by the firſt emperor of the preceding dynaſty, about 300 years ago. They have each their name; the hanger (*tchoui*), the eater (*che*), the ſleeper (*choui*), the will (*ſi*). Father Le Compte adds, that there are ſeven other bells in Pekin, caſt in the reign of Youlo, each of which weighs 120,000 pounds. But the ſounds even of their biggeſt bells are very poor; being ſtruck with a wooden inſtead of an iron clapper.

Ringing bells in change, or regular peals, is ſaid to be a cuſtom peculiar to England; whence Britain has been termed the *ringing iſland*. The cuſtom ſeems to have commenced in the time of the Saxons, and was common before the Conqueſt. The ringing of bells, though a recreation chiefly of the lower ſort, is in itſelf not incurious. The tolling a bell is nothing more than the producing a ſound by the ſtroke of the clapper againſt the ſide of the bell, the bell itſelf being in a pendant poſition and at reſt. In ringing, the bell, by means of a wheel and a rope, is elevated to a perpendicular; in its motion to this ſituation the clapper ſtrikes forcibly on one ſide, and in its return downwards on the other ſide of the bell, producing at each ſtroke a ſound. There were in London ſeveral ſocieties of ringers, particularly one known by the name of the *College Youths*: of this it is ſaid Sir Matthew Hale, lord chief juſtice of the court of King's Bench, was, in his youthful days, a member; and in the life of this learned and upright judge, written by Biſhop Burnet, ſome facts are mentioned which favour this relation. In England the practice of ringing is reduced to a ſcience, and peals have been compoſed which bear the name of their inventors. Some of the moſt celebrated peals now known were compoſed about 50 years ago by one Patrick. This man was a maker of barometers: in his advertiſements he ſtyled himſelf *Torricellian Operator*, from Torricelli, who invented inſtruments of this kind. In the year 1684, one Abraham Rudhall, of the city of Glouceſter, brought the art of bell founding to great perfection. His deſcendants in ſucceſſion have continued the buſineſs of caſting bells; and by a liſt publiſhed by them it appears, that at Lady-day 1774 the family in peals and odd bells, had caſt to the amount of 3594. The peals of St. Dunſtan's in the Eaſt, and St. Bride's, London, and St. Martin's in the Fields, Weſtminſter, are of the number.

The muſic of bells is altogether melody; but the pleaſure ariſing from it conſiſts in the variety of interchanges, and the various ſucceſſion and general predominance of the conſonances in the ſounds produced. Muſical authors ſeem to have written but little upon this ſubject.

Electrical Bells are uſed in a variety of entertaining experiments by electricians. The apparatus, which is originally of German invention, conſiſts of three ſmall bells ſuſpended from a narrow plate of metal; the two outermoſt by chains, and that in the middle, from which a chain paſſes to the floor, by a ſilken ſtring. Two ſmall knobs of braſs are alſo hung by ſilken ſtrings, one on each ſide of the bell in the middle, which ſerve for clappers. When this apparatus is connected with an electrified conductor, the outermoſt bells ſuſpended by the chains will be charged, attract the clappers, and be ſtruck by them. The clappers becoming electrified likewiſe will be repelled by theſe bells, and attracted by the middle bell, and diſcharge themſelves upon it by means of the chain extending to the floor. After this, they will be again attracted by the outermoſt bells; and thus, by ſtriking the bells alternately, occaſion a ringing, which may be continued at pleaſure. Flaſhes of light will be ſeen in the dark between the bells and clappers; and if the electrification be ſtrong, the diſcharge will be made without actual contact, and the ringing will ceaſe. An apparatus of this kind, connected with one of thoſe conductors that are erected for ſecuring buildings from lightning, will ſerve to give notice of the approach and paſſage of an electrical cloud.

Bell-*Animal*. See Animalcule.

Bell-*Metal*, a compoſition of tin and copper.

Bell, in chemiſtry, denotes a glaſs veſſel placed over ſome matter in a ſtate of exhalation, either to collect the vapour or gather the flowers. Chemical bells are a ſort of receptacles chiefly uſed in preparing matters by ſublimation, for gathering and condenſing fumes into a liquor, &c.

Diving-Bell. See Diving.

Bell-*Foundery*. See Foundery.

Bell-*Flower*, in botany. See Campanula.

Bell-*Weed*, in botany. See Jacea.

BELLA (Stefano de la), a moſt eminent engraver, was born at Florence A. D. 1610. His father was a goldſmith; and he himſelf began to work at his father's buſineſs. But whilſt he was learning to draw, in order to perfect himſelf in that profeſſion, ſome of the prints of Callot fell by accident into his hands; with which he was ſo delighted, that he prevailed upon his father to permit him to apply himſelf to engraving; and he became the diſciple of Canta Gallina, who was alſo the inſtructor of Callot. De la Bella at firſt imitated the manner of Callot. His abilities ſoon began to manifeſt themſelves; and as by degrees he acquired a facility in the handling of the point, he quitted the ſtyle in which he only ſhone as an imitator, and adopted one entirely his own, which in freedom and ſpirit is ſaid even to have ſurpaſſed that of his fellow diſciple. He went to Paris A. D. 1642, where he formed an acquaintance with Iſrael Silveſtre, then newly returned from Rome; and he was much employed by Henriete the uncle of Silveſtre. Some time after, Cardinal Richelieu engaged him to go to Arras and make drawings of the ſiege and taking of that town by the royal army; which drawings he engraved at his return. He alſo went to Holland, where, it is reported, he ſaw ſome of the prints of Rembrandt Gerretſz, and attempted to imitate them; but finding he did not ſucceed to his expectations, he dropped that deſign, and continued to purſue his own manner, as moſt ſuitable to his genius. After ſtaying ſome conſiderable time at Paris, his family affairs obliged him to return to Florence; where he obtained a penſion from the Great Duke, and was appointed to inſtruct the prince Coſmus his ſon in the art of deſign. Being ſubject to violent pains in the head, his life was rendered very uncomfortable by this cruel diſorder, which at laſt put an end to it A. D. 1664, when he was only 54 years of age. De la Bella drew very correctly, and with great taſte. His works manifeſt much genius and vaſt fertility of invention. The fire and animation which appear in them compenſate for their ſlightneſs; and we may reaſonably expect to find them ſlight when we are told that he engraved 1400 plates.

BELLAC, a town of France, in the department of Upper Vienne and late province of Limoſin, ſeated on the Vincon, 20 miles north of Limoges, on the little river Union. It contains about 770 houſes, and 3000 inhabitants. E. long. 1. 14. N. lat. 46. 4.

BELLADONNA, in botany, the trivial name of a ſpecies of Atropa. See ATROPA.

BELLAI (William du), lord of Langey, a French general, who ſignalized himſelf in the ſervice of Francis I. He was alſo an able negotiator, ſo that the emperor Charles V. uſed to ſay, "that Langey's pen had fought more againſt him than all the lances in France." He was ſent to Piedmont in quality of viceroy, where he took ſeveral towns from the Imperialiſts. His addreſs in penetrating into the enemy's deſigns was ſurpriſing. In this he ſpared no expence, and thereby had intelligence of the moſt ſecret councils of the emperor and his generals. He was extremely active in influencing ſome of the univerſities of France to give their judgment agreeable to the deſires of Henry VIII. king of England, when this prince wanted to divorce his queen, in order to marry Anne Bullen. It was then the intereſt of France to favour the king of England in this particular, it being an affront to the emperor, and a gratification to Henry, which might ſerve to form a ſtrict alliance between him and Francis I. He was ſent ſeveral times into Germany to the princes of the Proteſtant league, and was made a knight of the order of St. Michael. He was alſo a man of learning, having given proofs of his abilities and genius as a writer. He compoſed ſeveral works; the moſt remarkable of which was, the Hiſtory of his Own Times, in Latin; divided into ogdoades, that is, ſeveral parts, each conſiſting of eight books; moſt of which, however, have been loſt. When Langey was in Piedmont, in 1542, he had ſome remarkable intelligence which he was deſirous himſelf to communicate to the king, and being very infirm, he ordered a litter for his conveyance; but after having paſſed the mountain of Tarara, betwixt Lyons and Roan, he found himſelf ſo extremely bad at St. Saphorin that he was obliged to ſtop there, where he died the 9th of January, in the year 1543. He was buried in the church of Mans, and a noble monument was erected to his memory.

BELLARMIN (Robert), an Italian Jeſuit, one of the beſt controverſial writers of his time. In 1576 he read lectures at Rome on controverſies; which he did with ſuch applauſe, that Sixtus V. ſending a legate into France in 1590, appointed him as a divine, in caſe any diſpute in religion ſhould happen to be diſcuſſed. He returned to Rome, and was raiſed ſucceſſively to different offices, till at laſt, in 1599, he was honoured with a cardinal's hat; to accept of which dignity, it is ſaid, they were obliged to force him by the threats of an anathema. It is certain, that no Jeſuit ever did greater honour to his order than he; and that no author ever defended the cauſe of the Romiſh church in general, and that of the pope in particular, to more advantage. The Proteſtants have owned this ſufficiently: for, during the ſpace of 50 years, there was ſcarcely any conſiderable divine among them who did not fix upon this author for the ſubject of his books of controverſy. Notwithſtanding the zeal with which this Jeſuit maintained the power of the pope over the temporality of kings, he diſpleaſed Sixtus V. in his work *De Romano Pontifice*, by not inſiſting that the power which Jeſus Chriſt gave to his vicegerent was direct, but only indirect; and had the mortification to ſee it put into the index of the inquiſition, though it was afterwards removed. He left, at his death, to the Virgin Mary one half of his ſoul, and to Jeſus Chriſt the other. Bellarmin is ſaid to have been a man of great chaſtity and temperance, and remarkable for his patience. His ſtature was low, and his mien very indifferent; but the excellence of his genius might be diſcovered from the traces of his countenance. He expreſſed himſelf with great perſpicuity; and the words which he firſt made uſe of to explain his thoughts were generally ſo proper, that there appeared no raſure in his writings.

BELLATRIX, in aſtronomy, a ruddy glittering ſtar of the ſecond magnitude, in the left ſhoulder of Orion. It takes its name from *bellum*, as being anciently ſuppoſed to have a great influence in kindling wars, and forming warriors. Its longitude, according to Hevelius, for the year 1700, was 16° 47′ 20″; and its latitude ſouthward 16° 52′ 11″.

BELLCLARE, a town of Ireland, in the province of Connaught, and county of Sligo. W. long. 9. 5. N. lat. 53. 56.

BELLEAU (Remi), a French poet, born at Nogent le Rotrou, then in the territory of Perche, and province of Orleanois. He lived in the family of Renatus of Lorrain, marquis of Elbeuf, general of the French galleys; and attended him in his expedition into Italy, in 1557. This prince highly eſteemed Belleau for his courage; and having alſo a high opinion of his genius and abilities, entruſted him with the education of his ſon Charles of Lorrain. Belleau was one of the ſeven poets of his time who were denominated the *French Pleiades*. He wrote ſeveral pieces; and tranſlated the odes of Anacreon into the French language, but in this he is thought not to have preſerved all the natural beauties of the original. His paſtoral pieces are in greateſt eſteem. His verſes in that way (according to his eulogiſts) are expreſſed with ſuch beauty and ſimplicity, that they ſeem to be a living picture of what they deſcribe. He alſo wrote an excellent poem on the nature and difference of precious ſtones, which by ſome has been reputed his beſt performance. Belleau died at Paris, in the family of the duke d'Elbeuf, on the 6th of March, 1577. He was interred in the church De Peres Auguſtines, near the Pont-neuf: ſeveral eulogiums were made to his memory.

BELLEFOREST (Francis de), a French author, born in the former province of Guienne, in 1530. He was 7 years of age when he loſt his father; and his mother was left in poor circumſtances, but ſhe contributed all in her power to his education. He was ſupported ſome years by the queen of Navarre, ſiſter to Francis I. Some time after he went to ſtudy at Bourdeaux; thence he removed to Toulouſe; and at laſt to Paris, where he got acquainted with ſeveral men of learning, and was honoured with the friendſhip of many perſons of quality. He wrote, 1. A Hiſtory of the Nine Charles's of France; 2. Annotations on the Books of St. Auguſtin; 3. An Univerſal Hiſtory of the World; 4. The Chronicles of Nicholas Gillet, augmented; 5. An Univerſal Coſmography; 6. Annals, or a General Hiſtory of France: and many other works. In ſhort, he ſupported his family by writing books on whatever ſubject was propoſed to him by the bookſellers, according to the taſte of the public. He died in 1583.

BELLEGARDE, a ſtrong town of France in Rouſſillon, on the frontiers of Catalonia. It opens a paſſage to the Pyrenean mountains. E. long. 3. 0. N. lat. 42. 20.

BELLEGARDE, a town in the department of Saone and Loire, and late province of Burgundy in France. E. long. 4. 0. N. lat. 46. 57.

BELLE-ISLE, an iſland of France, 15 miles from the coaſt of Brittany. It is the largeſt of all the French European iſlands, being between 12 and 13 leagues in circumference. It is a mixture of craggy rocks and fertile ſoil; but the inhabitants are very poor, and the only trade carried on in it is the curing of pilchards. There are three harbours in the iſland, *viz.* Palais, Sauzon, and Goulford; every one of which labours under ſome capital defect, either in being expoſed, ſhallow, or dangerous in the entrance. It contains only one little

city called *Le Palais*, three county towns, 103 villages, and about 5000 inhabitants. The iſland originally belonged to the earl of Cornouaille; but was afterwards yielded to the king, who, in 1742, erected it into a duchy, in favour of marſhal Belleiſle. The town of Palais takes its name from a caſtle belonging to the duke de Belleiſle, which ſtood in its neighbourhood; but was afterwards converted into a citadel fronting the ſea, and ſtrongly fortified. Its fortifications are compoſed principally of hornworks; and it is provided with two dry ditches, the one next the counterſcarp, and the other ſo contrived as to ſecure the interior fortifications. This citadel is divided from the largeſt part of the town by an inlet of the ſea, over which there is a bridge of communication. From the other part of the town, and which is moſt inhabited, it is only divided by its own fortifications and a glacis. In this ſtate was the iſland in 1761, when an expedition was undertaken againſt it by a Britiſh fleet under the command of commodore Keppel, having on board a conſiderable land force commanded by general Hodgſon. The fleet ſailed from Spithead on the 29th of March, and arrived before Belleiſle on the 7th of April. The next day it was agreed to attempt a landing on the ſouth-eaſt part of the iſland, in a ſandy bay, near Lochmana point. Here the enemy were in poſſeſſion of a little fort; they had moreover entrenched themſelves on a hill exceſſively ſteep, the foot of which was ſcarped away. The attempt was made in three places with great reſolution; but the Britiſh were at laſt repulſed with the loſs of 500 men. It was not before the 25th of April that the weather allowed a ſecond attempt. This was made on a very ſtrong place, where the enemy were rather leſs attentive, on account of the exceſſive ſteepneſs and difficulty of climbing up the rocks. Beſides the principal attack, two feints were made at the ſame time to diſtract the enemy, whilſt the men of war directed their fire with great ſucceſs on the hills. Theſe manœuvres gave brigadier-general Lambert, with an handful of men, an opportunity of climbing up a very ſteep rock without moleſtation. This little body formed themſelves in good order without delay, and were immediately attacked by 300 French. The Britiſh, however, ſuſtained this attack until the whole corps of brigadier Lambert, which had now likewiſe aſcended, came to their aſſiſtance, with whoſe help they repulſed the enemy. The landing of all the forces being ſoon after made good, the French were driven into the town of Palais. Here the chevalier de St. Croix, who commanded them, a brave and experienced officer, reſolved to hold out to the laſt extremity; and it was not till the 7th of June that he capitulated, and the garriſon marched out with the honours of war. The iſland, however, was reſtored to the French by the treaty concluded in 1763.

Belle-isle, an iſland of North America, lying at the mouth of the ſtrait between the country of the Eſquimaux, or New Britain, and the north-end of Newfoundland; whence the ſtraits take alſo the name of *Belleiſle*. W. long. 58. 5. N. lat. 51. 50.

BELLEROPHON, in fabulous hiſtory, the ſon of Glaucus king of Epirus, happening accidentally to kill his brother, fled to Prœtus king of Argos, who gave him a hoſpitable reception: but Sthenobea, his queen, falling in love with the beautiful ſtranger, and finding that nothing could induce him to injure his benefactor, ſhe accuſed him to her huſband of an attempt to violate her honour. Prœtus, however, not being willing to act contrary to the laws of hoſpitality, ſent him to Iobates king of Lyſia, and the father of Sthenobea, with letters deſiring him to put him to death: whence the proverb *Bellerophontis literas affert*, equivalent to *Literæ Uriæ*. That prince, at the receipt of theſe letters, was celebrating a feſtival of nine days, which prevented Bellerophon's deſtruction. Iobates, however, ſent him in the mean time to ſubdue the Solymi, the Amazons, and Lyſians, and thought to get rid of him by expoſing him to the greateſt dangers; but by his prudence and courage he came off victorious. Iobates next employed him to deſtroy the Chimæra; when Minerva, or, according to others, Neptune, in conſideration of his innocence, furniſhed him with the horſe Pegaſus, by whoſe aſſiſtance he killed the Chimæra. Iobates, on his return, being convinced of his truth and integrity, and charmed with his heroic virtues, gave him his daughter Philonoë in marriage, and declared him his ſucceſſor; which when Sthenobea heard, ſhe killed herſelf. Bellerophon at length growing vain with his proſperity, reſolved, by the aſſiſtance of Pegaſus, to aſcend the ſkies; when Jupiter checked his preſumption, by ſtriking him blind in his flight; on which he fell down to the earth, and wandered till his death in contempt and miſery: but Pegaſus mounting into heaven, Jupiter placed him among the conſtellations.

BELLES LETTRES, polite literature. Whether we conſult the voluminous dictionaries of the French language, or thoſe treatiſes that profeſs to point out the method of ſtudying and teaching the Belles Lettres, we find not, in the one or the other, either a clear definition, or a ſuccinct explication of the words *Belles Lettres*, nor any ſummary of thoſe ſciences which are comprehended under that general and collective denomination. It appears to be a vague term, under which every one may include whatever he thinks proper. Sometimes we are told that by the Belles Lettres is meant, the knowledge of the arts of poetry and oratory; ſometimes that the true Belles Lettres are natural philoſophy, geometry, and other eſſential parts of learning; and ſometimes, that they comprehend the art of war, by land and ſea: in ſhort, they are made to include all that we know, and whatever we pleaſe; ſo that, in treating on the Belles Lettres, they talk of the uſe of the ſacraments, &c. Some comprehend under the term, all thoſe inſtructive and pleaſing ſciences which occupy the memory and the judgment, and do not make part either of the ſuperior ſciences, of the *polite arts*, or of mechanic profeſſions: hence they make hiſtory, chronology, geography, genealogy, blazonry, philology, &c. the Belles Lettres. In a word, it were an endleſs taſk to attempt to enumerate all the parts of literature which different learned men have comprehended under this title. Nor would it be of any uſe to the reader for us to pretend to fix the true import of the term. Whatever arts or ſciences it may be ſuppoſed to include, they are ſeverally explained in the courſe of this work.

BELLEVOIS, a painter of ſea pieces, is known through all parts of Europe as a good painter, though no particulars have been handed down concerning his life. He died in 1684. His ſubjects are views of havens, ſea-ports, ſhores, calms, and ſtorms at ſea; but in his calms he ſhows his peculiar excellence. Pictures of this maſter are often in public ſales; and ſome of them, which ſeem in his beſt ſtyle, are ſold for conſiderable prices.

BELLEY, a town of France, in the department of Ain and late province of Breſſe. It is ſeated near the river Rhone, in E. long. 5. 50. N. lat. 45. 43.

BELLINGHAM, a town of Northumberland in England. W. long. 2. 10. N. lat. 55. 10.

BELLINI (Gentil), a Venetian painter, born in the year 1421. He was employed by the republic of Venice, and to him and his brother the Venetians are indebted for the noble works which are to be ſeen in their council-hall. We are told that Mahomet II. emperor of the Turks, having ſeen ſome of his performances, was ſo ſtruck with them, that he wrote to the republic, entreating them to ſend him. The painter accordingly went to Conſtantinople, where he did many excellent pieces. Amongſt the reſt, he painted the

decollation of St. John the Baptiſt, whom the Turks revere as a great prophet. Mahomet admired the proportion and ſhadowing of the work; but he remarked one defect in regard to the ſkin of the neck, from which the head was ſeparated; and in order to prove the truth of his obſervation, he ſent for a ſlave and ordered his head to be ſtruck off. This ſight ſo ſhocked the painter, that he could not be eaſy till he had obtained his diſmiſſion; which the Grand Signior granted, and made him a preſent of a gold chain. The republic ſettled a penſion upon him at his return, and made him a knight of St. Mark. He died in 1501, in his 80th year. *John Bellini*, his brother, painted with more art and ſweetneſs than he; and died in 1512, aged 90.

Bellini (Laurence), an eminent phyſician, born at Florence in the year 1643. After having finiſhed his ſtudies in polite literature, he went to Piſa, where he was aſſiſted by the generoſity of the grand duke Ferdinand II. and ſtudied under two of the moſt learned men of that age, Oliva and Borelli. Oliva inſtructed him in natural philoſophy, and Borelli taught him mathematics. At 20 years of age, he was choſen profeſſor of philoſophy at Piſa, but did not continue long in this office; for he had acquired ſuch a reputation for his ſkill in anatomy, that the grand duke procured him a profeſſorſhip in that ſcience. This prince was often preſent at his lectures, and was highly ſatisfied with his abilities and performances. Bellini, after having held his profeſſorſhip almoſt 30 years, accepted of an invitation to Florence, when he was about 50 years of age. Here he practiſed phyſic with great ſucceſs, and was advanced to be firſt phyſician to the grand duke Coſmus III. He wrote the following books in Latin: 1. An anatomical diſcourſe on the ſtructure and uſe of the kidneys. 2. A ſpeech by way of thanks to the ſerene duke of Tuſcany. 3. Some anatomical obſervations, and a propoſition in mechanics. 4. Of the urine and pulſe, of blood-letting, fevers, and diſeaſes of the head and breaſts. 5. Several tracts concerning urine, the motion of the heart, and bile, &c. He died January 8th, 1703, being 60 years of age. His works were read and explained publicly during his life, by Dr. Pitcairn, profeſſor of phyſic in Leyden.

BELLINZONA, a town of Italy, in the Milaneſe, and one of the bailiwicks which the Swiſs poſſeſs in that country. It is ſeated on the river Jeſino, five miles above the place where it falls into the Lago Maggiore, and it is fortified with two ſtrong caſtles formerly joined together by a wall flanked with towers; but the Swiſs have demoliſhed a part of the fortifications. E. long. 9. 0. N. lat. 46. 8.

BELLIS, the daisy: A genus of the ſyngeneſia order, belonging to the polygamia ſuperflua claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The receptacle is naked and conic; there is no pappus; the calyx is hemiſpherical, with equal ſcales; and the ſeeds are ovated.

The *Species* are, 1. The perennis, with a naked ſtalk, having one flower. This is the common daiſy, which grows naturally in paſture-lands in moſt parts of Europe. It is often a troubleſome weed in the graſs of gardens, ſo is never cultivated. Its leaves have a ſubtile ſubacid taſte; and have been formerly recommended in aſthmas and hectic fevers, as well as in ſuch diſorders as are occaſioned by drinking cold liquors when the body has been much heated. Ludovici prefers this plant to thoſe commonly uſed as antiſcorbutics, and has greatly praiſed its effects in hypochondriacal diſorders. 2. The annua, with leaves on the lower part of the ſtalk, is a low annual plant growing naturally on the Alps and the hilly parts of Italy. It ſeldom riſes more than three inches high; and hath an upright ſtalk garniſhed with leaves on the lower part: but the upper part is naked, ſupporting a ſingle flower like that of the common daiſy, but ſmaller. 3. The hortenſis, or garden daiſy, with a large double flower. This is generally thought to be only a variety of the common daiſy; but Mr. Miller aſſures us, that he was never able to improve the common daiſy by culture, or to make the garden daiſy degenerate into the common ſort for want of it. The varieties of this ſpecies cultivated in gardens are, the red and white garden daiſy; the double variegated garden daiſy; the chilling, or hen and chicken garden daiſy: and the cock's-comb daiſy with red and white flowers. The garden daiſies flower in April and May, when they make a pretty variety, being intermixed with plants of the ſame growth: they ſhould be planted in a ſhady border, and a loamy ſoil without dung, in which they may be preſerved without varying, provided the roots are parted and tranſplanted every autumn. This is all the culture they require, except keeping them free from weeds. Formerly they were planted as edgings to borders; but for this purpoſe they are improper, becauſe where fully expoſed to the ſun, they frequently die in large patches, whereby the edgings become bald in many different places.

Bellis *Major*. See Chrysanthemum.

BELLON, the ſame as *colica pictonum*; a diſtemper common in countries where they ſmelt lead-ore. It is attended with languor, intolerable pains and ſenſations of griping in the belly, and generally coſtiveneſs.—Beaſts, poultry, &c. as well as men, are ſubject to this diſorder: hence a certain ſpace round the ſmelting-houſes is called *bellon-ground*, becauſe it is dangerous for an animal to feed upon it.

BELLONA, in Pagan mythology, the goddeſs of war, is generally reckoned the ſiſter of Mars, and ſome repreſent her as both his ſiſter and wife. She is ſaid to have been the inventreſs of the needle; and from that inſtrument is ſuppoſed to have taken her name Βελονη, ſignifying a *needle*. This goddeſs was of a cruel and ſavage diſpoſition, delighting in bloodſhed and ſlaughter; and was not only the attendant of Mars, but took a pleaſure in ſharing his dangers. She is commonly repreſented in an attitude expreſſive of fury and diſtraction, her hair compoſed of ſnakes clotted with gore, and her garments ſtained with blood: ſhe is generally depictured driving the chariot of Mars, with a bloody whip in her hand; but ſometimes ſhe is drawn holding a lighted torch or brand, and at others a trumpet. Bellona had a temple at Rome, near the Circus Flaminius, before which ſtood the column of war, from whence the conſul threw his lance when he declared war. She was alſo worſhipped at Comana, in Cappadocia; and Camden obſerves, that in the time of the emperor Severus, there was a temple of Bellona in the city of York.

BELLONARII, in antiquity, prieſts of Bellona, the goddeſs of wars and battles. The bellonarii cut and mangled their bodies with knives and daggers in a cruel manner, to pacify the deity. In this they are ſingular, that they offered their own blood, not that of other creatures, in ſacrifice. In the fury and enthuſiaſm wherewith they were ſeized on theſe occaſions, they ran about raging, uttering prophecies, and foretelling blood and ſlaughter, devaſtations of cities, revolutions of ſtates, and the like: whence Martial calls them *turba entheata Bellonæ*. In after-times, they ſeem to have abated much of their zeal and tranſport, and to have turned the whole into a kind of farce, contenting themſelves with making ſigns and appearances of cutting wounds. Lampridius tells us, the emperor Commodus, out of a ſpirit of cruelty, turned the farce again into a tragedy, obliging them to cut and mangle their bodies in reality.

BELLONIA (ſo named from the famous Petrus Bellonius, who left many valuable tracts on natural hiſtory, &c.), a genus of the monogynia order, belonging to the pentandria claſs of plants. Of this genus there is only one ſpecies known, *viz.*

he aſpera, with a rough balm leaf. This is very common in he warm iſlands of America.

BELLORI (John Peter), of Rome; a celebrated antiquary and connoiſſeur in the polite arts: author of the lives of the modern painters, architects, and ſculptors, and of other works on antiquities and medals. He died in the year 1696.

BELLOWS, a machine ſo contrived as to exſpire and inſpire the air by turns, by enlarging and contracting its capacity. This machine is uſed in chambers and kitchens, in forges, furnaces, and founderies, to blow up the fire: it ſerves alſo for organs and other pneumatic inſtruments, to give them a proper ſupply of air. All theſe are of various conſtructions, according to their different purpoſes; but in general they are compoſed of two flat boards, ſometimes of an oval, ſometimes of a triangular figure: two or more hoops, bent according to the figure of the boards, are placed between them; a piece of leather, broad in the middle, and narrow at both ends, is nailed on the edges of the boards, which it thus unites together; as alſo on the hoops which ſeparate the boards, that the leather may the eaſier open and fold again: a tube of iron, braſs, or copper, is faſtened to the undermoſt board, and there is a valve within, that covers the hole in the underboard to keep the air from eſcaping.

Anacharſis the Scythian is recorded as the inventor of bellows. The action of bellows bears a near affinity to that of the lungs; and what we call blowing in the latter, affords a good illuſtration of what is called *reſpiring* in the former. Animal life itſelf may on ſome occaſions be ſubſiſted by blowing into the lungs with a pair of bellows. Dr. Hooke's experiment to this end is remarkable: having laid the thorax of a dog bare, by cutting away the ribs and diaphragm, pericardium, &c. and having cut off the aſpera arteria below the epiglottis, and bound it on the noſe of a bellows, he found, that as he blowed, the dog recovered, and as he ceaſed, fell convulſive; and thus was the animal kept alternately alive and dead above the ſpace of an hour. There are bellows made wholly of wood, without any leather about them; one of which is preſerved in the repoſitory of the Royal Society; and Dr. Plot deſcribes another in the copper-works at Ellaſton in Staffordſhire. Ant. della Fruta contrived a ſubſtitute for bellows, to ſpare the expence of them in the fuſion of metals. This is called by Kircher *camera æolia*, and in England commonly the *water bellows*; where water falling through a funnel into a cloſe veſſel, ſends from it ſo much air continually as blows the fire. See the article FURNACE.

The bellows uſed by ſmiths and founders, whether ſingle or double, are wrought by means of a rocker, with a ſtring or chain faſtened thereto, which the workman pulls. The bellows pipe is fitted into that of the tewel. One of the boards is fixed, ſo as not to play at all. By drawing down the handle of the rocker, the moveable board riſes, and by means of a weight on the top of the upper board, ſinks again. The bellows of forges and furnaces of mines uſually receive their motion from the wheels of a water-mill. Others, as the bellows of enamellers, are wrought by means of one or more ſteps or treddles under the workman's feet. Laſtly, the bellows of organs are wrought by a man called the *blower*; and in ſmall organs by the foot of the player. Butchers have alſo a kind of blaſt or bellows of a peculiar make, by which they bloat or blow up their meat when killed, in order to deceive the eye of the purchaſer.

Bone-BELLOWS, φυσήτηρες οστεινοι, occur in Herodotus for thoſe applied by the Scythians to the genitals of mares in order to diſtend the uterus, and by this compreſſion make them yield a greater quantity of milk.

Heſſian BELLOWS are a contrivance for driving air into a mine for the reſpiration of the miners. This M. Papin improved, changing its cylindrical form into a ſpiral one; and with this, working it only with his foot, he could make a wind to raiſe two pounds weight.

Hydroſtatic BELLOWS. See HYDROSTATICS.

BELLUNESE, a territory of Italy, belonging to the Venetians. It lies between Friuli, Codorino, Feltrino, the biſhopric of Trent and Tirol. It has good iron mines, but the only conſiderable place is Belluno.

BELLUNO, a town of Italy, in the Venetian territories and capital of the Belluneſe. It is a Biſhop's ſee; and is ſituated among the Alps, on the river Piave, between the towns Cadora and Trevigni, in E. long. 12. 15. N. lat. 46. 9.

BELLY, in anatomy, the vulgar name of that part which is more uſually called *abdomen*. See ANATOMY.

BELMONTE, a town of Italy, in the Hither Calabria, and kingdom of Naples. It is ſituated on the coaſt of the Tuſcan ſea, in E. long. 16. 50. N. lat. 39. 20.

BELOMANCY, BELOMANTIA, a kind of divination by means of arrows, practiſed in the eaſt, but chiefly among the Arabians. The word is of Greek origin; compounded of βελος *arrow*, and μαντεια *divination*. Belomancy has been performed in different manners. One was to mark a parcel of arrows, and put 11 or more of them into a bag: theſe were afterwards drawn out; and according as they were marked or not, they judged of future events. Another way was to have three arrows, upon one of which was wrote, "God orders it me;" upon another, "God forbids it me;" and upon the third nothing at all. Theſe were put into a quiver, out of which they drew one of the three at random: if it happened to be that with the firſt inſcription, the thing they conſulted about was to be done: if it chanced to be that with the ſecond inſcription, it was let alone; but if it proved that without inſcription, they drew over again. Belomancy is an ancient practice, and probably that which Ezekiel mentions, chap. xxi. 21. At leaſt St. Jerome underſtands it ſo, and obſerves that the practice was frequent among the Aſſyrians and Babylonians. Something like it is alſo mentioned in Hoſea, chap. iv. only that ſtaves are there mentioned inſtead of arrows, which is rather rhabdomancy than belomancy. Grotius, as well as Jerome, confounds the two together, and ſhows that it prevailed much among the Magi, Chaldeans, and Scythians; whence it paſſed to the Sclavonians, and thence to the Germans, who Tacitus obſerves made uſe of it.

BELON (Peter), of Le Mans, the capital of the ci-devant Le Maine a province of France, flouriſhed about the middle of the 16th century. He publiſhed ſeveral books in Latin. He wrote, in French, of birds, beaſts, fiſhes, ſerpents, and the neglected culture of plants; and a book of Travels, or obſervations of many ſingularities and memorable things found in Greece, Aſia, Judæa, Egypt, Arabia, and other foreign countries. He was murdered near Paris by one of his enemies in 1564.

BELONE, in ichthyology, the trivial name of a ſpecies of eſox. See BARRACIDA.

BELSHAZZAR, the laſt king of Babylon, generally ſuppoſed to be the ſon of Evil-merodach, and grandſon to the great Nebuchadnezzar.—During the time that Babylon was beſieged by Cyrus, Belſhazzar made an entertainment for a thouſand of his moſt eminent courtiers (Dan. v. 1. &c.); and being heated with wine, ordered that the veſſels of gold and ſilver which his grandfather Nebuchadnezzar had taken out of the temple at Jeruſalem might be brought to the banqueting-houſe, that he and his princes, together with his wives and concubines, might drink out of them, which accordingly was done; and to add to their profaneneſs, in the midſt of their cups, they ſang ſongs in praiſe of their ſeveral idols. But it

was not long before a damp was put to the king's mirth, by an hand appearing upon the wall, which in three words wrote the ſentence of his condemnation. The king ſaw the hand that wrote; and, being exceedingly affrighted, commanded all his wiſe men, magicians, and aſtrologers, to be immediately called, that they might read the writing, and explain its meaning. When they came, the king promiſed, that whoever ſhould expound this writing ſhould be made the third perſon of his kingdom in place and power. But the Magi could comprehend nothing of this writing; which increaſed the diſorder and uneaſineſs that the king was in, together with his whole court: whereupon, at the inſtance of the queen-mother, Daniel was ſent for. The king made him the ſame offer of honours and preſents that he had done to his own magicians if he would explain the writing. Daniel modeſtly refuſed thoſe offers: but having undertaken to perform what he required of him, he firſt reproved the king with great freedom for his ingratitude to God, who had advanced him to the rank of a ſovereign, and for the profanation of the veſſels which were conſecrated to his ſervice; and then proceeded to the interpretation of the words, which were theſe, *Mene, Tekel, Upharſin. Mene*, ſays he, which ſignifies *number*, intimates, that the days both of your life and reign are numbered, or that you have but a ſhort time to live; *Tekel*, which ſignifies *weight*, intimates, that you have been weighed in the balance of God's juſtice, and found too light; and *Upharſin* (or *Peres*, as Daniel has it, and means the ſame thing), which ſignifies a *fragment*, intimates, that your kingdom ſhall be divided and given to the Medes and Perſians. Which accordingly came to paſs: for that very night, in the midſt of their feaſting and revelling, the city was taken by ſurpriſe, Belſhazzar ſlain, and the kingdom tranſlated to Cyaxares, whom the Scripture calls *Darius the Mede*.

BELT, the *Great*, a famous ſtrait of Denmark between the iſland of Zealand and that of Funen, at the entrance of the Baltic Sea. It is not however ſo commodious, nor ſo much frequented, as the Sound. In 1658 the whole ſtrait was frozen ſo hard, that Charles Guſtavus king of Sweden marched over it with a deſign to take Copenhagen.

Belt, the *Leſſer*, lies to the weſt of the Great Belt, between the iſland of Funen and the coaſt of Jutland. It is one of the paſſages from the German Ocean to the Baltic, though not three miles in breadth, and very crooked.

Belt, *Baltheus*, properly denotes a kind of military girdle, uſually of leather, wherewith the ſword or other weapons are ſuſtained.—Belts are known among the ancient and middle-age writers by divers names, as ζωνη, ζωμα, *zona*, *cingulum*, *reminiculum*, *rinca* or *ringa*, and *baldrellus*. The belt was an eſſential piece of the ancient armour; inſomuch that we ſometimes find it uſed to denote the whole armour. In later ages, the belt was given to a perſon when he was raiſed to knighthood; whence it has alſo been uſed as a badge or mark of the knightly order. The denomination *belt* is alſo applied to a ſort of bandages in uſe among ſurgeons, &c. Thus we meet with quickſilver belts, uſed for the itch; belts for keeping the belly tight, and diſcharging the water in the operation of tapping, &c.

Belt is alſo a frequent diſeaſe in ſheep, cured by cutting their tails off, and laying the fore bare; then caſting mould on it, and applying tar and gooſe greaſe.

Belts, in aſtronomy, two zones or girdles ſurrounding the body of the planet Jupiter. See Astronomy.

Belts, in geography, certain ſtraits between the German Ocean and the Baltic. The belts belong to the king of Denmark, who exacts a toll from all ſhips which paſs through them, excepting thoſe of Sweden, which are exempted.

BEL-tein, a ſuperſtitious cuſtom obſerved in the Highlands of Scotland. It is a kind of rural ſacrifice, performed by the herdſmen of every village on the firſt of May. They cut a ſquare trench on the ground, leaving a turf in the middle: on that they make a fire of wood, on which they dreſs a large caudle of eggs, butter, oatmeal, and milk; and bring beſides the ingredients of the caudle, plenty of beer and whiſky; for each of the company muſt contribute ſomething. The rites begin with ſpilling ſome of the caudle on the ground by way of libation: on that, every one takes a cake of oatmeal, upon which are raiſed nine ſquare knobs, each dedicated to ſome particular being, the ſuppoſed preſerver of their flocks and herds, or to ſome particular animal, the real deſtroyer of them: each perſon then turns his face to the fire, breaks off a knob, and flinging it over his ſhoulder, ſays, *This I give to thee, preſerve thou my horſes; this to thee, preſerve thou my ſheep;* and ſo on. After that, they uſe the ſame ceremony to the noxious animal: *This I give to thee, O fox! ſpare thou my lambs; this to thee, O hooded crow! this to thee, O eagle!* When the ceremony is over, they dine on the caudle; and after the feaſt is finiſhed, what is left is hid by two perſons deputed for that purpoſe; but on the next Sunday they re-aſſemble and finiſh the reliques of the firſt entertainment.

BELTURBET, a town of Ireland in the county of Cavan and province of Ulſter, ſituated on the river Earn, in W. long. 7. 35. N. lat. 54. 7.

BELTZ, or Belzo, a province of Red Ruſſia in Poland, bounded by Leopold on the ſouth, by Chelm on the north, Little Poland on the eaſt, and Volhynia on the weſt. Its capital town is Beltz.

Beltz, or *Belzo*, a town of Poland, and capital of the province of the ſame name, ſeated on the confines of Upper Volhynia, among marſhes, in E. long. 25. 15. N. lat. 50. 5.

BELVEDERE, in the Italian architecture, &c. denotes either a pavilion on the top of a building, or an artificial eminence in a garden; the word literally ſignifying a *fine proſpect* or *view*.

Belvedere, a conſiderable town of Greece, and capital of a province of the ſame name in the Morea. The province lies on the weſtern coaſt: it is the moſt fertile and rich in all the Morea; and from it the raiſins called *Belvederes* take their name. The town is ſituated in E. long. 22. 0. N. lat. 38. 5.

BELVIDERE, in botany. See Chenopodium.

BEMA, in antiquity, denotes a ſtep or pace. The bema made a kind of itinerary meaſure among the Greeks, the length of which was equivalent to one cubit and two thirds, or to ten palms. Whence alſo the term *bematizein*, βηματιζειν, to *meaſure* a road.

Bema, in eccleſiaſtical writers, denotes the altar or ſanctuary in the ancient churches. In which ſenſe *bema* made the third or innermoſt part of the church, anſwering to the chancel among us.

Bema was alſo uſed for the biſhop's chair, ſeat, or throne, placed in the ſanctuary. It was called *bema* from the ſteps by which it was to be aſcended.

Bema alſo ſignified the reader's deſk. This in the Greek church was denominated βημα γνοσων, in the Latin church *ambo*.

Bema is more peculiarly uſed for the Manichees altar, which was in a different place from that of the Catholics.

Bema was alſo a denomination given by this ſect to the anniverſary of the day when Manes was killed, which with them was a ſolemn feaſt and day of rejoicing. One of the chief ceremonies of the feaſt conſiſted in ſetting out and adorning their bema or altar with great magnificence and pomp.

BEMBEA, a province of the kingdom of Angola in Africa. It is divided into Higher and Lower; and extends on one fide along the fea, and on the other divides Angola from the foreign ftates on the fouth. The country is large, populous, and abounding with cattle; with the fat of which the inhabitants anoint their heads and bodies, and clothe themfelves with their hides coarfely dreffed. They are addicted to the fame idolatrous fuperftitions with the reft of the natives, but fpeak a quite different language. The province is watered by a river called *Lutano*, or *San Francifco*, which abounds with crocodiles, fea-horfes, and monftrous ferpents, that are very dangerous to travellers.

BEMBO (Peter), a noble Venetian, fecretary to Leo X. and afterwards cardinal, was one of the beft writers of the 16th century. He was a good poet both in Italian and Latin; but he is juftly cenfured for the loofenefs and immodefty of fome of his poems. He publifhed, befides thefe, A Hiftory of Venice; Letters; and a book in praife of the Duke and Ducheſs of Urbino. He died in 1547, in the 72d year of his age.

BEMSTER, or Bemister, a town of Dorfetfhire in England, feated on the river Bert, in W. long. 3. 15. N. lat. 50. 45.

BEN, in pharmacy, the name of an exotic purgative fruit, of the fize and figure of a nut; whence it is alfo called the *ben-nut*, fometimes *balanus myrepfica*, or *glans unguentaria*. Naturalifts diftinguifh two kinds of bens; viz. the great, *ben magnum*, which refembles the filbert, and is by fome called *avellana purgatrix*, brought from America; and the fmall, *ben parvum*, brought from Ethiopia. Ben-nuts yield, by expreffion, much oil, which, from its property of not becoming rancid, at leaft for years, is ufed as a menftruum for the extraction of the odoriferous part of the flowers of jeffamin, violets, rofes, hyacinths, lilies of the valley, tuberofes, jonquils, clove julyflowers, and others, which, like thefe, yield little or no effential oil by diftillation, but impart their fragrance to expreffed oils. The method of impregnating oil of ben with the odour of flowers is this: Some fine carded cotton is dipped in the oil, and put in the bottom of a proper veffel. On this is fpread a thick layer of frefh flowers, above which more cotton dipt in oil is placed; and thus alternately flowers and cotton are difpofed, till the veffel (which may be made of tin, with a cover to be fcrewed on to it, or of porcelain) is full. By digeftion during 24 hours in a water-bath, the oil will receive the odour of the flowers.

BENARES. See Banares.

BENAVARRI, a town of the kingdom of Arragon in Spain, feated on the frontiers of Catalonia. E. long. 0. 40. N. lat. 41. 55.

BENAVENTO, a town of Spain, in the kingdom of Leon, and Terra di Campos, with the title of a duchy. It is feated on the river Ela, in W. long. 5. 0. N. lat. 42. 4.

BENAVIDUS, or Bonavitus (Marcus Mantua), a celebrated civilian, taught civil law with reputation, during 60 years, at Padua the place of his birth; and died in 1582, aged 93. His principal works are, 1. *Collectanea fuper Jus Cæfareum*. 2. *Conſiliorum*, tom. ii. 3. *Problematum legalium*. 4. *De illuſtribus Juriſconſultis*, &c.

BENCH, or Banc, in law. See Banc.

Free-Bench fignifies that eftate in copyhold-lands which the wife, being eſpoufed a virgin, has, after the deceafe of her hufband, for her dower, according to the cuftom of the manor. As to this free-bench, feveral manors have feveral cuftoms; and in the manors of Eaft and Weft Enbourne, in the county of Berks, and other parts of England, there is a cuftom, that when a copyhold tenant dies, the widow fhall have her free-bench in all the deceafed hufband's lands, whilft fhe lives fingle and chafte: but if fhe commits incontinency, fhe fhall forfeit her eftate: nevertheleſs, upon her coming into the court of the manor, riding on a black ram, and having his tail in her hand, and at the fame time repeating a form of words preſcribed, the ſteward is obliged, by the cuſtom of the manor, to re-admit her to her free-bench.

King's Bench, a court in which the king was formerly accuſtomed to ſit in perſon, and on that account was moved with the king's houſehold. This was originally the only court in Weſtminſter-hall, and from this it is thought that the courts of common pleas and exchequer were derived. As the king in perſon is ſtill preſumed in law to ſit in this court, though only repreſented by his judges, it is ſaid to have ſupreme authority; and the proceedings in it are ſuppoſed to be *coram nobis*, that is, before the king. This court conſiſts of a lord chief juſtice and three other juſticees or judges, who are inveſted with a ſovereign juriſdiction over all matters whether of a criminal or public nature. The chief juſtice has a ſalary of 5,500l. a year, and the other judges 2,400l. each.

All crimes againſt the public good, though they do not injure any particular perſon, are under the cognizance of this court; and no private ſubject can ſuffer any unlawful violence or injury againſt his perſon, liberty, or poſſeſſions, but a proper remedy is afforded him here; not only for ſatisfaction of damages ſuſtained, but for the puniſhment of the offender; and wherever this court meets with an offence contrary to the firſt principles of juſtice, it may puniſh it. It frequently proceeds on indictments found before other courts, and removed by *certiorari* into this. Perſons illegally committed to priſon, though by the king and council, or either of the houſes of parliament, may be bailed in it; and in ſome caſes even upon legal commitments. Writs of mandamus are iſſued by this court, for the reſtoring of officers in corporations, &c. unjuſtly turned out, and freemen wrongfully diſfranchiſed.

The court of King's bench is now divided into a crown ſide and plea ſide; the one determining criminal, and the other civil cauſes.—On the crown ſide, or crown office, it takes cognizance of all criminal cauſes, from high treaſon down to the moſt trivial miſdemeanour or breach of the peace. Into this court alſo indictments from all inferior courts may be removed by writ of *certiorari*; and tried either at bar, or at *niſi prius*, by a jury of the county out of which the indictment is brought. The judges of this court are the ſupreme coroners of the kingdom. And the court itſelf is the principal court of criminal juriſdiction known to the laws of England. For which reaſon, by the coming of the court of King's Bench into any county (as it was removed to Oxford on account of the ſickneſs in 1665), all former commiſſions of *oyer* and *terminer*, and a general gaol-delivery, are at once abſorbed and determined *ipſo facto*; in the ſame manner as by the old Gothic and Saxon conſtitutions, *Jure vetuſto obtinuit, quieviſſe omnia inferiora judicia, dicente jus rege*. Into this court of King's Bench has reverted all that was good and ſalutary of the *Star-chamber*.

On the plea ſide, this court determines all perſonal actions commenced by bill or writ; as actions of debt, upon the caſe, detinue, trover, ejectment, treſpaſs, waſte, &c. againſt any perſon in the cuſtody of the marſhal of the court, as every perſon ſued here is ſuppoſed to be by law.

The officers on the crown ſide are the clerk and ſecondary of the crown; and on the ſide of the pleas there are two chief clerks or prothonotaries, and their ſecondary and deputy, the cuſtos brevium, two clerks of the papers, the clerk of the declarations, the ſigner and ſealer of bills, the clerk of the rules, clerk of the errors, and clerk of the bails; to which may be added the filazers, the marſhal of the court, and the crier.

Amicable Bench. See Amicable *Benches*.

BENCHERS, in the inns of court, the ſenior members of the ſociety, who are inveſted with the government of the whole.

BENCOOLEN, a fort and town of Aſia, on the ſouth-weſt coaſt of the iſland of Sumatra, belonging to the Britiſh. The place is known at ſea by a ſlender mountain called the *Sugar Loaf*, which riſes about 20 miles inland. About a quarter of a mile from the ſea ſtands an Indian village, whoſe houſes are ſmall and low, and built on poſts. The country about Bencoolen is mountainous and woody, and the air unwholeſome, the mountains being continually covered with thick heavy clouds that produce lightning, thunder, and rain. There is no beef to be had, except that of buffaloes, which is not very palatable; and indeed proviſions of all kinds, except fruit, are pretty ſcarce. The chief trade is in pepper, of which great quantities grow on the iſland. There are frequent bickerings betwixt the natives and the factory, to the no ſmall injury of the Eaſt-India Company. The factory was once entirely deſerted; and had not the natives found that trade decreaſed by reaſon of their abſence, it is ſcarcely probable that ever the Engliſh would have been invited thither again. E. long. 101. 5. S. lat. 4. 5.

BEND, in heraldry, one of the nine honourable ordinaries, containing a third part of the field when charged, and a fifth when plain. It is ſometimes, like other ordinaries, indented, ingrailed, &c. and is either dexter or ſiniſter. See HERALDRY.

In BEND, is when any things, borne in arms, are placed obliquely from the upper corner to the oppoſite lower, as the bend lies.

BENDER, a town of Beſſarabia in European Turkey, ſeated on the river Nieſter, in E. long. 29. 5. N. lat. 46. 40. It is remarkable for being the place of retreat of Charles XII. after he was defeated by the Ruſſians at the battle of Pultowa in 1709.

BENDERMASSEN, a town of the iſland of Borneo in Aſia, and capital of a kingdom of the ſame name. It has a good harbour; and ſtands in E. long. 113. 50. S. lat. 2. 40.

BENDIDA, in antiquity, a feſtival, not unlike the Bacchanalia, celebrated by the Athenians in honour of Diana.

BENDING, in a general ſenſe, the reducing a ſtraight body into a curve, or giving it a crooked form. The bending of timber-boards, &c. is effected by means of heat, whereby their fibres are ſo relaxed that you may bend them into any ſhape that may be required.

BENDING, in the ſea-language, the tying two ropes or cables together: thus they ſay, *bend the cable*, that is, make it faſt to the ring of the anchor; *bend the ſail*, make it faſt to the yard.

BENDS, in a ſhip, the ſame with what are called *wails* or *wales*; the outmoſt timbers of a ſhip's ſide, on which the men ſet their feet in climbing up. They are reckoned from the water, and are called the *firſt*, *ſecond*, or *third bend*. They are the chief ſtrength of a ſhip's ſides; and have the beams, knees, and foot-hooks, bolted to them.

BENDY, in heraldry, is the field divided into four, ſix, or more parts, diagonally, and varying in metal and colour.—The general cuſtom of England is to make an even number; but in other countries they regard it not, whether even or odd.

BENCAPED, among ſailors. A ſhip is ſaid to be *bencaped* when the water does not flow high enough to bring her off the ground, out of the dock, or over the bar.

BENEDETTO (St.), a conſiderable town of the Mantuan, in Italy, in E. long. 11. 25. N. lat. 45. 0.

BENEDICITE, among eccleſiaſtical writers, an appellation given to the ſong of the three children in the fiery furnace, on account of its beginning with the word *benedicite*.—The uſe of this ſong in Chriſtian worſhip is very ancient, it appearing to have been ſung in all the churches as early as the days of St. Chryſoſtom.

BENEDICT XIV. Pope (Proſper Lambertini of Bologna), celebrated for his learning and moderation, which gained him the eſteem of all ſenſible Proteſtants. He was the patron of learned men and celebrated artiſts, and an elaborate writer on theological ſubjects. His works make 12 vols. in folio. He died in 1758.

BENEDICT (St.), the founder of the order of the Benedictin monks, was born in Italy, about the year 480. He was ſent to Rome when he was very young, and there received the firſt part of his education. At 14 years of age he was removed from thence to Sublaco, about 40 miles diſtant. Here he lived a moſt aſcetic life, and ſhut himſelf up in a cavern, where nobody knew any thing of him except St. Romanus, who, we are told, uſed to deſcend to him by a rope, and to ſupply him with proviſions. But being afterwards diſcovered by the monks of a neighbouring monaſtery, they choſe him for their abbot. Their manners, however, not agreeing with thoſe of Benedict, he returned to his ſolitude; whither many perſons followed him, and put themſelves under his direction, ſo that in a ſhort time he built 12 monaſteries. In the year 528, or the following, he retired to mount Caſſino, where idolatry was ſtill prevalent, a temple of Apollo having been erected there. He inſtructed the people in the adjacent country; and having converted them, he broke the image of Apollo, and built two chapels on the mountain. Here he founded alſo a monaſtery, and inſtituted the order of his name, which in time became ſo famous and extended over all Europe. It was here too that he compoſed his *Regula Monachorum*, which Gregory the Great ſpeaks of as the moſt ſenſible and beſt written piece of that kind ever publiſhed. The time of his death is uncertain, but is placed between 540 and 550. He was looked upon as the Eliſha of his time; and is reported to have wrought a great number of miracles, which are recorded in the ſecond book of the dialogues of St. Gregory the Great.

BENEDICT, abbot of Peterborough, was educated at Oxford, became a monk of the monaſtery of Chriſt's church in Canterbury, and ſome time after was choſen prior by the members of that ſociety. Though he had been a great admirer of Archbiſhop Becket, and wrote a life of that prelate, he was ſo much eſteemed by Henry II. that by the influence of that prince he was elected abbot of Peterborough, A. D. 1177. He aſſiſted at the coronation of Richard I. A. D. 1189; and was advanced to be keeper of the great ſeal, A. D. 1191. But he did not long enjoy this high dignity, as he died on Michaelmas-day, A. D. 1193. Beſides his Life of Archbiſhop Becket, he compoſed a Hiſtory of Henry II. and Rich. I. from A. D. 1170 to A. D. 1192; which has been much and juſtly eſteemed by many of our greateſt antiquaries, as containing one of the beſt accounts of the tranſactions of thoſe times. A beautiful edition of this work was publiſhed at Oxford, in two volumes, by Mr. Hearne, A. D. 1735.

BENEDICTINS, in church-hiſtory, an order of monks, who profeſs to follow the rules of St. Benedict. The Benedictins, being thoſe only that are properly called *monks*, wear a looſe black gown, with large wide ſleeves, and a capuche, or cowl, on their heads, ending in a point behind. In the canon law they are ſtyled *black friars*, from the colour of their habit being black.

The rules of St. Benedict, as obſerved by the Engliſh monks before the diſſolution of the monaſteries, were as follow: They were obliged to perform their devotions ſeven times in 24 hours, the whole circle of which devotions had a reſpect to the paſſion and death of Chriſt: they were obliged always to go two and two together: every day in Lent they were obliged to faſt till ſix in the evening, and abated of their uſual time of ſleep-

ing and eating; but they were not allowed to practiſe any voluntary auſterity without leave of their ſuperior: they never converſed in their refectory at meals, but were obliged to attend to the reading of the ſcriptures: they all ſlept in the ſame dormitory, but not two in a bed; they lay in their clothes: for ſmall faults they were ſhut out from meals; for greater, they were debarred religious commerce, and excluded from the chapel; and as to incorrigible offenders, they were excluded from their monaſteries. Every monk had two coats, two cowls, a table-book, a knife, a needle, and handkerchief; and the furniture of his bed was a mat, a blanket, a rug, and a pillow.

The time when this order came into England is well known; for to it the Engliſh owe their converſion from idolatry. In the year 596, Pope Gregory ſent hither Auguſtin, prior of the monaſtery of St. Andrew at Rome, with ſeveral other Benedictin monks. St. Auguſtin became archbiſhop of Canterbury; and the Benedictins founded ſeveral monaſteries in England, as alſo in the metropolitan church of Canterbury, and all the cathedrals that were afterwards built.

Pope John XXII. who died in 1334, after an exact inquiry, found, that, ſince the firſt riſe of the order, there had been of it 24 popes, near 200 cardinals, 7000 archbiſhops, 15,000 biſhops, 15,000 abbots of renown, above 4000 ſaints, and upwards of 37,000 monaſteries. There have been likewiſe of this order 20 emperors and 10 empreſſes, 47 kings and above 50 queens, 20 ſons of emperors and 48 ſons of kings; about 100 princeſſes, daughters of kings and emperors; beſides dukes, marquiſſes, earls, counteſſes, &c. innumerable. The order has produced a vaſt number of eminent writers and other learned men. Their Rabanus ſet up the ſchool of Germany. Their Alcuinus founded the univerſity of Paris. Their Dionyſius Exiguus perfected the eccleſiaſtical computation. Their Guido invented the ſcale of muſic, and their Sylveſter the organ. They boaſt to have produced Anſelmus, Ildephonſus, Venerable Bede, &c.

There are nuns likewiſe who follow the rule of St. Benedict; among whom thoſe who call themſelves *mitigated*, eat fleſh three times a-week, on Sundays, Tueſdays, and Thurſdays: the others obſerve the rule of St. Benedict in its rigour, and eat no fleſh unleſs they are out of health.

BENEDICTION, in a general ſenſe, the act of bleſſing, or giving praiſe to God, or returning thanks for his favours. Hence alſo benediction is ſtill applied to the act of ſaying grace before or after meals. Neither the ancient Jews nor Chriſtians ever ate without a ſhort prayer. The Jews are obliged to rehearſe 100 benedictions *per* day; of which 80 are to be ſpoken in the morning. The firſt treatiſe of the firſt order in the Talmud, intitled *Seraim*, contains the form and order of the daily benedictions. It was uſual to give benediction to travellers on their taking leave; a practice which is ſtill preſerved among the monks. Benedictions were likewiſe given among the ancient Jews, as well as Chriſtians, by impoſition of hands. And when at length the primitive ſimplicity of the Chriſtian worſhip began to give way to ceremony, they added the ſign of the croſs, which was made with the ſame hand as before, only elevated, or extended. Hence benediction, in the modern Romiſh church, is uſed, in a more particular manner, to denote the ſign of the croſs made by a biſhop, or prelate, as conferring ſome grace on the people. The cuſtom of receiving benediction, by bowing the head before the biſhops, is very ancient; and was ſo univerſal, that emperors themſelves did not decline this mark of ſubmiſſion. Under the name *benediction*, the Hebrews alſo frequently underſtand the preſents which friends make to one another, in all probability becauſe they are generally attended with bleſſings and compliments, both from thoſe who give and thoſe who receive them.

Nuptial BENEDICTION, the external ceremony performed by the prieſt in the office of matrimony. This is alſo called *ſacerdotal* and *matrimonial benediction*, by the Greeks ἱερολογια and ἱεροτελεστια. The nuptial benediction is not eſſential to, but the confirmation of, a marriage in the civil law.

Beatic BENEDICTION, *benedictio beatica*, is the viaticum given to dying perſons. The Pope begins all his bulls with this form: *Salutem et apoſtolicam benedictionem.*

BENEDICTION is alſo uſed for an eccleſiaſtical ceremony, whereby a thing is rendered ſacred or venerable. In this ſenſe benediction differs from conſecration, as in the latter unction is applied, which is not in the former. Thus the chalice is conſecrated, and the pix bleſſed; as the former, not the latter, is anointed: though, in the common uſage, theſe two words are applied promiſcuouſly.—The ſpirit of piety, or rather of ſuperſtition, has introduced into the Romiſh church benediction for almoſt every thing. We read of forms of benedictions for wax-candles, for boughs, for aſhes, for church-veſſels, and ornaments; for flags or enſigns, arms, firſt-fruits, houſes, ſhips, paſchal eggs, cilicium or the hair-cloth of penitents, church-yards, &c. In general, theſe benedictions are performed by aſperſions of holy water, ſigns of the croſs, and prayers ſuitable to the nature of the ceremony. The forms of theſe benedictions are found in the Roman pontifical, in the Roman miſſal, in the book of eccleſiaſtical ceremonies printed in Pope Leo X.'s time, and in the rituals and ceremonies of the different churches which are found collected in father Martene's work on the rites and diſcipline of the church.

BENEFICE (*beneficium*), in middle-age writers, is uſed for a fee, ſometimes denominated more peculiarly *beneficium militare*. In this ſenſe, benefice was an eſtate in land, at firſt granted for life only; ſo called, becauſe it was held *ex mero beneficio* of the donor; and the tenants were bound to ſwear fealty to the lord, and to ſerve him in the wars. In after-times, as theſe tenures became perpetual and hereditary, they left their name of *beneficia* to the livings of the clergy; and retained to themſelves the name of *feuds*.

BENEFICE, in an eccleſiaſtical ſenſe, a church endowed with a revenue for the performance of divine ſervice; or the revenue itſelf aſſigned to an eccleſiaſtical perſon, by way of ſtipend, for the ſervice he is to do that church. All church-preferments, except biſhoprics, are called *benefices*; and all benefices are, by the canoniſts, ſometimes ſtyled *dignities*: but we now ordinarily diſtinguiſh between benefice and dignity; applying dignity to biſhoprics, deaneries, archdeaconries, and prebendaries; and benefice to parſonages, vicarages, and donatives. Benefices are divided by the canoniſts into ſimple and ſacerdotal. In the firſt there is no obligation but to read prayers, ſing, &c. ſuch are canonries, chaplainſhips, chantries, &c. The ſecond are charged with the cure of ſouls, or the direction and guidance of conſciences; ſuch as vicarages, rectories, &c.

The members of the Romiſh church again diſtinguiſh benefices into regular and ſecular. *Regular* or titular benefices are thoſe held by a religious, or a regular, who has made profeſſion of ſome religious order; ſuch are abbeys, priories, conventuals, &c. or rather, a regular benefice is that which cannot be conferred on any but a religious, either by its foundation, by the inſtitution of ſome ſuperior, or by preſcription: for preſcription, forty years poſſeſſion by a religious makes the benefice regular. *Secular* benefices are only ſuch as are to be given to ſecular prieſts, *i. e.* to ſuch as live in the world, and are not engaged in any monaſtic order. All benefices are reputed ſecular, till the contrary is made to appear. They are called *ſecular benefices*, becauſe held by ſeculars; of which kind are almoſt all cures.

Three modes of vacating a benefice, are deſcribed by the canoniſts, viz. 1. *De jure*, when the perſon enjoying it is

guilty of certain crimes expreſſed in thoſe laws, as hereſy, ſimony, &c. 2. *De facto*, as well as *de jure*, by the natural death or the reſignation of the incumbent; which reſignation may be either expreſs, or tacit, as when he engages in a ſtate, &c. inconſiſtent with it, as, among the Romaniſts, by marrying, entering into a religious order, or the like. 3. By the *ſentence of a judge*, by way of puniſhment for certain crimes, as perjury, concubinage, &c.

Benefices began about 500. The following account of thoſe in England is given as the fact by Dr. Burn, viz. that there are 1071 livings not exceeding 10l. *per annum*; 1467 livings above 10l. and not exceeding 20l. *per annum*; 1126 livings above 20l. and not exceeding 30l. *per annum*; 1049 livings above 30l. and not exceeding 40l. *per annum*; 884 livings above 40l. and not exceeding 50l *per annum*;—5597 livings under 50l. *per annum*. It muſt be 500 years before every living can be raiſed to 60l. a-year by Queen Anne's bounty, and 339 years before any of them can exceed 50l. a-year. On the whole, there are above 11,000 church preferments in England, excluſive of biſhoprics, deaneries, canonries, prebendaries, prieſt-vicars, lay vicars, ſecondaries, &c. belonging to cathedrals, or choriſters, or even curates to well beneficed clergymen.

Benefice *in commendam* is that, the direction and management of which, upon a vacancy, is given or recommended to an eccleſiaſtic, for a certain time, till he may be conveniently provided for.

BENEFICIARII, in Roman antiquity, denote ſoldiers who attended the chief officers of the army, being exempted from other duty. Beneficiarii were alſo ſoldiers diſcharged from the military ſervice or duty, and provided with *beneficia* to ſubſiſt on. Theſe were probably the ſame with the former, and both might be compriſed in the ſame definition. They were old experienced ſoldiers, who, having ſerved out their legal time, or received a diſcharge as a particular mark of honour, were invited again to the ſervice, where they were held in great eſteem, exempted from all military drudgery, and appointed to guard the ſtandard, &c. Theſe, when thus recalled to ſervice, were alſo denominated *evocati*; before their recal, *emeriti*.

Beneficiarii was alſo uſed for thoſe raiſed to a higher rank by the favour of the tribunes or other magiſtrates. The word *beneficiarius* frequently occurs in the Roman inſcriptions found in Britain, where *conſulis* is always joined with it; but beſides *beneficiarius conſulis*, we find in Grutar *beneficiarius tribuni*, *prætorii*, *legati*, *præfecti*, *proconſulis*, &c.

BENEFICIARY, in general ſomething that relates to benefices. Beneficiary, *beneficiarius*, is more particularly uſed for a beneficed perſon, or him who receives and enjoys one or more benefices. A beneficiary is not the proprietor of the revenues of his church; he has only the adminiſtration of them, though unaccountable for the ſame to any but the Deity.

Beneficiary is alſo uſed, in middle-age writers, for a feudatory or vaſſal. The denomination was alſo given to the clerks or officers who kept the accounts of the *beneficia*, and made the neceſſary writings.

BENEFICIUM, in military matters among the Romans, denoted a promotion to a higher rank by the favour of ſome perſon in authority.

BENEFIT of Clergy. See Clergy.

BENESOEUF, a town of Egypt, ſeated on the weſtern ſhore of the Nile, and remarkable for its hemp and flax. E. long. 31. 0. N. lat. 29. 10.

BENEVENTE, a town of the province of Leon in Spain, ſeated on the river Eſla, in W. long. 5. 5. N. lat. 42. 4.

BENEVENTO, a city of Italy, in the kingdom of Naples, with an archbiſhop's ſee. It is ſituated near the confluence of the rivers Sabato and Calore, in a fertile valley called the *Strait of Benevento*, full of gentlemen's ſeats and houſes of pleaſure. This town has frequently ſuffered terribly by earthquakes; particularly in 1703, when a great part of it was overturned, and the reſt much damaged. E. long. 14. 57. N. lat. 41. 6.

The arch of Trajan, now called the Porta Aurea, forms one of the entrances to the city. This arch, though it appears to great diſadvantage from the walls and houſes that hem it in on both ſides, is in tolerable preſervation, and one of the moſt magnificent remains of Roman grandeur to be met with out of Rome. The architecture and ſculpture are both ſingularly beautiful. This elegant monument was erected in the year of Chriſt 114, about the commencement of the Parthian war, and after the ſubmiſſion of Decebalus had intitled Trajan to the ſurname of Dacicus. The order is compoſite; the materials, white marble; the height, 60 palms; length, 37 and a half; and depth 24. It conſiſts of a ſingle arch, the ſpan of which is 20 palms, the height 35. On each ſide of it, two fluted columns, upon a joint pedeſtal, ſupport an entablement and an attic. The intercolumniations and frize are covered with baſſo relievos, repreſenting the battles and triumph of the Dacian war. In the attic is the inſcription. As the ſixth year of Trajan's conſulate, marked on this arch, is alſo to be ſeen on all the milliary columns he erected along his new road to Brunduſium, it is probable that the arch was built to commemorate ſo beneficial an undertaking. Except the old metropolis of the world, no city in Italy can boaſt of ſo many remains of ancient ſculpture as are to be found in Benevento. Scarce a wall is built of any thing but altars, tombs, columns, and remains of entablatures that have been diſcovered.

The cathedral church is a clumſy edifice, in a ſtyle of Gothic, or rather Lombard, architecture. This church, dedicated to the Virgin Mary, was built in the ſixth century, enlarged in the 11th, and altered conſiderably in the 13th, when archbiſhop Roger adorned it with a new front. To obtain a ſufficient quantity of marble for this purpoſe, he ſpared neither ſarcophagus, altar, nor inſcription; but fixed them promiſcuouſly and irregularly in the walls of his barbarous ſtructure. Three doors (a type of the Trinity, according to the rules eſtabliſhed by the myſtical Vitruvii of thoſe ages) open into this façade. That in the centre is of bronze, emboſſed with the life of Chriſt, and the effigies of the Beneventine Metropolitan, with all his ſuffragan biſhops. The inſide offers nothing to the curious obſerver but columns, altars, and other decorations, executed in the moſt inelegant ſtyle that any of the church-building barbarians ever adopted. In the court ſtands a ſmall Egyptian obeliſk, of red granite, crowded with hieroglyphics. In the adjoining ſquare, are a fountain and a very indifferent ſtatue of Benedict the 13th, long archbiſhop of Benevento.

The following abſtract of the Beneventine hiſtory is given by Mr. Swinburn, in his *Travels in Sicily*. According to ſome authors (he informs us), Diomed was the founder of Beneventum; whence its origin muſt be referred to the "years that immediately ſucceeded the Trojan war. Other writers aſſign it to the Samnites, who made it one of their principal towns, where they frequently took refuge when worſted by the Romans. In their time, its name was *Maleventum*, a word of uncertain etymology: however, it ſounded ſo ill in the Latin tongue, that the ſuperſtitious Romans, after achieving the conqueſt of Samnium, changed it into Beneventum, in order to introduce their colony under fortunate auſpices. Near this place, in the 479th year of Rome, Pyrrhus was defeated by Curius Dentatus. In the war againſt Hannibal, Beneventum ſignalized its attachment to Rome, by liberal tenders of ſuccour and real ſervices. Its reception of Gracchus, after his defeat of Hanno, is extolled by Livy; and, from the grati

tude of the ſenate, many ſolid advantages accrued to the Beneventines. As they long partook, in a diſtinguiſhed manner, of the glories and proſperity of the Roman empires, they alſo ſeverely felt the effects of its decline, and ſhared in a large proportion the horrors of devaſtation that attended the irruption of the northern nations.

"The modern hiſtory of this city will appear intereſting to thoſe readers who do not deſpiſe the events of ages which we uſually and juſtly call dark and barbarous. They certainly are of importance to all the preſent ſtates of Europe; for at that period originated the political exiſtence of moſt of them. Had no northern ſavages deſcended from their ſnowy mountains, to overturn the Roman coloſſus, and break aſunder the fetters of mankind, few of thoſe powers, which now make ſo formidable a figure, would ever have been ſo much as heard of. The avengers of the general wrongs were, no doubt, the deſtroyers of arts and literature, and brought on the thick clouds of ignorance, which for many centuries no gleam of light could penetrate; but it is to be remembered, alſo, that the Romans themſelves had already made great progreſs in baniſhing true taſte and knowledge, and would very ſoon have been a barbarous nation, though neither Goths nor Vandals had ever approached the frontier.

"The Lombards came the laſt of the Scythian or Scandinavian hordes, to invade Italy. After fixing the ſeat of their empire at Pavia, they ſent a detachment to poſſeſs itſelf of the ſouthern provinces. In 571, Zotto was appointed duke of Benevento, as a feudatory of the king of Lombardy; and ſeems to have confined his rule to the city alone, from which he ſallied forth to ſeek for booty. The ſecond duke, whoſe name was Arechis, conquered almoſt the whole country that now conſtitutes the kingdom of Naples. His ſucceſſors appear long to have remained ſatisfied with the extent of dominion he had tranſmitted to them. Grimwald, one of them, uſurped the crown of Lombardy; but his ſon Romwald, though a very ſucceſsful warrior, contented himſelf with the ducal title. The fall of Deſiderius, laſt king of the Lombards, did not affect the ſtate of Benevento. By an effort of policy or reſolution, Arechis the ſecond kept poſſeſſion; and availing himſelf of the favourable conjuncture, aſſerted his independence,—threw off all feudal ſubmiſſion,—aſſumed the ſtyle of Prince,—and coined money with his own image upon it; a prerogative exerciſed by none of his predeceſſors as dukes of Benevento. During four reigns, this ſtate maintained itſelf on a reſpectable footing; and might long have continued ſo, had not civil war, added to very powerful aſſaults from abroad, haſtened its ruin. Radelchis and Siconulph aſpired to the principality; and each of them invited the Saracens to his aid. The deſolation cauſed by this conflict is ſcarcely to be deſcribed. No better method for terminating theſe fatal diſſenſions could be deviſed, than dividing the dominions into two diſtinct ſovereignties. In 851, Radelchis reigned as Prince at Benevento; and his adverſary fixed his court, with the ſame title, at Salerno. From this treaty of partition, the ruin of the Lombards became inevitable: a want of union undermined their ſtrength,—foreigners gained an aſcendant over them,—irreſolution and weakneſs pervaded their whole ſyſtem of government. The erection of Capua into a third principality, was another deſtructive operation: and now the inroads of the Saracens,—the attacks of the eaſtern and weſtern emperors,—anarchy and animoſity at home—reduced the Lombard ſtates to ſuch wretchedneſs, that they were able to make a very feeble reſiſtance to the Norman arms. The city of Benevento alone eſcaped their ſway, by a grant which the emperor Henry II. had made of it to the biſhop of Rome, in exchange for the territory of Bamberg in Germany, where the Popes enjoyed a kind of ſovereignty. From the year 1054 to this day, the Roman See, with ſome ſhort interruptions of poſſeſſion, has exerciſed temporal dominion over this city. Benevento has given three popes to the chair of St. Peter; *viz.* Felix III. Victor III. and Gregory VIII. and what it is much prouder of, reckons St. Januarius in the liſt of its Biſhops."

BENEVOLENCE, in morals, ſignifies the love of mankind in general, accompanied with a deſire to promote their happineſs. See MORALS.

BENFELD, a town of France, in the department of the Lower Rhine, and late province of Alſace, whoſe fortifications were demoliſhed in conſequence of the treaty of Weſtphalia. It is ſeated on the river Ill, twelve miles ſouth-weſt of Straſburg. E. long. 7. 45. N. lat. 48. 14.

BENGAL, a country of Indoſtan in Aſia, bounded on the eaſt by the kingdoms of Aſſem, Tipra, and Arracan; on the weſt, by Malva and Berar; on the north, by Gehud, Rotas, Benares, and Jeſuat; and on the ſouth, by Orixa and the bay of Bengal. Its greateſt length from weſt to eaſt is about 720 miles, and its breadth from ſouth to north, where greateſt, is not leſs than 300; though in ſome places not above 150; extending from 21 to 25 degrees of north latitude, and from 80 to 91 of eaſt longitude.

As this country lies almoſt entirely within the torrid zone, and in the middle of a very extenſive continent, it is ſometimes ſubject to ſuch extremes of heat as render it very fatal to European conſtitutions. Dr Lind is of opinion, that the climate of Bengal is the moſt dangerous in this reſpect of any of the Engliſh territories excepting Bencoolen on the coaſt of Sumatra. Part of this unhealthineſs ariſes from the mere circumſtance of heat; for in all the ſouthern parts of India, when the wind blows over land, it is ſo extremely hot and ſuffocating as ſcarcely to be borne. The reaſon of this is evident from the mere inſpection of a map of Aſia, where it is evident that whatever wind blows over land, eſpecially in the ſouthern parts, muſt paſs over an immenſe tract of country ſtrongly heated by the ſun; and as in every part of this extenſive continent there are ſandy deſerts of very conſiderable magnitude, the heat is thus prodigiouſly increaſed. This becomes very evident on the falling of a ſhower of rain at the time the land-wind prevails; for if the wind in its way paſſes through the ſhower, the air is agreeably cooled though the ſky ſhould be ever ſo clear; while thoſe who reſide only at a few miles diſtance, but out of the direct line of the ſhower, will be fainting under the exceſſive heat. Here indeed, when the air is clear, the ſun-beams are much more powerful than in our climate, inſomuch that the light at noon-day is too powerful for the eyes to bear; and the large ſtars, as Venus and Jupiter, ſhine with a ſurpriſing luſtre. Thus the reflection of the ſun-beams from the earth muſt neceſſarily occaſion an extraordinary degree of heat in the atmoſphere; ſo that from the winds above-mentioned very great inconveniences ſometimes ariſe, ſimilar to thoſe which are occaſioned by the *Harmattan* in Africa. Mr. Ives tells us, that it is affirmed they will ſnap glaſs if it be too much expoſed to them; he has ſeen the veneering ſtripped off from a cheſt of drawers by their means; and they will certainly crack and chap almoſt every piece of wood that is not well ſeaſoned. In certain places they are ſo loaded with ſand, that the horizon appears quite hazy where they blow, and it is almoſt impoſſible to prevent the eyes from being thus greatly injured. They have likewiſe a very pernicious effect on ſuch people as are expoſed to them while ſleeping. This ſeldom fails to bring on a fit of the *barbiers*, a kind of paralytic diſtemper attended with a total deprivation of the uſe of the limbs, and which the patient never gets the better of but by removing to ſome other climate. Theſe hot winds are made uſe of with great ſucceſs for cooling liquors, by wrapping a wet cloth round the bottles and expoſing it to the air. The

reaſon of this is the very quick evaporation which takes place, and which, in every ſimilar inſtance, produces a great degree of cold.

The unhealthineſs of Bengal, however, is more particularly to be attributed to the inundations of the Ganges and Burrampooter, by which ſuch quantities of putreſcible matters are brought down as infect the air with the moſt malignant vapours when the waters retire. Though the rainy ſeaſon begins in Bengal only in the month of June, the river begins to ſwell in the mountains of Thibet early in April, and by the latter end of that month in Bengal alſo. The reaſon of this is partly the melting of the ſnow on the mountains of Thibet, and partly the vaſt collection of vapours brought by the ſoutherly or ſouth-weſt monſoon, which are ſuddenly ſtopped by the high mountains of Thibet. Hence it is obvious, that the accumulation and condenſation of theſe vapours muſt firſt take place in the neighbourhood of the mountains which oppoſe them; and thus the rainy ſeaſon commences ſooneſt in thoſe places which lie neareſt the mountains.

In Bengal the waters riſe at firſt very ſlowly, increaſing only at the rate of one inch a day for the firſt fortnight. It then gradually augments to two and three inches before any quantity of rain falls in the low countries; and when the rain becomes general, the increaſe at a medium is five inches per day. By the latter end of July, all the lower parts of Bengal, contiguous to the Ganges and Burrampooter, are overflowed, and preſent a ſurface of water more than 100 miles wide. This vaſt collection of fluid, however, is owing in a great meaſure to the rains which fall on the low country itſelf; for the lands in the neighbourhood are overflowed ſome time before the bed of the river is filled. It muſt be obſerved, that the ground on the bank of the river, and even to ſome miles diſtance, is higher than that which is more remote; and thus a ſeparation is made for a conſiderable time betwixt the waters of the land-flood and thoſe of the river.

As the cultivated lands in Bengal would receive damage from ſuch a copious inundation, they muſt for this reaſon be guarded by ſtrong dykes to reſiſt the waters, and admit only a certain quantity. Theſe, collectively taken, are ſaid to be more than 1000 miles in length, and are kept up at an enormous expence; yet they do not always anſwer the purpoſe, on account of the looſeneſs of the earth of which they are compoſed, even though ſome are of the thickneſs of an ordinary rampart at the baſe. One particular branch of the Ganges (navigable only in the rainy ſeaſon, and then equal in ſize to the Thames at Chelſea) is conducted for 70 miles between dykes; and when full, the paſſengers look down upon the adjacent country as from the top of a hill.

The tide becoming leſs capable of counteracting ſuch an impetuous torrent of freſh water, the height of the inundation gradually diminiſhes as it approaches the ſea, and totally vaniſhes at the point of confluence; which is owing to the facility with which the waters of the inundation ſpread over the level of the ocean. But when the force of winds conſpires with that of the tide, the waters are retarded in ſuch a manner as ſometimes to raiſe the inundation two feet above the ordinary level; which has been known to occaſion the loſs of whole crops of rice. In the year 1763, a melancholy accident happened at Luckipour, when a ſtrong gale of wind, conſpiring with a high ſpring-tide, at a ſeaſon when the periodical flood was within a foot and an half of its higheſt pitch, the waters are ſaid to have riſen ſix feet above their ordinary level. Thus the inhabitants of a particular diſtrict were ſwept away with their houſes and cattle; and to aggravate the diſtreſs, it happened in a part of the country where it was ſcarcely poſſible to find a tree by which a drowning man might ſave himſelf.

For the ſpace of a few days before the middle of Auguſt the inundation is at a ſtand, and then begins to abate by a ceſſation of rain in the mountains, though great quantities ſtill continue to fall on the low country. The inundation does not, however, in its decreaſe, always keep pace with that of the river, by reaſon of the height of the banks; but after the beginning of October, when the rain has nearly ceaſed, the remainder goes off quickly by evaporation, leaving the ground exceedingly enriched and fertile.

From the changing of the monſoon in October to the middle of March, the rivers are in a ſtate of tranquillity; when the north-weſt winds begin, and may be expected once in three or four days till the commencement of the rainy ſeaſon. Theſe are the moſt formidable enemies of the inland navigation carried on by the large rivers. They are ſudden and violent ſqualls, attended with rain; and though their duration is commonly but ſhort, ſometimes produce fatal effects, whole fleets of trading boats having been ſunk by them almoſt inſtantaneouſly. They are more frequent in the eaſtern than the weſtern part of Bengal, and happen oftener towards the cloſe of the day than at any other time; but as they are indicated ſome time before the approach by the riſing and ſingular appearance of the clouds, the traveller has commonly time enough to ſeek for a place of ſhelter. It is in the great rivers alone that they are ſo formidable, and that about the end of May or beginning of June, when the rivers are much increaſed in width. After the commencement of the rainy ſeaſon, which varies in different parts from the middle to the end of June, tempeſtuous weather occaſionally happens. At this ſeaſon places of ſhelter are more common than at any other time by the filling up of the creeks and inlets as the river increaſes: and on the other hand, the bad weather, when it happens, is of longer continuance than during the ſeaſon of the north-weſters. The rivers being now ſpread to the diſtance of ſeveral miles, large waves are raiſed on them particularly when blowing in a direction contrary to the rapid parts of the ſtream, and the danger ariſing from theſe ſhould of courſe be avoided.

In the interval between the end of the rainy ſeaſon and the beginning of the north-weſters, this navigation may be very ſafely undertaken; an ordinary degree of attention being then only requiſite to pilot the boat clear of ſhallows and ſtumps of trees. The ſeaſon of the north-weſters requires the greateſt care and attention. Should one of theſe ſqualls approach, and no creek or inlet offer for ſhelter, the ſteep bank of the river ſhould be always ſought as a place of ſhelter, if it is not in a crumbling ſtate, whether it be to the windward or leeward, rather than the other. If this cannot be done, the flat ſide muſt be taken up with; and if it be a lee ſhore, the anchor ſhould be thrown out to prevent driving upon it. In theſe caſes the maſt is always ſuppoſed to be ſtruck; and, provided this be done, and the cargo judiciouſly diſpoſed of, there is little danger of any of the boats commonly uſed being loſt.

The boats commonly employed in the inland navigation of Bengal are called *budgerows*, and are formed ſomewhat like a pleaſure-barge. Some have cabins 14 feet broad and proportionally long, drawing from four to five feet water. Their motion is very ſlow, not exceeding the rate of eight miles a-day when moved by their oars; ſo that their progreſs down the river muſt depend principally on the motion of the current. From the beginning of November to the middle or latter end of May, the uſual rate of going down the ſtream is about 40 miles in twelve hours, and during the reſt of the year from 50 to 70 miles. The current is ſtrongeſt while the waters of the inundation are running off, which happens in part of Auguſt and September. In many of the ſhallow rivers, however, the current is exceedingly ſlow during the dry months; inſomuch that the track-rope is frequently uſed in going downwards. In towing againſt the ſtream the ſteep ſide of the river is generally

preferred on account of the depth of water, though the current runs much ſtronger there than on the oppoſite ſide. On theſe occaſions it is neceſſary to provide a very long track-rope, as well for avoiding the falling pieces of the ſteep bank on the one ſide as the ſhallow water on the other, when it becomes neceſſary to change ſides through the badneſs of the tracking ground. The anchor ſhould always be kept ready for dropping in caſe the track-rope breaks. The uſual rate of towing againſt the ſtream is from 17 to 20 miles a-day; and to make even this progreſs the windings of the river require the boats to be dragged againſt the current at the rate of four miles and an half an hour for 12 hours. When the waters are high, a greater progreſs will be made, notwithſtanding the ſuperior ſtrength of the current; becauſe the filling of the river-bed gives many opportunities of cutting off angles and turnings, and ſometimes even large windings, by going through creeks.

Moſt of the vegetables and animals common to other countries in the torrid zone, are alſo uſually found at Bengal. Its great produce of grain is rice, which is commonly exported from thence into other countries. By various accidents, however, the crop of rice ſometimes fails, and a famine is produced; and of this there have been many inſtances in Bengal, as well as in other parts of Indoſtan. One of the moſt deplorable of this kind happened in the year 1770. The nabob and ſeveral great men of the country diſtributed rice *gratis* to the poor until their ſtocks began to fail, when thoſe donations were of conſequence withdrawn. Vaſt multitudes then came down to Calcutta, the capital Engliſh ſettlement in the province, in hopes of meeting with relief at that place. The granaries of the Company, however, being quite empty, none could be afforded; ſo that when the famine had prevailed a fortnight, many thouſands fell down in the ſtreets and fields; whoſe bodies, mangled by the dogs and vultures, corrupting in the air, ſeemed to threaten a plague as the conſequence of the famine. An hundred people were daily employed on the Company's account, with doolys, ſledges, and bearers, to throw them into the river. At this time the fiſh could not be eaten, the river being ſo full of carcaſes; and many of thoſe who ventured to feed upon them died ſuddenly. Hogs, ducks, and geeſe, alſo fed moſtly on carnage; ſo that the only meat that could be procured was mutton; and this, from the dryneſs of the ſeaſon, was ſo ſmall, that a quarter of it was ſcarcely a pound and an half in weight.

A very ſingular and alarming phenomenon appeared in the month of Auguſt. This was a large black cloud at a diſtance in the air, which ſometimes obſcured the ſun, and ſeemed to extend a great way over and about Calcutta. The hotter the day proved the lower this cloud ſeemed to deſcend, and for three days it occaſioned great ſpeculation. The bramins pretended, that this phenomenon, which was a cloud of inſects, ſhould make its appearance three times; and if ever they deſcended to the earth, the country would be deſtroyed by ſome untimely misfortune. They ſaid, that about 150 years before there had been ſuch another bad time, when the earth was parched for want of water; and this cloud of inſects made its appearance, though it came much lower the ſecond time than it had done before. On the third day, the weather being very hot and cloudy, they deſcended ſo low that they could be plainly ſeen. They ſeemed to be about the ſize of a horſe-ſtinger, with a long red body, large head and eyes, keeping cloſe together like a ſwarm of bees, and, to appearance, flying quite on a line. None, however, were caught, as the people were ſo much frightened by the prognoſtications of the bramins. Whilſt it rained they continued in one poſition for near a quarter of an hour; then they roſe five or ſix feet at once, and in a little time deſcended as much, until a ſtrong north-weſt wind blew for two days ſucceſſively. During its continuance they aſcended and deſcended, but more precipitately than before; and next morning the air was quite clear. For ſome days before the cloud made its appearance, the toads, frogs, and inſects, which, during the rains, make a continual noiſe through the night, diſappeared, and were neither heard nor ſeen but in the river.

The cauſe of this dreadful famine was a preternatural drought. In this country they have two harveſts, one in April, called the *little harveſt*, which conſiſts of the ſmaller grain; the ſecond, called the *grand harveſt*, is only of rice. But by a drought which happened in 1769 the great harveſt of that year failed, as did alſo the little one of 1770, which produced the dreadful conſequences already recited.

Among the vegetable productions of Bengal Mr. Ives mentions the areca tree, the woody part of which is as tough as whalebone. Here is alſo a beautiful tree called *chulta*, the flower of which is at firſt a hard green ball on footſtalks about four inches in length. This opens, and the calyx is compoſed of five round thick and ſucculent leaves; the corolla conſiſts of the like number of fine beautiful white petals. After one day the corolla falls off and the ball cloſes again, and is ſold in the markets. There is a ſucceſſion of theſe for ſeveral months. The mango tree grows here alſo in plenty. Its fruit is preferred to all others in the country excepting very fine pine-apples; the gentlemen eat little elſe in the hot months when theſe fruits are in ſeaſon. If no wine is drunk with them, they are apt to produce boils, which are troubleſome but healthful. In the walks of Bengal they have a tall tree called the *tatoon*, ſaid to have been firſt brought into England by Captain Birch. The leaves are of a deep ſhining green, the lower part rather paler where it is ribbed, and undulated round the edges. The fruit is of the ſize, ſhape, and colour of an olive, with a moderately thin huſk, and a kernel like that of the date; five or ſix grow on the ſame pedicle. Near Calcutta is a large ſpreading tree called the *ruſſa*, which makes a fine appearance when in full bloom. The natives ſay that this and another near the Dutch ſettlement are the only two in Bengal. They pretend likewiſe that they can never find the ſeed; but Mr. Ives informs us that this is to be met with in plenty, though in a bad condition, the ants and other vermin being ſo fond of them, that not a ſingle pod is ever to be met with that is not touched by one or other of theſe ſpecies of inſects. This tree bears flowers of bright crimſon, and all the ſhades from thence down to a bright yellow. They are in ſuch plenty as almoſt to cover the tree, but have little or no ſmell. The fruit is a pod, of the ſhape and ſize of a large garden-bean, containing four or five fleſhy ſeeds, which eaſily fall into two when dry. They are brown on the outſide, white within, and nearly ſquare, but convex on the ſides.

Mr. Ives makes mention of a kind of birds found in Bengal, and named *argill* or *burgill* (ſee ARDEA). They are very large, and in the evening, majeſtically ſtalk along like ſo many naked Indians, for which our author in fact at firſt miſtook them. On diſcovering that they were birds, he reſolved to ſhoot one of them; which, however, was very difficult to be done. The Indians ſhowed evident marks of diſſatisfaction at the attempt; and informed him that it was impoſſible to ſucceed, becauſe theſe birds were poſſeſſed by the ſouls of bramins. At laſt, however, he ſucceeded; and informs us that the bird he ſhot extended 14 feet 10 inches between the tips of the wings; from the tip of the bill to the extremity of the claw was ſeven feet and a half: the legs were naked, as was alſo one-half of the thighs; the naked parts being three feet in length. The feathers of the wings and back were of an iron colour, and very ſtrong; thoſe of the belly were very long, and on the breaſt was a great deal of down all of a dirty white. The bill was 16 inches round at the baſe, nearly of a triangular ſhape, and

of different colours. In the craw was a land-tortoiſe 10 inches long; and a large black male cat was found entire in its maw.

It is generally ſuppoſed that Bengal is the richeſt and moſt populous province in the empire of Indoſtan. Beſides its own conſumption, which is certainly very conſiderable, its exports are immenſe. One part of its merchandiſe is carried into the inland country. Thibet takes off a quantity of its cottons, beſides ſome iron and cloths of European manufacture. The inhabitants of thoſe mountains fetch them from Patna themſelves, and exchange them for muſk and rhubarb.

But the trade of Thibet is nothing when compared to that which Bengal carries on with Agra, Delhi, and the provinces adjacent to thoſe ſuperb capitals, in ſalt, ſugar, opium, ſilk, ſilk-ſtuffs, and an infinite quantity of cottons, and particularly muſlins. Theſe articles, taken together, amounted formerly to more than 1,750,000l. a-year. So conſiderable a ſum was not conveyed to the banks of the Ganges; but it was the means of retaining one nearly equal which muſt have iſſued from thence to pay the duties, or for other purpoſes. Since the viceroys of the Mogul have made themſelves nearly independent, and ſend him no revenues but ſuch as they chooſe to allow him, the luxury of the court is greatly abated, and the trade we have been ſpeaking of is no longer of ſo much importance.

The maritime trade of Bengal, managed by the natives of the country, has not ſuffered the ſame diminution, nor was it ever ſo extenſive as the other. It may be divided into two branches, of which Catek is in poſſeſſion of the greater part. Catek is a diſtrict of ſome extent, a little below the moſt weſtern mouth of the Ganges. Balaſore, ſituated upon a navigable river, ſerves it for a port. The navigation to the Maldives, which the Engliſh and French have been obliged to abandon on account of the climate, is carried on entirely from this road. Here they load their veſſels with rice, coarſe cottons, and ſome ſilk ſtuffs, for theſe iſlands; and receive cowries in exchange, which are uſed for money in Bengal, and are ſold to the Europeans. The inhabitants of Catek, and ſome other people of the Lower Ganges, maintain a conſiderable correſpondence with the country of Aſham. This kingdom, which is thought to have formerly made a part of Bengal, and is only divided from it by a river that falls into the Ganges, deſerves to be better known, if what is aſſerted here be true, that gun-powder has been diſcovered there, and that it was communicated from Aſham to Pegu, and from Pegu to China. Its gold, ſilver, iron, and lead mines would have added to its fame, if they had been properly worked. In the midſt of theſe riches, which were of very little ſervice to this kingdom, ſalt was an article of which the inhabitants were ſo much in want, that they were reduced to the expedient of procuring it from certain vegetable ſubſtances.

About the commencement of the preſent century, ſome Bramins of Bengal carried their ſuperſtitions to Aſham, where the people were guided ſolely by the dictates of natural religion. The prieſts perſuaded them, that it would be more agreeable to Brama if they ſubſtituted the pure and wholeſome ſalt of the ſea to that which they uſed. The ſovereign conſented to this, on condition that the excluſive trade ſhould be in his hands; that it ſhould only be brought by the people of Bengal; and that the boats laden with it ſhould ſtop at the frontiers of his dominions. Thus have all theſe falſe religions been introduced by the influence and for the advantage of the prieſts who teach, and of the kings who admit them. Since this arrangement has taken place, 40 veſſels from 500 to 600 tons burden each, are annually ſent from the Ganges to Aſham laden with ſalt, which yields 200 *per cent.* profit. They receive in payment a ſmall quanity of gold and ſilver, ivory, muſk, eagle-wood, gum-lac, and ſilk in great quantity. Except theſe two branches of maritime trade, which, for particular reaſons, have been confined to the natives of the country, all the reſt of the veſſels ſent from the Ganges to the different ſea-ports of India belong to the Europeans, and are built at Pegu.

A ſtill more conſiderable branch of commerce, which the Europeans at Bengal carry on with the reſt of India, is that of opium. Patna, ſituated on the Upper Ganges, is the moſt celebrated place in the world for the cultivation of opium. The fields are covered with it. Beſides what is carried into the inland parts, there are annually 3000 or 4000 cheſts exported, each weighing 300 pounds. It ſells upon the ſpot at the rate of between 24l. and 25l. a cheſt on an average. This opium is not purified like that of Syria and Perſia, which we make uſe of in Europe; it is only a paſte that has undergone no preparation, and has not a tenth part of the virtue of purified opium.

The Dutch ſend rice and ſugar from their ſettlements to the coaſt of Coromandel, for which they are paid in ſpecie, unleſs they have the good fortune to meet with ſome foreign merchandiſe at a cheap rate. They ſend out one or two veſſels laden with rice, cottons, and ſilk: the rice is ſold in Ceylon, the cottons at Malabar, and the ſilk at Surat; from whence they bring back cotton, which is uſefully employed in the coarſer manufactures of Bengal. Two or three ſhips laden with rice, gum-lac, and cotton ſtuffs, are ſent to Baſſora; and return with dried fruits, roſe-water, and a quantity of gold. The rich merchandiſe carried to Arabia is paid for entirely in gold and ſilver. The trade of the Ganges with the other ſea-ports of India brings 1,225,000l. annually into Bengal.

Though this trade paſſes through the hands of the Europeans, and is carried on under their protection, it is not entirely on their own account. The Moguls, indeed, who are uſually ſatisfied with the places they hold under the government, have ſeldom any concern in theſe expeditions; but the Armenians, who, ſince the revolutions in Perſia, are ſettled upon the banks of the Ganges, to which they formerly only made voyages, readily throw their capitals into this trade. The Indians employ ſtill larger ſums in it. The impoſſibility of enjoying their fortunes under an oppreſſive government does not deter the natives of this country from labouring inceſſantly to increaſe them. As they would run too great a riſk by engaging openly in trade, they are obliged to have recourſe to clandeſtine methods. As ſoon as an European arrives, the Gentoos, who know mankind better than is commonly ſuppoſed, ſtudy his character; and, if they find him frugal, active, and well informed, offer to act as his brokers and caſhiers, and lend or procure him money upon bottomry, or at intereſt. This intereſt, which is uſually nine *per cent.* at leaſt, is higher when he is under a neceſſity of borrowing of the Cheyks.

Theſe Cheyks are a powerful family of Indians, who have, time immemorial, inhabited the banks of the Ganges. Their riches have long ago procured them the management of the bank belonging to the court, the farming of the public revenue, and the direction of the money, which they coin afreſh every year in order to receive annually the benefit ariſing from the mint. By uniting ſo many advantages, they are enabled to lend the government 1,750,000l. 2,625,000l. or even 4,375,000l. at a time. When the government finds it impoſſible to refund the money, they are allowed to indemnify themſelves by oppreſſing the people.

The Europeans who frequent the Ganges have not been ſufficiently alarmed at this deſpotiſm, which ought to have prevented them from ſubmitting to a dependence upon the Cheyks. They have fallen into the ſnare, by borrowing con-

fiderable ſums of theſe avaricious financiers, apparently at nine, but in reality at thirteen *per cent.* if we take into the account the difference between the money that is lent them and that in which they are obliged to make their payments. The engagements entered into by the French and Dutch companies have been kept within ſome bounds; but thoſe of the Engliſh company have been unlimited. In 1755, they were indebted to the Cheyks about 1,225,000l.

The Portugueſe, who firſt frequented this rich country, had the wiſdom to eſtabliſh themſelves at Chatigan, a port ſituated upon the frontier of Arracan, not far from the moſt eaſtern part of the Ganges. The Dutch, who, without incurring the reſentment of an enemy at that time ſo formidable, were deſirous of ſharing in their good fortune, were engaged in ſearching for a port which, without obſtructing their plan, would expoſe them the leaſt to hoſtilities. In 1603, their attention was directed to Balaſore; and all the companies, rather through imitation than in conſequence of any well-concerted ſchemes, followed their example. Experience taught them the propriety of fixing as near as poſſible to the markets from whence they had their merchandiſe; and they ſailed up that branch of the Ganges which, ſeparating itſelf from the main river at Mourcha above Caſſimbuzar, falls into the ſea near Balaſore under the name of the river *Hughly*. The government of the country permitted them to erect warehouſes wherever there was plenty of manufactures, and to fortify themſelves upon this river.

The firſt town that is met with in paſſing up the river is Calcutta, the principal ſettlement of the Engliſh company. Six leagues higher is ſituated Frederic Nagore, founded by the Danes in 1756, in order to ſupply the place of an ancient ſettlement where they could not maintain their ground. This new eſtabliſhment has not yet acquired any importance, and there is all the reaſon imaginable to believe that it will never become conſiderable. Two leagues and an half higher lies Chandernagore, a ſettlement belonging to the French. At the diſtance of a mile from Chandernagore is Chinſura, better known by the name *Dougli*, being ſituated near the ſuburbs of that anciently renowned city. The Dutch have no other poſſeſſions there, but merely their fort; the territory round it depending on the government of the country, which hath frequently made it feel its power by its extortions. Another inconvenience attending this ſettlement is a ſand-bank that prevents ſhips from coming up to it: they proceed no farther than Tulta, which is 20 miles below Calcutta; and this of courſe occaſions an additional expence to the government.

The Portugueſe had formerly made Bandel, which is eighty leagues from the mouth of the Ganges, and a quarter of a league above the Hughly, the principal ſeat of their commerce. Their flag is ſtill diſplayed, and there are a few unhappy wretches remaining there, who have forgotten their country after having been forgotten by it. This factory has no other employment than that of ſupplying the Moors and the Dutch with miſtreſſes.

The exports from Bengal to Europe conſiſt of muſk, gum-lac, nicaragua wood, pepper, cowries, and ſome other articles of leſs importance brought thither from other places. Thoſe that are the immediate produce of the country are borax, ſaltpetre, ſilk ſtuffs, muſlins, and ſeveral different ſorts of cotton manufactures.

It would be tedious and uſeleſs to enumerate all the places where ticken and cottons, fit for table-linen or intended to be worn plain, painted, or printed, are manufactured. DACA may be looked upon as the general mart of Bengal, where the greateſt variety of fineſt cottons are to be met with, and in the greateſt quantity.

The purchaſes made in Bengal by the European nations, amounted in all a few years ago to no more than 870,000l. One third of this ſum was paid in iron, lead, copper, woollens, and Dutch ſpices: the remainder was diſcharged in money. Since the Engliſh have made themſelves maſters of this rich country, its exports have been increaſed, and its imports diminiſhed, becauſe the conquerors have carried away a greater quantity of merchandiſe, and pay for it out of the revenues they receive from the country. There is reaſon to believe, that this revolution in the trade of Bengal has not arrived at its criſis, and that ſooner or later it will be attended with ſtill more important conſequences.

BENGO, a province of the kingdom of Angola in Africa, having the ſea on the weſt, and the province of Moſeche on the eaſt. It produces plenty of banana trees; but the Portugueſe have grubbed up vaſt quantities of theſe, and cultivated the land, which now abounds with maize, and the maniac root, of which they make bread. The province is divided into a great number of diſtricts, of which the chiefs are natives, but tributary to Portugal, and obliged to till the lands belonging to the Portugueſe. They are Chriſtians, and have eight places of public worſhip.

BENGUELA, a province of the kingdom of Angola in Africa, bounded on the eaſt by the river Rimba, on the north by the Coanza, and extending weſtward quite to Cape Negro. Benguela was formerly governed by its own kings; but was entirely ruined by the incurſions of the barbarous Giagas, ſo that its being conquered by the Portugueſe proved a great happineſs. It ſtill retains the title of *kingdom*, and is allowed to enjoy ſome ſmall privileges; but is far from being reſtored to the ſtate of plenty it enjoyed before its deſtruction by the Giagas already mentioned. It produces abundance of ſalt, but inferior in quality to that which is made in the province of Chiſſama. The zimbis alſo, whoſe ſhells are current as money through many countries of Africa, are caught upon the coaſt. The country, which is moſtly mountainous, abounds with elephants, rhinoceroſes, lions, tigers, crocodiles, &c. which are very dangerous, and deſtroy great numbers of cattle.

BENJAMIN. See BENZOIN and STYRAX.

BENIARAX, an ancient and conſiderable town in the kingdom of Algiers in Africa, ſeated in W. long. 0. N. lat. 35. 0.

BENIN, a country of Guinea, in Africa, has part of the gulph called the *Bite of Benin*, and the Slave Coaſt, on the weſt; part of Gago and Biafara, on the north; Myjac and Makoko on the eaſt; and Congo on the ſouth, where it extends about one degree beyond the equinoctial line: the length from eaſt to weſt is about 600 miles; but its north and ſouth bounds are not ſo well determined. The land in general is low and woody; in ſome parts it has rivers and lakes, but in others there is a ſcarcity of water. There are here a great number of wild beaſts, particularly elephants, lions, tygers, leopards, baboons, monkeys, wild boars, deer, &c. The birds are partridges, of which ſome are blue and ſome green, turtles, wild ducks, woodcocks, &c. Their grain is Indian corn: they have no potatoes; but plenty of yams, which are of the potatoe kind, but vaſtly larger and more coarſe: theſe are their ordinary food, and ſerve in the room of bread; they have two ſorts of beans, like horſe-beans, but not near ſo good. Their fruits are cocoa-nuts, cormantine apples, bananas, wild figs, &c.

The negroes poſſeſs ſeveral colours which might ſerve for painting, and a good ſort of ſoap made with palm-oil and wood-aſhes; they have a great deal of cotton, which not only ſerves for their own uſe, but is exported to diſtant places. The river Rio or Benin has a great many arms; ſome of

which are ſo large, that they deſerve the name of rivers: it abounds with fiſh, which the inhabitants eat ſmoke-dried as well as freſh. The place of trade in this river is at Arebo, about 120 miles diſtant from its mouth; and to this place the ſhips may ſail up. Thoſe who take this voyage ſee the mouths of a great many rivers open into the principal channel to the right and the left: but how far it aſcends into the country is not known. A little higher up, the country is very low and marſhy, and ſeems to be divided into iſlands; and yet there are trees of all ſizes growing on the banks; this renders the country very unhealthy, as many of our Britiſh ſailors have found to their coſt; it is alſo incommoded with vaſt numbers of flies, called *muſquitoes*, which ſting terribly, and render the ſkin full of puſtules. There are three principal villages, to which the negroes come from the inland countries to traffic. One is called *Boodadou*, and conſiſts of about 50 houſes, or rather huts, for they are made with reeds and covered with leaves. The ſecond called *Arebo*, was mentioned above: this is much larger than the former, and pretty well ſtocked with inhabitants; and the houſes have much more room, but they are built after the ſame manner. The third has the name of *Agatou*, and was built upon a hill. It was almoſt ruined by the wars; but the negroes lately rebuilt it, on account of its agreeable ſituation. At Great Benin the king reſides.

The inhabitants of Benin are very exact in their trading, and will not recede from any of their old cuſtoms: this renders them very ſlow in their dealings, and backward to pay their debts, which ſometimes obliges the traders to ſail before they receive ſatisfaction; but then they are paid as ſoon as they return. Some of the merchants are appointed by the government, which demands a ſort of cuſtom; but it is very trifling. There are three ſorts of officers under the king; the firſt are always near him, and none can addreſs him but by their means: there are ſeveral of the ſecond ſort; one takes care of the ſlaves, another of the cattle, another of the ſtreets, another of war, and ſo on.

The children here go almoſt naked till they are 14, and then they wrap a cotton cloth round their middles: the richer ſort put on a ſort of callico gowns when they go abroad, with a kind of drawers; but within they are contented with their uſual cloth: the better ſort of women wear their cotton cloths like petticoats, and have a covering round their ſhoulders, which is open before.

The richer inhabitants of Benin live upon beef, mutton, and poultry; their drink is water, and brandy when they can get it. The poorer ſort live upon dried fiſh, bananas, and beans; their drink is water and palm-wine. Their chief handicraft men are ſmiths, carpenters and curriers; but they perform all their work in a very bungling manner. The men have as many wives as they can keep, which they take without any ceremony except treating their relations. The wives of the lower ſort may go wherever they have a mind; but thoſe of the rich are ſhut up: they allow their wives to be very familiar with the Europeans, and yet pretend to be very jealous of their own countrymen. When a woman is caught in adultery, ſhe is turned away, and the goods of the man are forfeited to the huſband; but if the relations of the woman are rich, they prevail with him to overlook the fault by bribing him with preſents.

Circumciſion, which is practiſed among them, is performed ſeven days after the children are born, at which time the father makes a feaſt for the relations; they have alſo cuſtoms, relating to uncleanneſs, reſembling thoſe of the Jews. Thieves are puniſhed by making the party amends if they can, otherwiſe they are baſtinadoed: but murder is always puniſhed with death. When a perſon is only ſuſpected of a crime, they have ſeveral ways of putting him to a trial, like the fire ordeal, or the bitter water of the Jews; but they are of ſuch a nature, that the innocent may be as often ſacrificed as the guilty.

With regard to their religion, they believe in an almighty and inviſible God; yet worſhip images in human form, and in thoſe of all ſorts of animals, making them offerings, every one being his own prieſt: they look upon theſe leſſer deities as mediators between him and man; ſome of theſe idols are in the houſe and ſome in cabins by themſelves. Every fifth day is holy; on which the rich kill cows, ſheep, and goats, and others dogs, cats and fowls, which they diſtribute among their poor neighbours.

Benin, the capital of a kingdom of the ſame name, is the reſidence of their kings, and is ſeated pretty far in the country: it ſtands in a plain, and is about four miles in compaſs. The ſtreets are long and broad; and there are markets twice a-day, where they ſell cows, cotton, elephants teeth, European merchandizes, and whatever the country produces. The houſes are large, with clay walls, and at a diſtance from each other; they are covered with reeds, ſtraw, and leaves. The women in this place are the greateſt ſlaves; for they go every day to market, manage the houſehold affairs, take care of the children, cook the victuals, and till the ground. The king's palace makes great part of the town; and, its great extent excepted, there is nothing worth taking notice of, it being only a confuſed heap of buildings, made with boards and clay, without regularity or neatneſs. In the middle, there is a wooden tower about 70 feet high, made like a chimney; and on the top is a brazen ſerpent, hanging with his head downwards: this is pretty well made, and is the moſt curious thing in the town: there is a gallery of ſtatues, but ſo wretchedly carved, that there is no knowing what they repreſent without being told: behind a curtain there are 11 brazen heads, with an elephant's tooth on each: theſe are the king's idols: his throne is made of ivory, on which he ſits in a pavilion of India ſtuff. The king ſhows himſelf but once a-year, on the day of a certain feſtival; and then he is ſurrounded with his wives and a great number of his officers, who walk out in proceſſion to begin the feaſt by ſacrificing to their gods; this done, he beſtows victuals and wine among the multitude, which is imitated by his officers. All the inhabitants of this town and country go under the denomination of the *king's ſlaves*: and ſome relations ſay, that none of them wear any habit till given them by the king: but this ſeems to be only a ſalvo to account for the great number of men and women that are daily ſeen naked in the ſtreets; for if it be true, that the king of Benin can bring 100,000 fighting men into the field, his ſubjects muſt be very numerous; and probably his majeſty is not rich enough to beſtow garments upon them all. The Europeans reſort hither to purchaſe ſlaves. E. long. 54. N. lat. 7. 40.

BENISH days, among the Egyptians, a term for three days of the week, which are days of leſs ceremony in religion than the other four, and have their name from the *beniſh*, a garment of common uſe, not of ceremony. In Cairo, on Sundays, Tueſdays, and Thurſdays, they go to the paſhaw's divan; and theſe are the general days of buſineſs. Fridays they ſtay at home, and go to their moſques at noon; but though this is their day of devotion, they never abſtain from buſineſs. The three other days of the week are the beniſh-days, in which they throw off all buſineſs and ceremony, and go to their little ſummer-houſes in the country.

BENNET (Henry), earl of Arlington, was born of an ancient family in Middleſex. In the beginning of the civil war he was appointed under-ſecretary to George Lord Digby, ſecretary of ſtate; afterwards entered himſelf as a volunteer for the royal cauſe, and did his majeſty ſome ſervice, eſpecially at Andover in Hampſhire, where he received ſeveral wounds.

When the wars were ended, he left not the king when ſucceſs did, but attended his intereſt in foreign parts. He was made ſecretary to the duke of York; received the honour of knighthood from Charles II. at Bruges, in 1658; and was ſent envoy to the court of Spain. His majeſty, upon his return to England, called him home, made him keeper of his privy purſe, and principal ſecretary of ſtate. He had always a peculiar hatred to the lord chancellor Hyde; who on the other hand conſidered him as a concealed Papiſt. In 1670 he was one of the council diſtinguiſhed by the title of the *Cabal*, and one of thoſe who adviſed ſhutting up the exchequer. In 1672 he was made Earl of Arlington and Viſcount Thetford, and ſoon after Knight of the Garter. In 1673 he was appointed one of the three plenipotentiaries from the court of Great Britain to Cologn, to mediate a peace between the emperor and the king of France. The Houſe of Commons, in 1673, drew up articles of impeachment againſt him. In 1674 he was made chamberlain of his majeſty's houſehold, with this public reaſon, that it was in recompenſe of his long and faithful ſervices, and particularly for his having performed the office of principal ſecretary of ſtate for the ſpace of 12 years, to his majeſty's great ſatisfaction. But afterwards his intereſt began to decline, while that of the earl of Danby increaſed; for, upon his return from his unſucceſsful journey to Holland in 1675, his credit was ſo much ſunk, that ſeveral perſons at court diverted the king with mimicking his perſon and behaviour; yet he held his lord chamberlain's place to the day of his death, in 1685. His eſteemed letters to Sir William Temple were publiſhed after his death.

Bennet (Chriſtopher), an eminent phyſician in the 16th century, was the ſon of John Bennet, of Raynton, in Somerſetſhire. He was educated at Lincoln college, Oxford; and gave the public a treatiſe on conſumptions, intitled, *Theatri Tabidorum Veſtibulum*, &c. alſo *Exercitationes Diagnoſticæ, cum Hiſtoriis demonſtrativis, quibus Alimentorum et Sanguinis vitia deteguntur in pleriſque morbis*, &c.

Bennet (Dr. Thomas), an eminent divine, born at Saliſbury on the 7th of May 1673, and educated at St. John's college, Cambridge. In 1700 he was made rector of St. James's, in Colcheſter; afterwards he was lecturer of St. Olave's, Southwark, and morning-preacher at St. Lawrence, Jewry; and at laſt was preſented to the vicarage of St. Giles's, Cripplegate, worth 500l. a year. While he was in this ſtation, he was engaged in ſeveral expenſive law-ſuits in defence of the rights of the church, to which he recovered 150l. a-year. He wrote, 1. An Anſwer to the Diſſenters Plea for Separation. 2. A Confutation of Popery. 3. A Diſcourſe of Schiſm. 4. An Anſwer to a book intitled Thomas againſt Bennet. 5. A Confutation of Quakeriſm. 6. A brief Hiſtory of the joint Uſe of pre-conceived Forms of Prayer. 7. An Anſwer to Dr. Clarke's Scripture-doctrine of the Trinity. 8. A Paraphraſe, with Annotations, on the Book of Common Prayer. 9. An Hebrew Grammar; and other pieces. He died October 9th, 1728, in the 56th year of his age.

BENOIT (Renatus), a famous doctor of the Sorbonne, and curate of Euſtathius at Paris in the 16th century. He was a ſecret favourer of the Proteſtant religion; and that his countrymen might be able to read the bible in their own tongue, he publiſhed at Paris the French tranſlation, which had been made by the reformed miniſters at Geneva. This tranſlation was approved of by ſeveral doctors of the Sorbonne before it went to the preſs, and king Charles IX. had granted a privilege for the printing of it. Yet when it was publiſhed, it was immediately condemned. He had been before that time confeſſor to the unhappy Mary queen of Scotland, during her ſtay in France, and attended her when ſhe returned into Scotland. Some time before the death of Henry III. Dr. Benoit, or ſome of his friends with his aſſiſtance, publiſhed a book, intitled, *Apologie Catholique*, i. e. The Catholic Apology; in which it was ſhewn, that the Proteſtant religion, which Henry king of Navarre profeſſed, was not a ſufficient reaſon to deprive him of his right of ſucceeding to the crown of France. When Henry IV. was reſolved to embrace the Catholic religion, he aſſiſted at that aſſembly in which king Henry abjured the reformed religion. The king promoted him to the biſhopric of Troyes in Champagne 1597, but he could never obtain the pope's bulls to be inſtalled. However, he enjoyed the temporalities of that biſhopric till he reſigned it. He died in the year 1608.

BENSERADE (Iſaac de), an ingenious French poet of the 17th century, was born at Lyons. He made himſelf known at court by his verſes and his wit, and had the good fortune to pleaſe the cardinals de Richelieu and Mazarin. After the death of Richelieu, he got into favour with the Duke de Breze, whom he accompanied in moſt of his expeditions; and when this nobleman died, he returned to court, where his poetry became highly eſteemed. He wrote, 1. A Paraphraſe upon Job. 2. Verſes for Interludes. 3. Rondeaux upon Ovid. 4. Several Tragedies. A ſonnet which he ſent to a young lady with his Paraphraſe on Job being put in competition with the Urania of Voiture, cauſed him to be much ſpoken of; for what an honour was it to be head of a party againſt this celebrated author? Thoſe who gave the preference to Benſerade's performance were ſtyled the *Jobiſts*, and their antagoniſts the *Uraniſts*; and the diſpute long divided the whole court and the wits. Some years before his death he applied himſelf to works of piety, and tranſlated almoſt all the Pſalms of David.

It is aſſerted by M. l'Abbé Olivet, that Benſerade, towards the latter end of his life, withdrew from court, and made Gentilly the place of his retirement. When he was a youth, he ſays it was the cuſtom to viſit the remains of the ornaments with which Benſerade had embelliſhed his houſe and gardens, where every thing ſavoured of his poetical genius. The barks of the trees were full of inſcriptions: and, amongſt others, he remembers the firſt which preſented itſelf was as follows:

Adieu, fortune! honneurs, adieu! vous et les votres;
Je viens ici vous oublier;
Adieu, toi-meme amour! bien plus que les autres
Difficile à congédier.

Fortune and honours, all adieu,
And whatſoe'er belongs to you!
I to this retirement run,
All your vanities to ſhun.
Thou too adieu, O powerful love!
From thee 'tis hardeſt to remove.

Mr. Voltaire is of opinion that theſe inſcriptions were the beſt of his productions, and he regrets that they have not been collected together.

Benſerade ſuffered at laſt ſo much from the ſtone, that, notwithſtanding his great age, he reſolved to ſubmit to the operation of cutting. But his conſtancy was not put to this laſt proof; for a ſurgeon, letting him blood by way of precaution, pricked an artery, and, inſtead of endeavouring to ſtop the effuſion of blood, ran away. There was but juſt time to call F. Commire, his friend and confeſſor, who came ſoon enough to ſee him die. This happened the 19th of October 1691, in the 82d year of his age.

BENSHEIM, a town of Germany in the Palatine of the Rhine, ſeated in E. long. 8. 45. N. lat. 52. 23.

BENSON (Dr. George), a learned diſſenting miniſter,

born at Great Salkeld, in Cumberland, in 1699. His love of learning was ſo ſucceſsful, that, at 11 years of age, he was able to read the Greek Teſtament. He afterwards ſtudied at Dr. Dixon's academy at Whitehaven, from whence he removed to the univerſity of Glaſgow. In 1721 he was choſen paſtor of a congregation of Diſſenters at Abingdon in Berkſhire; in 1729 he received a call from a ſociety of Diſſenters in Southwark, with whom he continued 11 years; and in 1740 was choſen by the congregation of Crutched Friars, colleague to the learned and judicious Dr. Lardner. From the time of his engaging in the miniſtry he propoſed to himſelf the critical ſtudy of the Scriptures, particularly of the New Teſtament, as a principal part of his buſineſs. The firſt fruits of theſe ſtudies which he preſented to the public was, A Defence of the Reaſonableneſs of Prayer, with a Tranſlation of a Diſcourſe of Maximus Tyrius, containing ſome popular Objections againſt Prayer, and an Anſwer to them. The light which Mr. Locke had thrown on the obſcureſt parts of St. Paul's epiſtles, by making him his own expoſitor, encouraged and determined Mr. Benſon to attempt to illuſtrate the remaining epiſtles in the ſame manner. In 1731 he publiſhed A Paraphraſe and Notes on the Epiſtle to Philemon, as a ſpecimen. This was well received, and the author encouraged to proceed in his deſign. With the epiſtle to Philemon was publiſhed "A ſhort diſſertation, to prove from the ſpirit and ſentiments the apoſtle diſcovered in his epiſtles, that he was neither an enthuſiaſt nor impoſtor; and conſequently that the religion which he aſſerted he received immediately from heaven, and confirmed by a variety of miracles, is indeed divine." This argument hath ſince been improved and illuſtrated, with great delicacy and ſtrength, in a review of the apoſtle's entire conduct and character by Lord Lyttelton. Mr. Benſon proceeded with great diligence and reputation to publiſh Paraphraſes and Notes on the two Epiſtles to the Theſſalonians, the firſt and ſecond to Timothy, and the Epiſtle to Titus; adding Diſſertations on ſeveral important Subjects, particularly on Inſpiration. In the year 1735 our author publiſhed his Hiſtory of the firſt planting of Chriſtianity, taken from the Acts of the Apoſtles, and their Epiſtles, in 2 vols. 4to. In this work, beſides illuſtrating throughout the hiſtory of the Acts and moſt of the epiſtles, by a view of the hiſtory of the times, the occaſion of the ſeveral epiſtles, and the ſtate of the churches to whom they were addreſſed, he eſtabliſhed the truth of the Chriſtian religion on a number of facts, the moſt public, important, and inconteſtable. He alſo wrote The Reaſonableneſs of the Chriſtian Religion; The Hiſtory of the Life of Jeſus Chriſt; A Paraphraſe and Notes on the ſeven Catholic Epiſtles; and ſeveral other works which procured him great reputation. One of the univerſities in Scotland ſent him a diploma with a doctor's degree; and many of high rank in the church of England, as Herring, Hoadley, Butler, Benſon, Coneybeare, &c. ſhowed him great marks of favour and regard. He purſued the ſame ſtudies with great application and ſucceſs till the time of his death, which happened in the year 1763, in the 64th year of his age.

BENTHAM (Thomas), biſhop of Lichfield and Coventry, was born at Shirburn in Yorkſhire, in the year 1513, and educated in Magdalen college, Oxford. He took the degree of bachelor of arts in 1543, and in 1546 was admitted perpetual fellow, and became maſter of arts the year following, which was that of Edward VI.'s acceſſion to the crown. He now threw off the maſk of Popery, which during the equivocal reign of Henry VIII. he had worn with reluctance. When Mary came to the crown, being deprived of his fellowſhip by her viſitors, he prudently retired to Baſil in Switzerland, where for ſome time he expounded the Scriptures to the Engliſh exiles in that city; but, being ſolicited by ſome Proteſtants in London, he returned to London before the death of the queen, and was appointed ſuperintendant of a private congregation in the city. Immediately on the acceſſion of Elizabeth, Bentham was preferred in the church, and in the ſecond year of her reign was conſecrated biſhop of Lichfield and Coventry. He died at Eccleſhal in Staffordſhire in 1578, aged 65. He was buried in the chancel of the church there, and a monument was erected, with the effigy of himſelf, his wife, and four children, with the following inſcription:

Hac jacet in tumba Benthamus, epiſcopus ille
Doctus, divinus, largus, paſcens, pius, almus.
Ob. 19 *Feb.* 1578.

Biſhop Bentham had the character of a pious and zealous reformer, and was particularly celebrated for his knowledge of the Hebrew language. His works are, 1. Expoſition of the Acts of the Apoſtles; manuſcript. 2. A Sermon on Chriſt's Temptation; Lond. 8vo. 3. Epiſtle to M. Parker; manuſcript. 4. The Pſalms, Ezekiel, and Daniel, tranſlated into Engliſh in Queen Elizabeth's Bible.

BENTIVOGLIO (Guy), cardinal, born at Ferrara in the year 1579. He went to ſtudy at Padua, where he made a conſiderable proficiency in polite literature. Upon his leaving the univerſity, he went to reſide at Rome, where he became univerſally eſteemed. He was ſent nuncio to Flanders, and then to France; in both which employments his behaviour was ſuch as gave great ſatisfaction to Paul V. who made him a cardinal, which was the laſt promotion he made, a little before his death, which happened on the 28th of January 1621. Bentivoglio was at this time in France, where Louis XIII. and all the French court congratulated him on his new dignity; and when he returned to Rome, his Chriſtian majeſty entruſted him with the management of the French affairs at that court. Pope Urban VII. had a high regard for him on account of his fidelity, diſintereſtedneſs, and conſummate knowledge in buſineſs. He was beloved by the people, and eſteemed by the cardinals; and his qualities were ſuch, that in all probability he would have been raiſed to the pontificate on the death of Urban, which happened on the 29th of July 1644; but having gone to the conclave during the time of the moſt intolerable heats at Rome, it affected his body to ſuch a degree, that he could not ſleep for 11 nights afterwards; and this want of reſt threw him into a fever, of which he died the 7th of September 1644, aged 65. He has left ſeveral works; the moſt remarkable of which are, A Hiſtory of the Civil Wars of Flanders, An Account of Flanders, with Letters and Memoirs.

BENTIVOGLIO, a ſmall town of Italy in the territory of Bologna, with a caſtle, ſituated in E. long. 11. 34. N. lat. 44. 47.

BENTLEY (Richard), an eminent critic and divine, was born at Oulton, in the pariſh of Rothwell, near Wakefield. His anceſtors, who were of ſome conſideration, poſſeſſed an eſtate, and had a ſeat at Hepenſtall, in the pariſh of Halifax. His grandfather James Bentley was a captain in king Charles I.'s army at the time of the civil wars; and being involved in the fate of his party, had his houſe plundered, his eſtate confiſcated, and was himſelf carried priſoner to Pomfret Caſtle, where he died. Thomas Bentley, the ſon of James, and father of Dr. Bentley, married the daughter of Richard Willis of Oulton, who had been a major in the royal army. This lady, who was a woman of exceeding good underſtanding, taught her ſon Richard his Accidence. To his grandfather Willis, who was left his guardian, he was in part indebted for his education; and having gone through the grammar ſchool at Wakefield with ſingular reputation, both for his proficiency and his exact and regular behaviour, he was admitted of

St. John's college Cambridge, under the tuition of Mr. Johnſon, on the 24th of May 1676; being then only four months above 14 years of age. On the 22d of March 1681-2, he ſtood candidate for a fellowſhip, and would have been unanimouſly elected, had he not been excluded by the ſtatutes on account of his being too young for prieſt's orders. He was then a junior bachelor, and but little more than 19 years old. It was ſoon after this that he became a ſchool-maſter at Spalding. But that he did not continue long in this ſituation is certain from a letter of his grandfather Willis's, ſtill preſerved in the family, from which it appears, that he was with Dr. Stillingfleet at the Deanery of St. Paul's on the 25th of April 1683. He had been recommended by his college to the Dean as preceptor to his ſon; and Dr. Stillingfleet gave Mr. Bentley his choice whether he would carry his pupil to Cambridge or Oxford. He fixed upon the latter univerſity on account of the Bodleian library, to the conſulting of the manuſcripts of which he applied with the cloſeſt attention. Being now of age, he made over a ſmall eſtate which he derived from his family to his elder brother, and immediately laid out the money he obtained for it in the purchaſe of books. In July 1683, he took the degree of Maſter of Arts at St. John's college Cambridge. In 1692 his patron, being advanced to the ſee of Worceſter, collated him to a prebend in that church, and alſo made him his domeſtic chaplain. That learned prelate, as well as Dr. William Lloyd, then biſhop of Lichfield, had ſeen many proofs of our author's extraordinary merit, when they concurred in recommending him as a fit perſon to open the lectures upon Mr. Boyle's foundation in defence of natural and revealed religion. This gave him a fine opportunity of eſtabliſhing his fame. He ſaw it well; and reſolved to puſh it to the utmoſt. Sir Iſaac Newton's *Principia* had been publiſhed but a few years, and the book was little known and leſs underſtood. Mr. Bentley therefore determined to ſpare no pains in diſplaying to the beſt advantage the profound demonſtrations which that excellent work furniſhed in proof of a Deity; and that nothing might be wanting to complete the deſign, he applied to the author, and received from him the ſolution of ſome difficulties which had not fallen within the plan of his treatiſe. In ſhort, our author's ſermons at Boyle's lectures were univerſally admired, and highly raiſed his reputation as a preacher; notwithſtanding that error which laid him open to the raillery of Dr. Keil, *viz.* of proving the moon not to turn round her axis becauſe ſhe always ſhows the ſame face to the earth. In 1693, he was made keeper of the royal library at St. James's palace.

In the year following aroſe the famous diſpute between him and the honourable Mr. Boyle, in relation to the epiſtles of Phalaris; of which Mr. Boyle had publiſhed a very fine edition, with a Latin verſion of the text. Theſe epiſtles the Doctor aſſerted to be ſpurious, the production of ſome ſophiſt, and altogether contemptible as a literary performance. The principal pieces which appeared in this noted controverſy were, 1. Dr. Bentley's Diſſertation upon the Epiſtles of Themiſtocles, Socrates, Euripides, Phalaris, and the Fables of Æſop, at the end of the ſecond edition of Mr. Wotton's Reflections on Ancient and Modern Learning: but afterwards printed by Dr. Bentley entire, and added with great additions to his farther defence of it, in anſwer to Mr. Boyle. 2. "Dr. Bentley's Diſſertation on the Epiſtles of Phalaris and the Fables of Æſop examined by the Honourable Charles Boyle, Eſq." a book more commonly known by the title of *Boyle againſt Bentley*. 3. Dr. Bentley's Anſwer to the above, commonly known by the name of *Bentley againſt Boyle*; a curious piece, interſperſed with a great deal of true wit and humour. From the caprice or partiality of the age the victory was adjudged to Mr. Boyle, and the ridicule of the wits exerciſed upon Dr. Bentley. Thus Dr. Garth, in his poem of The Diſpenſary,

So diamonds take a luſtre from their foil,
And to a BENTLEY *'tis we owe a* BOYLE.

Dr. Bentley had alſo ſome wags who were his enemies *even* at Cambridge, who drew his picture in the hands of Phalaris's guards, who were putting him into their maſter's bull, and out of the Doctor's mouth came a label with theſe words, *I had rather be* ROASTED *than* BOYLED. And Dean Swift, in his Tale of a Tub, has ſome ſtrokes at Dr. Bentley upon this occaſion, but more eſpecially in his Battle of the Books, where, on account of Dr. Bentley's Diſſertation of Phalaris, &c. being annexed to Mr. Wotton's Reflections on Learning, and their being great friends, he makes Mr. Wotton and Dr. Bentley, ſtanding ſide by ſide, in each other's defence, to be both tranſfixed to the ground by one ſtroke of the javelin of Mr. Boyle; and this he heightens by the ſimile of a cook's ſpitting a brace of wood-cocks. Nay, ſo ſtrong is the influence of literary prejudice and faſhion, that many even of Dr. Bentley's friends conſidered Boyle's Examination as unanſwerable. Nor could they be convinced of the contrary, till the Doctor, firſt aſking them where it was ſo impregnable, and confuting one article after another upon the ſpot, as faſt as they inſtanced, aſſured them it was all of the ſame kind. This he effectually ſhowed in his Anſwer. It now, however, ſeems to be the ſettled opinion of the literary world, that the Doctor has not only the evident advantage in reſpect of learning and argument, but that he is little, if at all, inferior to his antagoniſt in point of wit and ſmartneſs. It may not, however, be amiſs to recite a few teſtimonies on the ſubject. Mr. Walpole, ſpeaking of Mr. Boyle's tranſlation of the Epiſtles of Phalaris, ſays, "This work occaſioned the famous controverſy with Dr. Bentley; who alone, and unworſted, ſuſtained the attacks of the brighteſt geniuſes in the learned world, and whoſe fame has not ſuffered by the wit to which it gave occaſion." Mr. Towers, in his Britiſh Biography, expreſſes himſelf in the following terms: "In the controverſy between him and Mr. Boyle, the popular clamour, indeed, was in favour of the latter; but Bentley's is unqueſtionably a much more valuable performance than that of Boyle. The latter, conſidered as a mere Engliſh compoſition, has the advantage in point of ſtyle; and pleaſed the generality, by the perſonal ſatire which it contained againſt Dr. Bentley, who had many enemies. But Bentley had greatly the ſuperiority with reſpect to juſt reaſoning, critical ſagacity, and extent of learning; and his vindication of himſelf alſo contained many ſhrewd and ſarcaſtical ſtrokes againſt Mr. Boyle and his performance. Much has been ſaid in favour of Mr. Boyle, as a genteel and polite writer; and it muſt be confeſſed, that Dr. Bentley's manner was often too aſſuming, and that he was deficient in point of civility. But notwithſtanding this, there was, perhaps, a much greater want of real candour and politeneſs, whatever affectation of them there might be, in the very contemptuous and unfair manner in which Dr. Bentley was treated throughout Mr. Boyle's book, than in any thing which Bentley had ſaid againſt Boyle. Bentley, with all his foibles, was too reſpectable a character to be a proper ſubject of ſuch treatment; though Swift, Garth, and Pope, have joined in countenancing the popular prejudices againſt him." Mr. Dodwell, who reſided at Oxford during the controverſy, who made himſelf in ſome ſort a party in it, and who had a very particular court paid to him by the Chriſt-church men, declared to them that he never learned ſo much from any book of the ſize in his life, as he had done from Dr. Bentley's Anſwer to Boyle.

In the year 1696, at the public commencement, Mr. Bent-

ley had been created Doctor of Divinity by the univerſity of Cambridge; and ſome time afterwards admitted *ad eundem*, in the univerſity of Oxford. In the year 1700 he was preſented to the maſterſhip of Trinity college, Cambridge, which is reckoned worth near 1000l. *per annum*. Upon this promotion he reſigned his prebend of Worceſter; and, in 1701, was collated to the archdeaconry of Ely. Being thus placed in a ſtate of eaſe and affluence, he entered into matrimony, and indulged his inclination in critical purſuits; and the fruits of his labours, which he occaſionally publiſhed, all diſplayed ſuch erudition and ſagacity, that, by degrees, he obtained the character of being the greateſt critic of the age. In the mean while, however, he carried matters with ſo high a hand in the government of his college, that, in 1709, a complaint was brought before the biſhop of Ely, as viſitor, againſt him, by ſeveral of the fellows, who charged him with embezzling the college money, and other miſdemeanors. In anſwer to this, he preſented his defence to the biſhop, which he publiſhed in 1710, under the title of *The preſent State of Trinity College*, 8vo; and thus began a quarrel, which was carried on with the moſt virulent animoſity on each ſide, for above 20 years, when it at laſt ended in the Doctor's favour. In 1716, upon the death of Dr. James, he was appointed regius profeſſor of divinity in the former univerſity; annexed to which was a good benefice in the biſhopric of Ely. His Majeſty King George I. on a viſit to the univerſity in 1717, having, as uſual, nominated by mandate ſeveral perſons for a doctor's degree in divinity, our profeſſor, to whoſe office it belonged to perform the ceremony called *creation*, demanded four guineas from each perſon, beſides a broad piece of gold, and abſolutely refuſed to create any doctor without theſe fees: hence there aroſe a long and warm diſpute, during which, the doctor was firſt ſuſpended, and then degraded; but on a petition to his Majeſty for relief from that ſentence, the affair was referred to the Court of King's Bench, where the proceedings againſt him being reverſed, a mandamus was iſſued, charging the univerſity to reſtore him. With regard to Dr. Bentley's long diſpute with his college, Mr. Whiſton repreſents his having been induced, in a ſingle inſtance, after four years of unexceptionable conduct, to recede from the excellent rule of *detur digniori*, in the election to a fellowſhip, as the firſt falſe ſtep which led to others, and was very prejudicial to his own happineſs. A conciſe and accurate account of his controverſies with his college and the univerſity, and of the publications which appeared on theſe occaſions, may be ſeen in Mr. Gough's Anecdotes of Topography. There are likewiſe, in the Harleian collection of manuſcripts in the Britiſh Muſeum, N° 7523, ſome authentic papers relative to the proceedings of the univerſity againſt Dr. Bentley. Dr. Bentley was endowed with a natural hardineſs of temper, which enabled him to ride out both theſe ſtorms without any extraordinary diſturbance, or interruption to his literary purſuits. In his private character, though he is generally allowed to have been too fond of money, he was hearty, ſincere, and warm in his friendſhip, an affectionate huſband, and a moſt indulgent father. He loved hoſpitality and reſpect; maintained the dignity and munificence of the ancient abbots in houſekeeping at his lodge, which he beautified; and, in converſation, tempered the ſeverity of the critic with ſuch a peculiar ſtrain of vivacity and pleaſantry, as was very entertaining. He died at his lodge in Trinity college, on the 14th of July 1742, at 80 years of age. To his lateſt hour, he could read the ſmalleſt Greek Teſtament without ſpectacles; and he died of a young man's diſorder, a pleuretic fever. He was of a large and robuſt frame of body, and of ſtrong features. Theſe gave a dignity, perhaps a ſeverity, to his aſpect, which probably heightened the opinion many had conceived of the haughtineſs and roughneſs of his temper. But, in fact, he was of ſo tender a diſpoſition, that he never read a touching ſtory without tears. It was not, indeed, till after he had been afflicted with a ſlight paralytic ſtroke, that this particular effect of the ſoftneſs of his nature was in every caſe apparent; ſo that it may poſſibly be imputed, in ſome degree, to his diſorder. It is however certain, that previous to that event he was endued with great tenderneſs and ſenſibility. In the conteſt about the viſitatorial power, when he met Biſhop Moore, he was ſo ſtruck with ſeeing his old friend appear in a hoſtile manner againſt him, that he fainted away in the court.

When we conſider the great abilities and uncommon erudition of which Dr. Bentley was poſſeſſed, it reflects ſome diſgrace on our country, ſays Dr. Kippis, that even his literary reputation ſhould be ſo long treated with contempt; that he ſhould be repreſented as a mere verbal critic, and as a pedant without genius. The unjuſt light in which he was placed, was not entirely owing to the able men who oppoſed him in the Boylean controverſy; it aroſe, perhaps, principally from the poets engaging on the ſame ſide of the queſtion, and making him the object of their ſatire and ridicule. The "Flaſhing Bentley" of Pope will be remembered and repeated by thouſands who know nothing of the Doctor's real merit. Having mentioned this epithet, we ſhall add the candid note of the poet's right reverend editor. "This great man, with all his faults, deſerved to be put into better company. The following words of Cicero deſcribe him not amiſs: *Habuit a natura genus quoddam acuminis, quod etiam arte limaverat, quod erat in reprehendendis verbis verſutum et ſolers; ſed ſæpe ſtomachoſum, nonnunquam frigidum, interdum etiam facetum.*" In the fourth book of the Dunciad, Mr. Pope introduces our critic at greater length, and with ſtill greater ſeverity. Perhaps it may be found, that the aſperity of Mr. Pope was not entirely owing to the combination of certain wits and poets againſt Dr. Bentley, but to perſonal reſentment. We are told that Biſhop Atterbury, having Bentley and Pope both at dinner with him, inſiſted on knowing what opinion the Doctor entertained of the Engliſh Homer. He for ſome time eluded the queſtion: but at laſt, being urged to ſpeak out, he ſaid, "The verſes are good verſes, but the work is not Homer, it is Spondanus." It muſt, indeed, be acknowledged, that one cauſe of Dr. Bentley's having enemies, was his not always bearing his faculties with ſufficient meekneſs. He appears to have had a conſiderable degree of literary pride, and to have ſpoken of himſelf and others with uncommon freedom. Mr. Whiſton informs us of the Doctor's having ſaid, "That when he himſelf ſhould be dead, Waſſe would be the moſt learned man in England." Dr. Salter, who was extremely devoted to the memory of Dr. Bentley, confeſſed that he was remarkable for his *faſtus*, eſpecially towards his equals, and for ſpeaking highly of himſelf. But at the ſame time he is deſcribed by Dr. Salter as having been a very amiable and pleaſant man in private life, and as poſſeſſing much good nature, though he has been otherwiſe repreſented. This account agrees with the moſt authentic information from different quarters. It is related of Dr. Bentley, that he uſed to pull off his hat to the younger ſtudents, but would not do it to the fellows of his college. Being aſked the reaſon for making this difference, he replied, "That the young ones might come to ſomething; but for the others, they never could be good for any thing."

Beſides the works already mentioned, Dr. Bentley wrote 1. Animadverſions and Remarks on the Poet Callimachus. 2. Annotations on the Two firſt Comedies of Ariſtophanes. 3. Emendations, &c. on the Fragment of Menander and Philemon. 4. Remarks upon Collins's Diſcourſe of Free-Thinking. 5. Beautiful and correct editions of Horace, Terence,

Phædrus, and Milton, with notes. In 1721 he publiſhed Propoſals for Printing a New Edition of the Greek Teſtament, and St. Hierom's Latin Verſion; in which edition he intended to make no uſe of any manuſcript that was not at leaſt 1000 years old. Upon theſe propoſals Dr. Middleton publiſhed ſome remarks; and the work never was printed. "If Dr. Middleton's attack contributed to this event (Dr. Kippis obſerves), he certainly did no little diſſervice to the cauſe of ſacred literature. The completion of Dr. Bentley's noble undertaking was the principal employment of the latter part of his life. He had collected and collated all the manuſcripts of Europe to which acceſs could be obtained. For this purpoſe, his nephew Thomas Bentley, LL. D. well known in the republic of letters, travelled through Europe at his uncle's expence. The work was of ſuch magnitude, that he found it neceſſary, for the firſt time, to publiſh propoſals for printing it by ſubſcription. The whole was completed for publication; and he had received 2000l. in part of the ſubſcription, all of which he returned to the ſubſcribers when he took the reſolution of not letting it appear in the world during his own life. The work is now in the poſſeſſion of his executor Dr. Richard Bentley, one of the ſenior fellows of Trinity College, and rector of Nailſton near Aſhby in Leiceſterſhire; and it is hoped that at ſome future period it may yet ſee the light. Other valuable remains of Dr. Bentley are ſtill in exiſtence; ſome of which are in the hands of his executor, and ſome in thoſe of Mr. Cumberland his grandſon. The latter gentleman is poſſeſſed of the Doctor's claſſic books, with his marginal notes. From theſe notes Mr. Cumberland has publiſhed an edition of Lucan; which, though not perfect throughout, is full and complete with regard to the four firſt books. The ſame gentleman has a Homer of our great critic's, with many marginal notes and corrections, preparatory to an edition of it which he intended to have given. Dr. Bentley's critical correſpondence with his numerous literary acquaintance, which muſt be very inſtructive and entertaining, is not only preſerved, but deſigned to be laid before the public."

Our author's publication of Milton, it is ſaid, was owing to Queen Caroline. Her Majeſty repreſented to him that he had printed no edition of an Engliſh claſſic, and urged him to undertake Milton. His notes upon this great poet have been the worſt received of any of his critical performances. The learned Biſhop Newton ſpeaks of them with conſiderable ſeverity, intermixed, however, with ſome degree of approbation.

BENZOIN, in the materia medica, a concrete reſinous juice, obtained from a ſpecies of ſtyrax. See STYRAX.

BERAMS, a coarſe cloth, all made with cotton-thread, which comes from the Eaſt Indies, and particularly from Surat.

BERAR, a province of Aſia, in the dominions of the Great Mogul, near the kingdom of Bengal. It abounds in corn, rice, pulſe, and poppies, from which laſt they extract opium; and ſugar canes grow almoſt without cultivation. The capital town is called *Shapour*.

BERAUM, a royal city of Bohemia, and capital of a circle of the ſame name. E. long. 14. 25. N. lat. 50. 2.

BERBERIS, the BARBERRY, or *pipperidge buſh*; a genus of the monogynia order, belonging to the hexandria claſs of plants; the characters of which are: the calyx conſiſts of ſix leaves; the petals are ſix, with two glands at the ungues; it has no ſtylus; and the berry contains two ſeeds.

The ſpecies are, 1. The *vulgaris*, or common barberry, grows naturally in hedges in many parts of England, as alſo in ſome parts of Scotland; but is alſo cultivated in gardens on account of its fruit, which is pickled and uſed for garniſhing diſhes. It riſes to the height of eight or ten feet, with many ſtalks, which have a white bark, yellow on the inſide. The ſtalks and branches are armed with ſharp thorns, which commonly grow by threes; the leaves are oval, obtuſe, and ſlightly ſawed on their edges. The flowers come out from the wings of the leaves in ſmall ramoſe bunches, like thoſe of the currant buſh, and are of a yellow colour; theſe are ſucceeded by oval fruit, which are at firſt green, but when ripe turn to a fine red colour. The flowers appear in May, and the fruit ripens in September. There are two or three varieties of this ſhrub, which by ſome have been taken for diſtinct ſpecies; one is the barberry without ſtone; another, the barberry with white fruit; and a third is called by Tournefort the *taller eaſtern barberry*, with a black ſweet fruit. Of theſe Mr. Miller obſerves, that the firſt certainly depends on the age of the plant; becauſe the ſuckers taken from thoſe buſhes commonly produce fruit with ſtones: the ſecond, he ſays, ſeldom bears any fruit; the leaves are of a lighter green colour, and the bark of the ſtalks is whiter than thoſe of the common kind: the third appears to be the ſame with the common ſort, excepting the colour and flavour of its fruit, which can never indicate a ſpecific difference. 2. The *canadenſis*, is a native of that country from whence it takes its name, and was formerly much more common in Britiſh gardens than at preſent. The leaves are much broader and ſhorter than thoſe of the common ſort, and the fruit is black when ripe. 3. The *cretica*, with a ſingle flower in each footſtalk, is at preſent very rare in Britain; the plants being tender whilſt young, and moſt of them killed by ſevere froſt. This never riſes more than three or four feet high in Britain; but ſends out many ſtalks from the root, which are ſtrongly armed with ſpines at every joint: the leaves are produced without order, and are ſhaped like thoſe of the narrow-leaved box-tree; the flowers come out from between the leaves, each having a ſlender footſtalk; but they are not ſucceeded by fruit in Britain.

The firſt ſort is generally *propagated* by ſuckers, which are ſent out in great plenty from the root; but ſuch plants are very apt to ſend out ſuckers in greater plenty than thoſe that are propagated by layers; ſo the latter method is preferable. The beſt time for laying down the branches is in the autumn, when the leaves begin to fall: the young ſhoots of the ſame year are the beſt for this purpoſe; theſe will be well rooted by the next autumn, when they may be taken off, and planted where they are deſigned to remain. Where this plant is cultivated for its fruit, it ſhould be planted ſingle, not in hedges as was formerly the practice; the ſuckers ſhould be every autumn taken away, and the groſs ſhoots pruned out: by this means the fruit will be much fairer and in greater plenty than on thoſe that are ſuffered to grow wild. The other ſorts may be propagated in the ſame manner; only the third ſhould be planted in pots, and ſheltered as ſoon as the young ſhoots are taken off, till the plants have acquired ſtrength, when they may be turned out, and planted in a warm ſituation.

The medicinal qualities of the barberry are theſe: the berries, which are ſo acid that birds will not feed upon them, are aſtringent; and have been given occaſionally in bilious purgings. Among the Egyptians, barberries are uſed in fluxes and in malignant fevers, for abating heat, quenching thirſt, raiſing the ſtrength, and preventing putrefaction. The fruit is macerated for a day and a night, in about 12 times its quantity of water, with the addition of a little fennel ſeed, or the like, to reconcile it to the ſtomach; the liquor ſtrained off, and ſweetened with ſugar or ſyrup of citrons, is given the patient liberally to drink. Proſper Alpinus, from whoſe treatiſe *De Medicina Ægyptorum* Dr. Lewis extracted this account, informs us, that he took this medicine himſelf with ſucceſs, in a peſtilential fever accompanied with an immoderate bilious diarrhœa. The leaves alſo are gratefully acid. The flowers are offenſive to the ſmell when near, but at a diſtance their

odour is extremely fine. An infuſion of the bark in white-wine is purgative. The roots boiled in ley, dye wool of a yellow colour. In Poland they dye leather of a moſt beautiful yellow with the bark of the root. The inner bark of the ſtems will dye linen of a fine yellow, with the aſſiſtance of alum. This ſhrub ſhould never be permitted to grow in corn lands; for the ears of wheat that grow near it never fill, and its influence in this reſpect has been known to extend acroſs a field of 300 or 400 yards. Cows, ſheep, and goats, eat it; horſes and ſwine reject this plant.

BERBICE, a river of Terra Firma in America, which falls into the North Sea, in S. lat. 6. 30. This is the only river in the country, and waters a great number of plantations of cotton, &c. belonging to the Dutch.

BERCARIA, Berqueria, or *Berkeria*, in middle-age writers, denotes a ſheep-fold, ſheep-cote, ſheep-pen, or other incloſure, for the ſafe keeping a flock of ſheep.—The word is abbreviated from *berbicaria*; of *berbex*, detorted from *vervex*. Hence alſo a ſhepherd was denominated *berbicarius* and *berquarius*.

BERCHEROIT, or Berkoits, a weight uſed at Archangel, and in all the Ruſſian dominions, to weigh ſuch merchandizes as are heavy and bulky. It weighs about 364 lb. Engliſh avoirdupois weight.

BERCHEM, or Berghem, (Nicholas), an excellent painter, was a native of Haerlem, and born in 1624. He received inſtructions from ſeveral very eminent maſters; and it was no ſmall addition to their fame that Berchem was their ſcholar. The charming pictures of cattle and figures by this admirable maſter are juſtly held in the higheſt eſtimation. He has been ſingularly happy in having many of them finely engraved by John Visscher, an artiſt of the firſt rank. Berchem had an eaſy expeditious manner of painting, and an inexpreſſible variety and beauty in the choice of ſites for his landſcapes; executing them with a ſurpriſing degree of neatneſs and truth. He poſſeſſed a clearneſs and ſtrength of judgment, and a wonderful power and eaſe in expreſſing his ideas; and although his ſubjects were of the lower kind, yet his choice of nature was judicious, and he gave to every ſubject as much of beauty and elegance as it would admit. The leafing of his trees is exquiſitely and freely touched; his ſkies are clear; and his clouds float lightly, as if ſupported by air. The diſtinguiſhing characters of the pictures of Berchem are, the breadth and juſt diſtribution of the lights; the grandeur of his maſſes of light and ſhadow; the natural eaſe and ſimplicity in the attitudes of his figures, expreſſing their ſeveral characters; the juſt degradation of his diſtances; the brilliancy and harmony, as well as the tranſparence, of his colouring; the correctneſs and true perſpective of his deſign; and the elegance of his compoſition; and where any of thoſe marks are wanting, no authority ought to be ſufficient to aſcribe any picture to him. He painted every part of his ſubjects ſo extremely well, as to render it difficult to determine in which he excelled moſt; his trees, buildings, waters, rocks, hills, cattle, and figures, being all equally well repreſented.

BERCHETT (Peter), an eminent hiſtory-painter, was born in France in 1659, and at the age of 18 was employed in the royal palaces. He came to England in 1681, to work under Rambour, a French painter of architecture; but, after ſtaying a year, returned to Marli. He came again, and was ſent by King William to the palace he was building at Loo, where he was employed 15 months; and then came a third time to England, where he had ſufficient buſineſs. We are informed by Mr. Walpole, that he then painted the ceiling of the chapel of Trinity college, Oxford, the ſtair-caſe at the Duke of Schomberg's in Pall-Mall, and the ſummer-houſe at Ranelagh. His drawings in the academy were much approved. Towards the cloſe of his life he retired to Marybone, where he painted only ſmall pieces of fabulous hiſtory, and died there in the year 1720.

BERDASH, in antiquity, was a name formerly uſed in England for a certain kind of neck-dreſs; and hence a perſon who made or ſold ſuch neck-cloths was called a *berdaſher*, from which is derived our word *haberdaſher*.

BERECYNTHIA, the mother of the gods, in the Pagan theology.

BERENGARIANISM, an appellation given by eccleſiaſtical writers to the opinion of thoſe who deny the truth and reality of the body and blood of Chriſt in the euchariſt. The denomination took its riſe from Berengarius, archdeacon and ſcholiaſticus of the church of Saint Mary at Anjou about the year 1035, who maintained, that the bread and wine, even after conſecration, do not become the true body and blood of our Lord, but only a figure and ſign thereof.—Berengarianiſm was ſtrenuouſly oppoſed by Lanfranc, Guitmond, Adelmannus, Albericus, &c. Divers ſynods were held, wherein the author was condemned at Rome, Verſailles, Florence, Tours, &c. He retracted, and returned again more than once; ſigned three ſeveral Catholic confeſſions of faith; the firſt in the ſecond council of Rome, the ſecond in the third, and the third in the fourth council of the ſame city. But he ſtill relapſed to his former opinion when the ſtorm was over; though Mabillon maintains he ſoon recovered from his fourth fall, and died an orthodox Catholic in the year 1088.

BERENICE, daughter of Ptolemy Auletes king of Egypt, ſucceeded her father before his death. This baniſhed prince implored the aſſiſtance of the Romans, and Pompey reſtored him. Berenice, to ſupport herſelf on the throne, allured a prince, whoſe name was Seleucus, deſcended from the kings of Syria, and admitted him to her nuptial bed, and to her ſceptre. She was ſoon weary of him, and put him to death. She next caſt her eye on Archelaus, who married her, and put himſelf at the head of her troops to repulſe the Romans. He was killed in a battle. Ptolemy returned to Alexandria, and put his rebellious daughter Berenice to death.

Berenice, wife of Ptolemy Euergetes king of Egypt, cut off her hair in purſuance of a vow, and conſecrated it in the temple of Venus. This depoſit being afterwards loſt, Conon the mathematician, in compliment to her, declared that the queen's locks had been conveyed to heaven, and compoſed thoſe ſeven ſtars near the tail of the bull, called to this day *coma Berenices*.

Berenice, daughter of Coſtobarus and of Salome ſiſter to Herod the Great, was married firſt to Ariſtobulus, ſon of the fame Herod and Mariamne. He having a brother who married the daughter of Archelaus king of Cappadocia, often upbraided Berenice that he was married below himſelf in wedding her. Berenice related all theſe diſcourſes to her mother, and exaſperated her ſo furiouſly, that Salome, who had much power over Herod's mind, made him ſuſpect Ariſtobulus, and was the principal cauſe that urged this cruel father to get rid of him. She married again; and having loſt her ſecond huſband, went to Rome, and got into the favour of Auguſtus. But, above all, ſhe inſinuated herſelf into the good graces of Antonia, the wife of Druſus, which in the end proved of great ſervice to Agrippa.

Berenice, grand-daughter of the preceding, and daughter of Agrippa I. king of Judea, has been much talked of on account of her amours. She was betrothed to one Marcus, but he died before the marriage. Soon after, ſhe married his uncle Herod, who, at the deſire of Agrippa, both his brother and father-in-law, was created king of Chalcis by the emperor Claudius. She loſt her huſband in the 8th year of the emperor Claudius; and in her widowhood, it was rumoured ſhe

committed inceſt with her brother Agrippa. To put a ſtop to this report, ſhe offered herſelf in marriage to Polemon king of Cilicia, provided he would change his religion. He accepted her offers, was circumciſed, and married her. Berenice ſoon left him to follow her own ways, and he abandoned Judaiſm to return to his former religion. She was always very well with her brother Agrippa, and ſeconded him in the deſign of preventing the deſolation of the Jews. She got Titus into her ſnares; but the murmurs of the Roman people hindering her from becoming his wife, there remained nothing for her but the title of miſtreſs or concubine of the emperor. The French ſtage, in the 17th century, reſounded with amours of Titus and Berenice.

Berenice's *Hair*, *Coma Berenices*. See Berenice.

BERE-regis, a town of Dorſetſhire in England, in W. long. 2. 15. N. lat. 50 40.

BERESOW, a diviſion of the province of Tobolſk in Siberia. It is bounded on the north by the ſtraits of Waigatz, on the eaſt by a large bay of the frozen ocean which runs into the land towards the ſouth, and at the 65th degree of latitude ſeparates into two arms; one of which is called the *Oſkaia-Guba*, or *Oby-bay*; and the other *Tazowſkaia-Guba*, or the bay of *Tazow*. The river Oby empties itſelf into the former, and the Taz into the latter. This diſtrict was under the Ruſſian dominion long before the other parts of Siberia were conquered, being reduced by the Czar Gabriel ſo early as the year 1530.

BEREWICHA, or Berewica, in our old writers, denotes a village or hamlet belonging to ſome town or manor, ſituate at ſome diſtance therefrom.—The word frequently occurs in Doomſday-book: *Iſtæ ſunt berewichæ ejuſdem manerii.*

BERG, a duchy of Germany, in the circle of Weſtphalia. It is bounded on the north by the duchy of Cleves, on the weſt by the county of Mark and the duchy of Weſtphalia, on the ſouth by Weſteravia, and on the eaſt by the dioceſe of Cologne, from which it is ſeparated by the Rhine. It is about 150 miles in length, and 24 in breadth. It is very fruitful along the Rhine, but mountainous and woody towards the county of Mark. It is ſubject to the elector Palatine, but his right is diſputed by Pruſſia and Saxony. The principal town is Duſſeldorp; and the principal rivers, beſides the Rhine, are the Wipper, Agger, and Sieg.

Berg (St. Winox), a town of the Low Countries, in the country of Flanders, fortified by Vauban, and ſubject to France. It is ſeated on the river Colme, ſix miles from Dunkirk, and 21 from Ypres. The air is often very unwholeſome, eſpecially to ſtrangers. It has an hoſpital for ſoldiers, taken care of by friars called *Bons Fieux*, and two ſeminaries for young ſtudents. The river Colme ſerves inſtead of a canal to go to Hondſhot, St. Omer's, and Gravelines. There is likewiſe another canal to go to Dunkirk. The villages in its territory are very famous for butter and cheeſe, of which they ſend a great quantity to Flanders. Fort Lapin and Fort Suiſſe are within a cannon's ſhot of this place, and Fort St. Francis is ſeated on the canal, near three miles from the town. E. long. 2. 35. N. lat. 50. 57.

Berg zabern, a town of France in the former province of Alſace. E. long. 7. 55. N. lat. 49. 4.

Berg-*Gruin*, in natural hiſtory, the name of an earth uſed in painting, and properly called *green ochre*, though not known among the colour-men under that name. It is found in many parts of Germany, Italy, and England, commonly in the neighbourhood of copper-mines, from particles of which metal it receives its colour. In many parts of Germany, they have a purer kind of this, diſtinguiſhed by no peculiar name, but ſeparated by art from the waters draining from the copper-mines, and differing no otherwiſe from this native ſubſtance, than as the waſhed ochres of Oxfordſhire, &c. do from theſe ſent us in their natural condition. The characters by which the native kind is known from other green earths, are theſe: it is a denſe compact ſubſtance, conſiderably heavy, and of a pale but not diſagreeable green; of a rough and uneven, but not duſty ſurface, and ſomewhat unctuous to the touch. It adheres firmly to the tongue; does not break eaſily between the fingers; nor at all ſtains the hands. It is of a brackiſh diſagreeable taſte, and does not ferment when mixed with acids.

BERGAMASCO, a province of Italy, in the territory of Venice. It is bounded on the eaſt by the Breſſan, on the north by the Valteline, on the weſt and ſouth by the Milaneſe. It extends about 36 leagues from north to ſouth, and 30 from eaſt to weſt. It is watered by ſeveral rivers which render it very fertile, and particularly it produces a great number of cheſnuts. It has mines of iron, and quarries of marble, and other ſtones of which they make millſtones. There are a great number of villages, but no city except Bergamo the capital. The people are very induſtrious, and make the beſt of their natural productions. They are well ſtocked with cattle, and make fine tapeſtry. The language is more corrupt than in any other part of Italy.

BERGAMO (James Philip de), an Auguſtin monk, born at Bergamo in 1434, wrote in Latin a Chronicle from the creation of the world to the year 1503, and a Treatiſe of Illuſtrious Women. He died in 1518.

Bergamo, anciently *Bergomum*, a large and ſtrong town of Italy, in the Venetian territory, and capital of the province of Bergamaſco. It has a ſtrong citadel, and is the ſee of a biſhop. Its ſituation near the Alps renders the inhabitants ſubject to ſwellings in their throats, called goitres, ſaid to be owing to the badneſs of the Alpine waters. E. long. 9. 38. N. lat. 45. 42.

BERGAMOT, a ſpecies of citron, produced at firſt caſually by an Italian's grafting a citron on the ſtock of a bergamot pear-tree, whence the fruit produced by this union participated both of the citron-tree and the pear-tree. The fruit has a fine taſte and ſmell, and its eſſential oil is in general uſe as a perfume. The eſſence of Bergamot is alſo called *eſſentia de cedra*. It is extracted from the yellow rind of the fruit, by firſt cutting it in ſmall pieces, then immediately ſqueezing the oil out of them into a glaſs veſſel. This liquor is an ethereal oil. A water is diſtilled from the peel as follows: Take the outer rind of three bergamots, a gallon of pure proof ſpirit, and four pints of pure water; draw off a gallon in a balneum mariæ, then add as much of the beſt white ſugar as will be agreeable. Or take of the eſſence of bergamot three drams and a half, of rectified ſpirit of wine three pints, of volatile ammonia a dram; diſtil in a balneum mariæ, and draw off three pints.

Bergamot is alſo the denomination of a coarſe tapeſtry, manufactured with flocks of ſilk, wool, cotton, hemp, ox, cow, or goat's hair, and ſuppoſed to be invented by the people of Bergamo in Italy.

BERGARAC, a very rich, populous, and trading town of France, in the department of Dordogne, and late province of Perigord. It is ſeated on the river Dordogne fifty miles eaſt of Bourdeaux, in E. long. 0. 37. N. lat. 50. 57.

BERGAS, a town of Romania in European Turky, and the ſee of a Greek archbiſhop. It is ſeated on the river Lariſſa, in E. long. 27. 30. N. lat. 41. 17.

BERGEN, anciently *Bergi*, a city of Norway, and capital of the province of Bergenhus. It is the ſee of a biſhop, and has a ſtrong caſtle and a good port. It is a large place; but is ſubject to fires, as being all built of wood. It is ſurround-

ed with mountains almoſt inacceſſible; and little or no corn grows in all the country; that which they uſe is all imported, and diſtributed from thence throughout the kingdom. The principal trade is in ſtock-fiſh, firs, and deal-boards. E. long. 5. 45. N. lat. 60. 11.

Bergen, a town of Pomerania in Germany, and capital of the Iſle of Rugen, ſubject to the Swedes. E. long. 13. 0. N. lat. 54. 30.

Bergen-op-zoom, a town of the Low Countries, in Dutch Brabant, and in the marquiſate of the ſame name. It is ſeated on an eminence, in the middle of a moraſs, about a mile and a half from the eaſtern branch of the Scheldt, with which it has a communication by a navigable canal. The houſes are well built, and the market-places and ſquares handſome and ſpacious. The church before the laſt ſiege was reckoned a good building, and ſo was the marquis's palace. It has a good tract of land under its juriſdiction, with ſeveral villages, and ſome iſlands in the Scheldt. It has a very advantageous ſituation on the confines of Brabant, Holland, Zealand, and Flanders. It is ſtrong by nature as well as by art, being ſo ſecured by the moraſſes about it, which are formed by the river Zoom, that it was reckoned impregnable. It was, however, taken in 1747 by the French, but it is thought not without the help of treachery. The fortifications are allowed to be the maſterpiece of that great engineer Cohorn. It had been twice beſieged before without ſucceſs. The marquis of Spinola was the laſt but one who inveſted it, and he was forced to raiſe the ſiege with the loſs of 10,000 men. This place was among the conqueſts lately made by the French republican army; but it was afterwards reſtored to the Dutch patriots. E. long. 4. 15. N. lat. 51. 30.

BERGHEM. See Berchem.

BERGHMONT, an aſſembly or court held upon a hill in Derbyſhire, for deciding controverſies among the miners.

BERGMAN (Sir Torbern), a celebrated chemiſt and natural philoſopher, was born in the year 1735 at Catharineberg in Weſtgothland. His father was receiver-general of the finances, and had deſtined him to the ſame employment; but nature had deſigned him for the ſciences. To them he perceived an irreſiſtible inclination from his earlieſt years, and nature proved more powerful than the will of his friends. His firſt ſtudies were confined to mathematics and phyſics: and the efforts that were made to divert him from ſcience having proved ineffectual, he was ſent to Upſal with permiſſion to follow the bent of his inclination. Linnæus at that time filled the whole kingdom with his fame. Inſtigated by his example, the Swediſh youth flocked around him: and accompliſhed diſciples leaving his ſchool, carried the name and the ſyſtem of their maſter to the moſt diſtant parts of the globe. Bergman, ſtruck with the ſplendour of this renown, attached himſelf to the man whoſe merit had procured it, and by whom he was very ſoon diſtinguiſhed. He applied himſelf at firſt to the ſtudy of inſects, and made ſeveral ingenious reſearches into their hiſtory; among others into that of the genus of *tenthredo*, ſo often and ſo cruelly preyed on by the larvæ of the ichneumons, that neſtle in their bowels and devour them. He diſcovered that the leech is oviparous; and that the coccus aquaticus is the egg of this animal, from whence iſſue ten or twelve young. Linnæus, who had at firſt denied this fact, was ſtruck with aſtoniſhment when he ſaw it proved. *Vidi et obſtupui!* were the words he pronounced, and which he wrote at the foot of the memoir when he gave it his ſanction. Mr. Bergman ſoon diſtinguiſhed himſelf as an aſtronomer, naturaliſt, and geometrician; but theſe are not the titles by which he acquired his fame. The chair of chemiſtry and mineralogy, which had been filled by the celebrated Wallerius, becoming vacant by his reſignation, Mr. Bergman was among the number of the competitors: and without having before this period diſcovered any particular attention to chemiſtry, he publiſhed a memoir on the preparation of alum that aſtoniſhed his friends as well as his adverſaries. Nobody was able to conceive how in ſo ſhort a time he could have made a courſe of experiments ſo complete, on a ſubject ſo new to him. His diſſertation was warmly attacked in the periodical publications, and Wallerius himſelf criticiſed it without reſerve. But in the midſt of ſo many enemies, he poſſeſſed a firm friend. The prince Guſtavus, late king of Sweden, and then chancellor of the univerſity, took cognizance of the affair. After having conſulted two perſons, the moſt able to give him advice, and whoſe teſtimony went in favour of Bergman, he addreſſed a memorial, written with his own hand, in anſwer to all the grievances alleged againſt the candidate, to the conſiſtory of the univerſity and to the ſenate, who confirmed his Highneſs's wiſhes.

Bergman had now a hard taſk to fulfil: he had to ſatisfy the hopes that were conceived of him; to juſtify the opinion of Swab; to fill the place of Wallerius; and to put envy to ſilence. He did not follow the common track in the ſtudy of chemiſtry. As he had received the leſſons of no maſter, he was tainted with the prejudices of no ſchool. Accuſtomed to preciſion, and having no time to loſe, he applied himſelf to experiments without paying any attention to theories: he repeated thoſe often which he conſidered as the moſt important and inſtructive, and reduced them to method; an improvement till then unknown. He firſt introduced into chemiſtry the proceſs by analyſis, which ought to be applied to every ſcience; for there ſhould be but one method of teaching and learning, as there is but one of judging well. Theſe views have been laid down by Mr. Bergman in an excellent diſcourſe, which contains, if we may ſay ſo, his profeſſion of faith in what relates to the ſcience. It is here that he diſplays himſelf without diſguiſe to his reader; and here it is of importance to ſtudy him with attention. The productions of volcanoes had never been analyſed when Meſſrs. Ferber and Troil brought a rich collection of them into Sweden. At the ſight of them, Mr. Bergman conceived the deſign of inveſtigating their nature. He examined firſt of all the matters leaſt altered by the fire, and the forms of which were ſtill to be diſcerned: he followed them in their changes progreſſively; he determined, he imitated their more complicated appearances; he knew the effects which would reſult from the mixture and decompoſition of the ſaline ſubſtances which are found abundantly in theſe productions. He diſcovered ſuch as were formed in the humid way; and then in his laboratory he obſerved the proceſs of nature; that combat of flames and exploſions; that chaos in which the elements ſeem to claſh and to confound one another, unveiled themſelves to his eyes. He ſaw the fire of volcanoes kindled in the midſt of pyritical combinations, and ſea-ſalt decompoſed by clays; he ſaw fixed air diſengaged from calcined calcareous ſtones, ſpreading upon the ſurface of the earth, and filling caverns in which flame and animal life are equally extinguiſhed; he ſaw the ſulphureous acid thrown out in waves, convert itſelf into the vitriolic by mere contact with the air; and diſtilling through the rocks, from the alum veins of the ſolfatara. He ſaw the bitumens as they melted; the inflammable and ſulphureous airs exhaling; and the waters, become mineral and impregnated with the fire and vapours of thoſe ſtupendous furnaces, preparing for the beings that move and diſpute on the cruſt of the abyſs, a remedy for pain and a balſam for diſeaſe.

The continual application beſtowed by Mr. Bergman on his ſtudies having affected his health, he was adviſed to interrupt them if he wiſhed to prolong his life: but he found happineſs only in ſtudy, and wiſhed not to forfeit his title to reputation by a few years more of inactivity and languor. He

exhauſted his ſtrength, and died in the month of June in the year 1784. The univerſity of Upſal paid the moſt diſtinguiſhed honours to his memory; and the academy of Stockholm conſecrated to him a medal to perpetuate the regret of all the learned in Europe for his loſs. His Phyſical and Chemical Eſſays have been collected and tranſlated by Dr. Edmund Cullen, and publiſhed in 2 vols. 8vo.

BERIA, BERIE, *Berry*, ſignifies a large open field; and thoſe cities and towns in England which end with that word are built on plain and open places, and do not derive their names from boroughs as Sir Henry Spelman imagines. Moſt of our gloſſographers in the names of places have confounded the word *berie* with that of *bury* and *borough*, as if the appellative of ancient towns: whereas the true ſenſe of the word *berie* is a flat wide campaign, as is proved from ſufficient authorities by the learned Du Freſne, who obſerves that *Beria Sancti Edmundi*, mentioned by Mat. Paris, ſub ann. 1174, is not to be taken for the town, but for the adjoining plain. To this may be added, that many flat and wide meads, and other open grounds, are called by the name of *beries* and *beryfields*: the ſpacious meadow between Oxford and Iſlay was in the reign of king Athelſtan called *Bery*; as is now the largeſt paſture-ground in Quarendon in the county of Buckingham, known by the name of *Beryfield*. And though theſe meads have been interpreted demeſne or manor meadows, yet they were truly any flat or open meadows that lay adjoining to any villa or farm.

BERING'S STRAITS, the name of that narrow diviſion of the Old and New World, where the breadth between Aſia and America is only 13 leagues. They are ſo named from Captain Vitus Bering, a Dane by birth, and employed on the ſame plan of diſcovery in theſe parts as our great countryman Cook was in the late voyage. He was in the ſervice of Peter the Great; who, by the ſtrength of an extenſive genius, conceiving an opinion of the vicinity of America to his Aſiatic dominions, laid down a plan of diſcovery worthy of ſo extraordinary a monarch, but died before the attempt was begun; but his ſpirit ſurvived in his ſucceſſor. Bering, after a tedious and fatiguing journey through the wilds of Siberia, arrived in Kamtſchatka, attended with the ſcanty materials for his voyage, the greateſt part of which he was obliged to bring with him through a thouſand difficulties. He ſailed from the river of Kamtſchatka on July 15th 1728; and on the 15th of Auguſt ſaw Serdze Kamen, or the heart-ſhaped rock, a name beſtowed on it by the firſt diſcoverer.—From Serdze Kamen, to a promontory named by Captain Cook *Eaſt Cape*, the land trends ſouth-eaſt. The laſt is a circular peninſula of high cliffs, projecting far into the ſea due eaſt, and joined to the land by a long and very narrow iſthmus, in lat. 66. 6. This is the Tſchutſki Noſs of our navigators, and forms the beginning of the narrow ſtraits or diviſion of the old and new world. The diſtance between Aſia and America in this place, as already mentioned, is only 13 leagues. The country about the cape, and to the north-weſt of it, was inhabited. About mid-channel are two ſmall iſlands, named by the Ruſſians the *iſles of St. Diomede*; neither of them above three or four leagues in circuit. It is extremely ſingular that Bering ſhould have ſailed through this confined paſſage, and yet that the object of his miſſion ſhould have eſcaped him. His misfortune could only be attributed to the foggy weather, which he muſt have met with in a region notorious for miſts; for he ſays that he ſaw land neither to the north nor to the eaſt. Our generous commander, determined to give him every honour his merit could claim, has dignified theſe with the name of *Bering's Straits*. The depth of theſe ſtraits is from 12 to 29 or 30 fathoms. The greateſt depth is in the middle, which has a ſlimy bottom; the ſhalloweſt parts are near each ſhore, which conſiſts of ſand mixed with bones and ſhells. The current or tide very inconſiderable, and what there was came from the weſt. From Eaſt Cape the land trends ſouth by weſt. In lat. 65. 36. is the bay in which Captain Cook had the interview with the Tſchutſki. Immediately beyond is the bay of St. Laurence, about five leagues broad in the entrance and four deep, bounded at the bottom by high land. A little beyond is a large bay, either bounded by low land at the bottom, or ſo extenſive as to have the end inviſible. To the ſouth of this are two other bays; and in lat. 64. 13. long. 186. 36. is the extreme ſouthern point of the land of the Tſchutſki. This formerly was called the *Anadirſkoi Noſs*. Near it Bering had converſation with eight men, who came off to him in a *baidar* or boat covered with the ſkins of ſeals; from which by Bering and others it has been named the *Tſchutſki Noſs*.

BERITH, a ſimple mentioned in Scripture, uſed for cleanſing or taking out ſpots (Jer. ii. 22). Some will have it to be the *kali* or ſalt-wort, from the aſhes of which ſoap is made; and in our verſion it is rendered *ſoap*: others, after Rudbeck, made it to be the dye of the purple-fiſh.

BERKELEY (George), the celebrated biſhop of Cloyne, was the ſon of a clergyman in Ireland, diſtinguiſhed only by his piety and learning. He was educated at Trinity college in Dublin, of which he attained a fellowſhip. His firſt eſſays as a writer were publiſhed in the Spectator and Guardian, which entertaining works he adorned with many pieces in favour of virtue and religion. His learning and virtues, his wit and agreeable converſation, introduced him to the acquaintance, and procured him the eſteem and friendſhip of many great and learned men; and among others the Earl of Peterborough, Dr. Swift, and Mr. Pope. The Earl made him his chaplain, and took him as his companion on a tour through Europe. During his abſence, he was elected a ſenior fellow of his college; and created Doctor of Divinity *per ſaltum*, in the year 1717.

On his return, his intercourſe with the great was extended. Lord Burlington, in particular, conceived a great eſteem for him on account of his great taſte and ſkill in architecture; an art of which his lordſhip was an excellent judge and patron, and which Mr. Berkeley had made his particular ſtudy while in Italy. By this nobleman he was recommended to the Duke of Grafton, lord lieutenant of Ireland, who took him over to Ireland in 1721, after he had been abſent from his native country more than ſix years. In 1722, his fortune received a conſiderable increaſe from a very unexpected event. On his firſt going to London in the year 1713, Dean Swift introduced him to the family of Mrs. Eſther Vanhomrigh (the celebrated Vaneſſa), and took him often to dine at her houſe. Some years before her death, this lady removed to Ireland, and fixed her reſidence at Cell-bridge, a pleaſant village in the neighbourhood of Dublin, moſt probably with a view of often enjoying the company of a man for whom ſhe ſeems to have entertained a very ſingular attachment. But finding herſelf totally diſappointed in this expectation, and diſcovering the Dean's connection with Stella, ſhe was ſo enraged at this infidelity, that ſhe altered her intention of making him her heir, and left the whole of her fortune, amounting to near 8000l. to be divided equally between two gentlemen whom ſhe named her executors; Mr. Marſhal a lawyer, afterwards one of the judges of the court of common pleas in Ireland, and Dr. Berkeley. The Doctor received the news of this bequeſt from Mr. Marſhal with great ſurpriſe, as he had never once ſeen the lady who had honoured him with ſuch a proof of her eſteem from the time of his return to Ireland to her death. In 1724, the Doctor reſigned his fellowſhip; being promoted by his patron the Duke of Grafton to the deanery of Derry, worth 1100l. *per annum*. In the interval between this removal and his re-

turn from abroad, his mind had been employed in conceiving a moſt benevolent and charitable plan for the better ſupplying of the churches in our foreign plantations, and converting the ſavage Americans to Chriſtianity, by erecting a college in the Summer Iſlands. The propoſal was well received; and he obtained a charter for the foundation, with a parliamentary grant of 20,000l. toward carrying it into execution: but he could never get the money; ſo that, after two years ſtay in America on this buſineſs, the deſign dropped. He was warmly engaged too, in concert with Swift, Bolingbroke, and others, in a ſcheme for eſtabliſhing a ſociety for the improvement of the Engliſh language, in imitation of the academy of France. But Harley, the great patron of it, falling from power, this deſign too proved abortive. In 1728, the Dean married Anne, eldeſt daughter of the Right Honourable John Forſter Eſq. ſpeaker of the Iriſh houſe of commons.

In 1734, he was advanced from the deanery of Derry to the biſhoprick of Cloyne, where he diſtinguiſhed himſelf by paſtoral vigilance and conſtant reſidence; and at once endeared himſelf to his flock, by promoting their temporal and ſpiritual happineſs. He endeavoured by all means to raiſe a ſpirit of induſtry, and propagate the arts of cultivation and agriculture in that neglected country.

When the Earl of Cheſterfield was lord lieutenant of Ireland, he offered him a richer ſee; but he declined it, ſaying, his neighbours and he loved one another, and he could not think of forming new connexions in his old days, and tearing himſelf from thoſe friends whoſe kindneſs to him was his greateſt happineſs. In 1752, however, finding the infirmities of age come upon him, and that he was unable to diſcharge the functions of his office, he retired to Oxford, there to ſpend the remainder of his days in converſation with learned men, and to ſuperintend the education of one of his ſons: and that the revenues of the church might not be miſapplied, nor the intereſts of religion ſuffer by his abſence from his dioceſe, he made great intereſt for leave to reſign his biſhoprick, and to obtain in lieu of it a canonry of Chriſt-church. Failing of ſucceſs in this, he actually wrote over to the ſecretary of ſtate, to requeſt that he might have permiſſion to reſign his biſhoprick, then worth at leaſt 1400l. *per annum*. So uncommon a petition excited his Majeſty's curioſity to enquire who was the extraordinary man that preferred it: being told it was his old acquaintance Dr. Berkeley, he declared that he ſhould die a biſhop in ſpite of himſelf, but gave him full liberty to reſide where he pleaſed. The biſhop's laſt act before he left Cloyne was to ſign a leaſe of the demeſne lands in that neighbourhood, to be renewed yearly at the rent of 200l. which ſum he directed to be diſtributed every year, until his return, among poor houſe-keepers of Cloyne, Youghal, and Aghadda. At Oxford he lived highly reſpected by the learned members of that great univerſity, till the hand of Providence unexpectedly deprived them of the pleaſure and advantage derived from his reſidence among them. On Sunday evening, January 14th 1753, as he was ſitting in the midſt of his family, liſtening to a ſermon of Dr. Sherlock's which his lady was reading to him, he was ſeized with what the phyſicians termed a palſy in the heart, and inſtantly expired. The accident was ſo ſudden, that his body was quite cold, and his joints ſtiff, before it was diſcovered; as the biſhop lay on a couch, and ſeemed to be aſleep, till his daughter, on preſenting him with a diſh of tea, firſt perceived his inſenſibility. His remains were interred at Chriſt-church, Oxford, where there is an elegant marble monument erected to his memory by his lady, who had during her marriage brought him three ſons and one daughter. As to his perſon, he was a handſome man, with a countenance full of meaning and benignity, remarkable for great ſtrength of limbs, and, till his ſedentary life impaired it, of a very robuſt conſtitution. He was however often troubled with the hypochondria, and latterly with a nervous colic. Mr. Pope ſums up his character in one line: after having mentioned ſome particular virtues that characterize other prelates, he aſcribes

"*To* Berkeley *ev'ry virtue under heav'n.*"

Of this prelate an admirable deſcription is given in the following anecdote. Biſhop Atterbury, having heard much of Mr. Berkeley, wiſhed to ſee him. Accordingly he was one day introduced to that prelate by the Earl of Berkeley. After ſome time, Mr. Berkeley quitted the room: on which Lord Berkeley ſaid to the Biſhop, "Does my couſin anſwer your Lordſhip's expectations?" The Biſhop lifting up his hands in aſtoniſhment, replied: "So much underſtanding, ſo much knowledge, ſo much innocence, and ſuch humility, I did not think had been the portion of any but angels, till I ſaw this gentleman." His knowledge is ſaid to have even extended to the minuteſt objects, and included the arts and buſineſs of common life. Thus Dr. Blackwell, in his Memoirs of the Court of Auguſtus, having made an obſervation, "that the ingenious mechanic, the workers in ſtone and metal, and improvers in trade, agriculture, and navigation, ought to be ſearched out and converſed with, no leſs than the profeſſors of ſpeculative ſcience," adds the following eulogium on our prelate: "In this reſpect I would with pleaſure do juſtice to the memory of a very great though ſingular ſort of a man, Dr. Berkeley, better known as a philoſopher, and intended founder of an univerſity in the Bermudas, or Summer Iſlands, than as biſhop of Cloyne in Ireland. An inclination to carry me out on that expedition, as one of the young profeſſors, on his new foundation, having brought us often together, I ſcarce remember to have converſed with him on that art, liberal or mechanic, of which he knew not more than the ordinary practitioners. With the wideſt views, he deſcended into a minute detail, and begrudged neither pains nor expence for the means of information. He travelled through a great part of Sicily on foot; clambered over the mountains and crept into the caverns to inveſtigate its natural hiſtory, and diſcover the cauſes of its volcanoes: and I have known him ſit for hours in forgeries and founderies to inſpect their ſucceſſive operations. I enter not into his peculiarities either religious or perſonal: but admire the extenſive genius of the man, and think it a loſs to the weſtern world that his noble and exalted plan of an American univerſity was not carried into execution. Many ſuch ſpirits in our country would quickly make learning wear another face."

Many ingenious works were publiſhed by the Biſhop, particularly The Principles of Human Knowledge, the ſingular notions in which gave riſe to much controverſy: A New Theory of Viſion: Alciphron, or the Minute Philoſopher; one of the moſt elegant and genteel defences of that religion which he was born to vindicate both by his virtues and his ingenuity: and Siris, or a Treatiſe on Tar-Water, which, under his ſanction, became for a while a very popular medicine. In the Gentleman's Magazine for January 1777, it is ſaid that the Adventures of Signor Gaudentio di Lucca have generally been attributed to biſhop Berkeley; and we have obſerved that this work is aſcribed to him by the bookſellers in their printed catalogues. It is a beautiful Utopian Romance, which was publiſhed between 30 and 40 years ago, and has gone through ſeveral editions. What external evidence there is for its having been written by our ingenious prelate we cannot ſay; but we think that the book itſelf affords no internal evidence to the contrary. There are no ſentiments in it but what might be ſuppoſed to come from Dr. Berkeley, allowing for the *coſtume* neceſſary to be preſerved in the work, according to the plan upon which it is formed. The beauty and ſingularity of imagination diſplayed in it, and the philanthropy and humanity

with which it abounds, are perfectly ſuitable to the biſhop's character. The mode of government delineated in the Romance is agreeable to his ideas. It is the patriarchal, and repreſented as being admirably contrived for promoting the general happineſs. The deſcription, in particular, of the European diſcovered in the ſouthern wilds of Africa, and of his atrocious conduct, as ariſing from his being a modern free-thinker, is quite in Berkeley's ſtyle of thinking.

BERKSHIRE, an inland county of England, which contained the whole of that Britiſh principality inhabited by the Atrebatii, who are ſuppoſed to have been originally from Gaul. When Conſtantine divided the iſland into Roman provinces in 310, this principality was included in Britannia Prima, the firſt diviſion, whoſe boundaries were the Engliſh channel on the ſouth, and the Thames and Severn on the north. On the Romans quitting the iſland, and civil diſſenſions enabling the Saxons to eſtabliſh the Heptarchy, this part of the country was included in the kingdom of the Weſt-Saxons, which commenced in 519, and continued till 828, when it became the only remaining ſovereignty, having conquered all the others, and they were incorporated by the name of England, under Egbert; whoſe grandſon, Alfred, a native of Wantage in this county, in 889 divided his kingdom into counties, hundreds, and pariſhes, and at that time this diviſion firſt received its appellation of Berkſhire or Berocſhire. At preſent it is in the Oxford circuit, the province of Canterbury, and dioceſe of Saliſbury. The general ſhape of it ſomewhat reſembles the form of a ſlipper or ſandal. It contains an area of 654 ſquare miles, or 527,000 ſquare acres, is 39 miles long, 29 broad, and is about 137 in circumference. It ſupplies 560 men to the national militia, is ſituated north-weſt from London, has 140 pariſhes, 62 vicarages, 12 market-towns, but no city: 671 villages, 135,000 inhabitants, 11,560 houſes that pay the tax, is divided into 20 hundreds, ſends nine members to parliament, two for the county, two for Windſor, two for Reading, two for Wallingford, and one for Abingdon; and pays 10 parts of the proportion of the land-tax. Its principal river is the Thames. It alſo has the Kennet, great part of which is navigable; the Loddon, the Ocke, and the Lambourne, a ſmall ſtream, which, contrary to all other rivers, is always higheſt in ſummer, and ſhrinks gradually as winter approaches. The air of this county is healthy even in the vales; and though the ſoil is not the moſt fertile, yet it is remarkably pleaſant. It is well ſtored with timber, particularly oak and beech, and produces great plenty of wheat and barley. Its principal manufactures are woollen cloth, malt, and ſail cloth.

The market towns in this county are Abingdon, Faringdon, Hungerford, Eaſt-Iſley, Lower-Lambourne, Maidenhead, Newbury, Ockingham, Reading, Wallingford, Wantage, and Windſor, remarkable for its royal caſtle, as the county is for White-horſe-hill, near Lambourne, where is the rude figure of a horſe, which takes up near an acre of ground on the ſide of a green hill, ſaid to have been made by Alfred in the reign of his brother Ethelred, as a monument to perpetuate a victory over the Danes in 871, at Aſhdown now Aſhbury-Park.

The Roman Watling-ſtreet, from Dunſtable, enters Berkſhire at the village of Streatley, between Wallingford and Reading, and croſſing this county proceeds to Marlborough. Another Roman road from Hampſhire enters this county, leads to Reading and Newbury, the Spinæ of Cambden, where it divides: one branch extends to Marlborough in Wilts, and the other to Cirencester in Glouceſterſhire. A branch from the Icknield-ſtreet proceeds from Wallingford to Wantage. Near the laſt-mentioned place is a Roman camp, of a quadrangular form, ſituated on the brow of a hill; and there are other remains of encampments at Eaſt-Hampſtead, near Ockingham, near White-horſe hill, near Puſey, and upon Sinodun-hill, near Wallingford. At Lawrence Waltham is a Roman fort, and near Denchworth is Cherbury caſtle a fortreſs of Canute. Uffington caſtle, near White-horſe-hill, is ſuppoſed to be Daniſh; and near it is Dragon-hill, ſuppoſed to be the burying place of Uter Pendragon, a Britiſh prince. Near White-horſe-hill are the remains of a funeral monument of a Daniſh chief ſlain at Aſhdown by Alfred. In this county the following antiquities are worthy the notice of travellers: Abingdon church and abbey; Aldworth caſtle, near Eaſt Iſley: Bytham monaſtery; Dunnington caſtle; Lambourne church; Reading abbey; Sunning chapel; Wallingford church and caſtle; Windſor caſtle beggars all deſcription for ſituation, &c. Berkſhire is an earldom belonging to a branch of the Howard family, the repreſentative being earl of Suffolk and Berkſhire.

BERLIN, a city of Germany, capital of the electorate of Brandenburg, and of the whole Pruſſian dominions, ſeated in E. long. 13. 37. N. lat. 52. 53. This city is one of the largeſt, beſt built, and beſt governed, of any in Germany. The ſtreets are large, ſtraight, clean, and well paved, and ſome of them very long and elegant. There are alſo ſeveral large and beautiful ſquares, with pleaſant walks. It is ſurrounded with handſome gardens, which produce excellent fruit. The river Spree, that croſſes the city, has a communication with the Havel Oder, and Elbe, which greatly facilitate commerce. The French refugees have greatly contributed to the embelliſhment of the grandeur of Berlin; inaſmuch as they have introduced all kinds of arts and manufactures there.

The place is divided into five parts, without reckoning the ſuburbs, which are very large. The houſes in theſe laſt are almoſt all of wood; but ſo well plaſtered, that they ſeem to be of ſtone. In the ſuburb called *Spandau* is a houſe belonging to the royal family, with well contrived apartments, and furniſhed in a very fine taſte. In the ſuburb of Stralau is a houſe and garden belonging to the king. The royal gate of the city is defended by a half moon, and two baſtions, covered with brick; it fronts the royal ſtreet, which is one of the longeſt and moſt frequented in the city. It contains very handſome houſes, particularly thoſe belonging to ſome of the ſtate officers and miniſters. The royal ſtreet is croſſed by five others, which are large and fine. On the new bridge, which is of ſtone, over the Spree, is an equeſtrian ſtatue of William the Great, which is eſteemed an exquiſite piece of workmanſhip. The elector is repreſented in a Roman habit, his horſe ſtanding on a pedeſtal of white marble adorned with baſſo relievos, and four ſlaves are bound to the baſe.

After paſſing this bridge, we ſee the king's palace, which is a ſuperb edifice, four ſtories high, and the apartments extremely magnificent. No palace in Europe has ſuch a great quantity of ſilver tables, ſtands, luſtres, branched candleſticks, &c. In the knights hall there is a buffet, which takes up all one ſide, where there are baſons and ciſterns of gilt ſilver, of extraordinary magnitude. The furniture of the great apartment is extremely rich; and there is a very handſome gallery, adorned with paintings, repreſenting the principal actions of Frederic I. Formerly there were fine gardens to the palace, but they are now turned into a place of arms. The king's ſtables are large, ſtand near the palace, and front the great ſtreet. Externally they make a Gothic appearance, but within they are very magnificent. The mangers are of ſtone, and the pillars that divide the ſtalls are of iron, adorned with the king's cypher, gilt. Over the racks are pictures repreſenting the fineſt horſes which the king's ſtud has produced. Over the ſtables there are large rooms, containing all ſorts of horſe-furniture, particularly the horſe-equipage of Frederic I. all the metallic part of which is gold, ſet with diamonds. Beſides theſe, there are handſome lodgings for the officers of the ſtables. Over the riding-houſe is a theatre, where plays have

been acted, and balls have been made for the court's amuſement.

The arſenal conſiſts of four grand buildings, that form a court in the middle, like a college: each front has three large porticos. On the principal gate is a medallion of Frederic II. in bronze; and the four cardinal virtues, of a coloſſal ſtature, placed on pedeſtals on each ſide of the portico, ſeem to look at the portrait of the king, which is ſupported by Fame and Victory. The Corinthian order is prevalent in the firſt ſtage, and is managed with a great deal of art. The whole edifice is ſurrounded in the upper part with a balluſtrade, adorned with trophies and ſtatues, among which is Mars ſeated on a heap of ſeveral ſorts of arms. This altogether forms a noble and majeſtic decoration. It is bounded with iron in the ſhape of cannon, which are placed at proper diſtances, and ſupport iron chains that hang like feſtoons, to prevent paſſengers from approaching the windows below. The lower rooms are filled with a great number of braſs cannon; the walls and pillars which ſuſtain the floor are ſet off with cuiraſſes and helmets. The upper ſtory contains ſeveral rooms filled with arms, which are diſpoſed in a curious order. Behind the arſenal is the houſe of the general of the artillery, which includes the foundery, where they are continually at work. Beſides this there are other places where the train of artillery is kept.

The opera-houſe at Berlin is an elegant modern edifice. The front has a noble portico ſupported by Corinthian columns, and a pediment adorned with baſſo relievos and ſtatues. The columns that ſupport the roof throw the whole into a grand ſaloon. It has three galleries, and is ſaid to be capable of containing 2000 ſpectators.

A rampart and foſſe ſeparate Worder from Dorothea Stadt, or the New Town, inhabited chiefly by French. There are ſeven great alleys or walks, which divide this quarter into two parts. The middle walk is broader than the reſt, and is ſurrounded with balluſtrades, having a graſs-plot in the middle: this is for perſons that take the air on foot. The alleys on each ſide are paved, and ſerve for thoſe that come abroad in coaches. Theſe alleys, which are about three miles in length, are terminated with a bar, that leads towards the park. The alleys with trees are bounded by rows of houſes. In one of theſe is a building, formerly called the *leſſer ſtables*, and now made into lodgings for the guards. The apartments above theſe are occupied by the academy of painting and the academy of arts and ſciences. Behind theſe is the obſervatory, where there is a great number of aſtronomical and mathematical machines.

There are many other things worthy of obſervation, ſuch as the cabinet of medals, and of the antiquities belonging to the king; that of natural curioſities; the chemical laboratory, and its furnaces and medals, of a new invention; the theatre for anatomical demonſtrations; the royal library, which is one of the completeſt in Germany, and has many ſcarce books and manuſcripts.

This city was taken in 1760 by an army of Ruſſians, Auſtrians, Saxons, &c. who entered on the 9th of October. They totally deſtroyed the magazines, arſenals, and founderies, ſeized an immenſe quantity of military ſtores, and a number of cannon and arms; called firſt for the immediate payment of 800,000 guilders, and then laid on a contribution of 1,500,000 German crowns: not ſatisfied with this, many irregularities were committed by the ſoldiery; but on the whole, though ſome ſhocking actions were committed, a far more exact diſcipline was obſerved than from ſuch troops could have been expected upon ſuch an occaſion, where there was every incentive which could work upon the licence of a conquering army. Their officers no doubt with great difficulty preſerved even that degree of order. But though their behaviour was tolerable with regard to the private inhabitants, there was ſomething ſhocking and ungenerous in their treament of the king's palaces. The apartments of the royal caſtle of Charlottenburgh were entirely plundered, the precious furniture ſpoiled, the pictures defaced, without even ſparing the antique ſtatues collected by cardinal Polignac, which had been purchaſed by the houſe of Brandenburgh. The caſtle of Schonhauſen, belonging to the queen, and that of Fredericsfeld, belonging to the Margrave Charles, were alſo pillaged.

The palace of Potſdam, the famous Sans-ſouci, had a better fate; Prince Eſterhaſi commanded there, and it was preſerved from the ſmalleſt violation. The prince, on viewing the palace, only aſked which picture of the king reſembled him moſt; and being informed, deſired that he might have leave to take it, together with two German flutes which the king uſed, to keep them, he ſaid, in memory of his majeſty. This was a ſort of taking very different from plunder. They ſtaid in the city four days: but hearing that the king, apprehenſive of this ſtroke, was moving to the relief of his capital, they quitted it on the 13th of October; and having waſted the whole country round for a vaſt extent, and driven away all the cattle and horſes they could find, retreated by different routes out of Brandenburgh.

BERLIN, a ſort of four-wheeled vehicle, of the chariot kind; taking its name from the city of Berlin, in Germany: though ſome attribute the invention of it to the Italians, and derive the word from *berlina*, a name given by them to a ſort of ſtage, whereon perſons are expoſed to public ſhame. The berlin is a very convenient machine to travel in, being lighter, and leſs apt to be overturned, than a chariot. The body of it is hung high, on ſhafts, by leathern braces; there being a kind of ſtirrup, or footſtool, for the convenience of getting into it: inſtead of ſide-windows, ſome have ſereens to let down in bad, and draw up in good, weather.

BERME, in fortification, a ſpace of ground left at the foot of the rampart, on the ſide next the country, deſigned to receive the ruins of the rampart, and prevent their filling up the foſſe. It is ſometimes paliſadoed, for greater ſecurity; and in Holland it is generally planted with a quick-ſet hedge. It is alſo called *liziere*, *relais*, *foreland*, *retrait*, *pais de ſouris*, &c.

BERMUDAS, or SUMMER-ISLANDS, a cluſter of ſmall iſlands in the Atlantic ocean, lying almoſt in the form of a ſhepherd's crook, in W. long. 65. N. lat. 32. 30. between 200 and 300 leagues diſtant from the neareſt place of the continent of America, or any of the other Weſt-India iſlands. The whole number of the Bermudas iſlands is ſaid to be about 400, but very few of them are habitable. The principal is St. George's, which is not above 16 miles long, and three at moſt in breadth. It is univerſally agreed, that the nature of this and the other Bermudas iſlands has undergone a ſurpriſing alteration for the worſe ſince they were firſt diſcovered; the air being much more inclement, and the ſoil much more barren, than formerly. This is aſcribed to the cutting down thoſe fine ſpreading cedar-trees for which the iſlands were famous, and which ſheltered them from the blaſts of the north-wind, at the ſame time that it protected the undergrowth of the delicate plants and herbs. In ſhort, the Summer-iſlands are now far from being deſirable ſpots; and their natural productions are but juſt ſufficient for the ſupport of the inhabitants, who, chiefly for that reaſon perhaps, are temperate and lively even to a proverb: at firſt tobacco was raiſed upon theſe iſlands; but being of a worſe quality than that growing on the continent, the trade is now almoſt at an end. Large quantities of ambergris were alſo originally found upon the coaſts, and afforded a valuable commerce; but that trade is alſo reduced, as likewiſe their whale trade, though the perquiſites upon the latter form part of the governor's revenue, he having 10l. for every whale that is caught. The Bermudas iſlands, however, might ſtill

produce ſome valuable commodities, were they properly cultivated. There is here found, about three or four feet below the ſurface, a white chalk ſtone which is eaſily chiſſeled, and is exported for building gentlemen's houſes in the Weſt-Indies. Their palmetto leaves, if properly manufactured, might turn to excellent account in making women's hats; and their oranges are ſtill valuable. Their ſoil is alſo ſaid to be excellent for the cultivation of vines, and it has been thought that ſilk and cochineal might be produced; but none of theſe things have yet been attempted. The chief reſource of the inhabitants for ſubſiſtence is in the remains of their cedar-wood, of which they fabricate ſmall ſloops, with the aſſiſtance of the New-England pine, and ſell many of them to the American colonies, where they are much admired. Their turtle-catching trade is alſo of ſervice; and they are ſtill able to rear great variety of tame fowl, and have wild ones abounding in vaſt plenty. All the attempts to eſtabliſh a regular whale-fiſhery on theſe iſlands have hitherto proved unſucceſsful; they have no cattle, and even the black hog breed, which was probably left by the Spaniards, is greatly decreaſed. The water on the iſlands, except that which falls from the clouds, is brackiſh; and at preſent the ſame diſeaſes reign there as in the Caribbee iſlands. They have ſeldom any ſnow, or even much rain; but when it does fall, it is generally with great violence, and the north or north-eaſt wind renders the air very cold. The ſtorms generally come with the new moon; and if there is a halo or circle about it, it is a ſure ſign of a tempeſt, which is generally attended with dreadful thunder and lightning. The inhabited parts of the Bermuda iſlands are divided into nine diſtricts called *tribes*. 1. St. George. 2. Hamilton. 3. Ireland. 4. Devonſhire. 5. Pembroke. 6. Pagets. 7. Warwick. 8. Southampton. 9. Sandys. There are but two places on the large iſland where a ſhip can ſafely come near the ſhore, and theſe are ſo well covered with high rocks that few will chooſe to enter in without a pilot; and they are ſo well defended by forts, that they have no occaſion to dread an enemy. St. George's town is at the bottom of the principal haven; and is defended by nine forts, on which are mounted 70 pieces of cannon that command the entrance. The town has a handſome church, a fine library, and a noble town-houſe, where the governor, council, &c. aſſemble. Beſides theſe there are about 1000 houſes well built. The tribes of Southampton and Devonſhire have each a pariſh-church and library, and the former has a harbour of the ſame name: there are alſo ſcattered houſes and hamlets over many of the iſlands, where particular plantations require them. The inhabitants are clothed chiefly with Britiſh manufactures, and all their implements for tilling the ground and building are made in England.

Who were the firſt diſcoverers of the Bermudas, is a point not yet well aſcertained. John Bermudas a Spaniard is commonly ſaid to have diſcovered them in 1527; but this is diſputed, and the diſcovery attributed to Henry May an Engliſhman. As the iſlands were without the reach of the Indian navigation, the Bermudas were abſolutely uninhabited when firſt diſcovered by the Europeans. May abovementioned was ſhipwrecked upon St. George's; and with the cedar which they felled there, aſſiſted by the wreck of their own ſhip, he and his companions built another which carried them to Europe, where they publiſhed their accounts of the iſlands. When Lord Delawar was governor of Virginia, Sir Thomas Gates, Sir George Summers, and Captain Newport, were appointed to be his deputy-governors; but their ſhip being ſeparated by a ſtorm from the reſt of the ſquadron, was in the year 1609 wrecked on the Bermudas, and the governors diſagreeing among themſelves, built each of them a new ſhip of the cedar they found there, in which they ſeverally ſailed to Virginia. On their arrival there, the colony was in ſuch diſtreſs, that Lord Delawar, upon the report which his deputy-governors made him of the plenty they found at the Bermudas, diſpatched Sir George Summers to bring proviſions from thence to Virginia in the ſame ſhip which brought him from Bermudas, and which had not an ounce of iron about it except one bolt in the keel. Sir George, after a tedious voyage, at laſt reached the place of his deſtination, where, ſoon after his arrival, he died, leaving his name to the iſlands, and his orders to the crew to return with black hogs to the colony of Virginia. This part of his will, however, the ſailors did not chooſe to execute; but ſetting ſail in their cedar ſhip for England, landed ſafely at Whitchurch in Dorſetſhire.

Notwithſtanding this dereliction of the iſland, however, it was not without Engliſh inhabitants. Two ſailors, Carter and Waters, being apprehenſive of puniſhment for their crimes, had ſecreted themſelves from their fellows when Sir George was wrecked upon the iſland, and had ever ſince lived upon the natural productions of the ſoil. Upon the ſecond arrival of Sir George they enticed one Chard to remain with them; but differing about the ſovereignty of the iſland, Chard and Waters were on the point of cutting one another's throats, when they were prevented by the prudence of Carter. Soon after, they had the good fortune to find a great piece of ambergris weighing about 80 pounds, beſides other pieces, which in thoſe days were ſufficient, if properly diſpoſed of, to have made each of them maſter of a large eſtate. Where they were, this ambergris was uſeleſs; and therefore they came to the deſperate reſolution of carrying themſelves and it in an open boat to Virginia or to Newfoundland, where they hoped to diſpoſe of their treaſure to advantage. In the mean time, however, the Virginia Company claimed the property of the Bermudas iſlands; and accordingly ſold it to 120 perſons of their own ſociety, who obtained a charter from King James for their poſſeſſing it. This New Bermudas Company, as it was called, fitted out a ſhip with 60 planters on board to ſettle on the Bermudas, under the command of one Mr. Richard Moor, by profeſſion a carpenter. The new colony arrived upon the iſland juſt at the time the three ſailors were about to depart with their ambergris; which Moor having diſcovered, he immediately ſeized and diſpoſed of it for the benefit of the company. So valuable a booty gave vaſt ſpirit to the new company; and the adventurers ſettled themſelves upon St. George's iſland, where they raiſed cabins. As to Mr. Moor, he was indefatigable in his duty, and carried on the fortifying and planting the iſland with incredible diligence; for we are told, that he not only built eight or nine forts or rather blockhouſes, but inured the ſettlers to martial diſcipline. Before the firſt year of his government was expired, Mr. Moor received a ſupply of proviſions and planters from England; and he planned out the town of St. George as it now ſtands. The fame of this ſettlement ſoon awakened the jealouſy of the Spaniards, who appeared off St. George's with ſome veſſels; but being fired upon from the forts, they ſheered off, though the Engliſh at that time were ſo ill provided for a defence, that they had ſcarce a ſingle barrel of gunpowder on the iſland. During Moor's government the Bermudas were plagued with rats which had been imported into them by the Engliſh ſhips. This vermin multiplied ſo faſt in St. George's iſland, that they even covered the ground, and had neſts in the trees. They deſtroyed all the fruits and corn within doors; nay, they increaſed to ſuch a degree, that St. George's iſland was at laſt unable to maintain them, and they ſwam over to the neighbouring iſlands, where they made as great havock. This calamity laſted five years, though probably not with equal violence, and at laſt it ſuddenly ended.

When Moor's government terminated, he was ſucceeded by Captain Daniel Tucker, who improved all his predeceſſor's ſchemes for the benefit of the iſland, and particularly en-

couraged the culture of tobacco. Being a ſevere diſciplinarian, he held all under him ſo rigidly to duty, that five of his ſubjects planned as bold an enterpriſe for liberty as was perhaps ever put in execution. Their names were Barker, who is ſaid to have been a gentleman; another Barker, a joiner; Goodwin, a ſhip-carpenter; Paet, a ſailor; and Saunders, who planned the enterpriſe. Their management was as artful as their deſign was bold. Underſtanding that the governor was deterred from taking the pleaſure of fiſhing in an open boat, on account of the dangers attending it, they propoſed to build him one of a particular conſtruction, which accordingly they did in a ſecret part of the iſland; but when the governor came to view his boat, he underſtood that the builders had put to ſea in it. The intelligence was true: for the adventurers, having provided themſelves with the few neceſſaries they wanted, ſailed for England; and notwithſtanding the ſtorms they encountered, their being plundered by a French privateer, and the incredible miſeries they underwent, they landed in 42 days time at Corke in Ireland, where the Earl of Thomond generouſly relieved and entertained them.

In the year 1619 Captain Tucker reſigned his government to Captain Butler. By this time the high character which the Summer iſlands bore in England rendered it faſhionable for men of the higheſt rank to encourage their ſettlement; and ſeveral of the firſt nobility of England had purchaſed plantations among them. Captain Butler brought over with him 500 paſſengers, who became planters on the iſlands, and raiſed a monument to the memory of Sir George Summers. The iſland was now ſo populous (for it contained about a thouſand whites), that Captain Butler applied himſelf to give it a new conſtitution of government by introducing an aſſembly, the government till now having been adminiſtered only in the name of the governor and council. A body of laws was likewiſe drawn up, as agreeable to the laws of England as the ſituation of the iſland would admit of. One Mr. Barnard ſucceeded Captain Butler as governor, but died ſix weeks after his arrival on the iſland; upon which the council made choice of Mr. Harriſon to be governor till a new one ſhould be appointed. No fewer than 3000 Engliſh were now ſettled in the Bermudas, and ſeveral perſons of diſtinction had curioſity enough to viſit it from England. Among theſe was Mr. Waller the poet, a man of fortune, who being embroiled with the parliament and commonwealth of England, ſpent ſome months in the Summer iſlands, which he has celebrated in one of his poems as the moſt delightful place in the world. The dangers attending the navigation, and the untowardly ſituation of theſe iſlands, through their diſtance from the American continent, ſeem to be the reaſons why the Bermudas did not now become the beſt peopled iſlands belonging to England; as we are told that ſome time ago they were inhabited by no fewer than 10,000 whites. The inhabitants, however, never ſhowed any great ſpirit for commerce, and thus they never could become rich. This, together with the gradual alteration of the ſoil and climate already taken notice of, ſoon made them dwindle in their population; and it is computed that they do not now contain above half the number of inhabitants they once did, and even theſe ſeem much more inclined to remove to ſome other place than to ſtay where they are; ſo that unleſs ſome beneficial branch of commerce be found out, or ſome uſeful manufacture eſtabliſhed, the ſtate of the Bermudas muſt experience a gradual but inevitable decline.

BERN, one of the cantons of Switzerland, which holds the ſecond rank among the 13; but as it is by far the largeſt in extent, containing almoſt one-third of the whole country, it ſeems juſtly intitled to be the firſt. It is bounded to the north by the cantons of Baſil and Solothurn, and the Auſtrian foreſt-towns: to the ſouth by the lake of Geneva, the Valais, and duchy of Savoy; to the eaſt by Uri, Underwald, Lucern, and the county of Baden; and to the weſt by Solothurn, Neufchatel, Franche-Comté, the diſtrict of Biel, and the land of Gex. It is the moſt fruitful, the richeſt, and by much the largeſt, of all the cantons, extending in length about ſixty leagues, and about thirty where broadeſt. It yields not only plenty of grain, fruit, and paſture; but alſo good wine, a variety of coloured earths and clays, ſand-ſtone, mundick, gypſum, pit-coal, ſulphur, and iron-ore. Here likewiſe are large herds of cattle, great and ſmall; and, in conſequence of that, great quantities of milk, butter, and cheeſe. The rivers that water this canton are the Aar, the Emmat, the Wigger, the Aaa, the Ruſz, the Limmat, the Sanen, the Senſen, and the Kandel. The principal lake is that of Geneva; the length of which is about 18 leagues, and the greateſt breadth between three and four. The depth in ſome places is near 400 fathoms, in others not above 40. The Rhone enters it at the eaſt end near Bouveret, and iſſues out again at the weſt cloſe by Geneva. In ſummer its waters are much ſwelled by the melting of the ſnow on the mountains. This lake, however, is not entirely ſurrounded by the territory of Bern, but partly by Savoy and the country of Gex; the former of which belongs to the king of Sardinia, and the latter to France, and the territory of Sion. Its borders are extremely fertile and beautiful, being much embelliſhed with vineyards, which yield excellent wine, and interſperſed with towns and villages, betwixt which a conſiderable commerce is carried on. The other great lakes, that are wholly or partly within this canton, are thoſe of Neufchatel, Biel, Murte, Thun, Brien, and Halwyl, which all abound in fiſh, particularly that of Geneva, where trouts are ſometimes caught weighing 40 or 50 pounds. In that of Biel, called alſo the *Nydau-lake*, are two ſmall iſlands, one of which is very beautiful. This lake is about three leagues in length and one in breadth. Along the whole weſt and north-weſt ſides of the canton runs that chain of mountains called by the general name of *Jura*; but the ſeveral mountains of which it is compoſed have all their particular names. This canton is well cultivated, and very populous, the number of its ſubjects being computed at 400,000. German is the prevailing language, but almoſt all the people of faſhion ſpeak either French or Italian; even the common people in the Pais de Vaud, and other places that lie towards France or Italy, ſpeak a corrupt French or Italian, or a jargon compoſed of both. The eſtabliſhed religion here and the other Proteſtant cantons is Calviniſm, the ſame both in doctrine and diſcipline as in Holland; nor is any other tolerated, except in the common bailiages, and the vale of Frick. The miniſters are divided into deaneries and claſſes, and hold yearly chapters or ſynods. They are kept in a greater dependence on the civil power here than in the other cantons, and not ſuffered to interfere with matters of ſtate. The city of Bern firſt joined the confederacy in the year 1353. Towards the defence thereof the canton now furniſhes 2000 men. Every male from 16 to 60 is inrolled in the militia, and about a third of them regimented. There are officers for every diſtrict, whoſe province it is to ſee that the men be regularly exerciſed; that their arms, ammunition, and clothing, be in good condition; and that they be kept in a conſtant readineſs to march. Once a-year they are drawn out to a general review. The ſame attention is paid to thoſe that belong to the train of artillery. Some regiments conſiſt of married, and ſome of unmarried men; ſome of foot, others of dragoons. There is alſo one regiment and a troop of cuiraſſiers. The latter conſiſts entirely of burghers of Bern. Both the horſemen and footmen find their horſes, arms, and accoutrements. Beſides the arms and artillery in the arſenal at Bern, all the caſtles, where the country governors or bailiffs reſide, are well furniſhed with

them. At Bern is a conſtant guard or garriſon of 200 men, and a ſmall garriſon at Fort Arburg. In the ſame city is alſo an office, which grants licences for levies to foreign powers, and where the recruits make their appearance and are regiſtered. The bailiffs have the chief direction of affairs in their ſeveral diſtricts, being generals of the militia, and preſiding in the courts of juſtice; but, in civil cauſes above a certain value, an appeal lies from them to Bern; and, in capital caſes, their ſentence muſt be confirmed by the great council before it can be executed. When any bailiwick is to be diſpoſed of, as many balls as there are competitors are put into a bag, whereof one is gilt, and he that draws that is the ſucceſsful candidate.

It is remarked by Mr. Keyſler, that the wealthieſt peaſants in Switzerland are thoſe of Bern; it being difficult to find a village without one, at leaſt, who is worth between 20,000 or 30,000 guilders, and ſometimes even 60,000. He ſays, the common people of both ſexes wear ſtraw hats, and that the women's petticoats are tied up ſo near their arm pits, that hardly an hand's-breadth is left for their ſhape; that the inns, not only in this canton but throughout Switzerland, are in general very good; that the manners of the people were, in many reſpects, greatly changed within 50 years before he viſited them, which was ſeveral years ago, and conſequently muſt be much more ſo now; that, inſtead of the plainneſs and honeſt ſimplicity of their anceſtors, the love of ſuperfluities and high living greatly prevailed; that luxury, pomp, and that infatuation for foreign productions which had infected moſt parts of Europe, had alſo extended its contagious influence to Switzerland, though not to ſuch a degree as in many other countries. Dr. Burnet ſays, that drinking is ſo common, and produces ſo many quarrels and diſorders, that the bailiffs not only ſubſiſt by the fines payable for them, but often get eſtates, carrying perhaps 20,000 crowns at the end of five years to Bern; that their law is ſhort and clear, inſomuch that the moſt intricate ſuit is ended after two or perhaps three hearings, either in the firſt inſtance before the bailiff, or in the ſecond at Bern; that the civility expreſſed in this country to women, at firſt meeting them, is not by ſaluting them, but by ſhaking them by the hand, and that none but ſtrangers take off their hats to them. Mr. Addiſon ſays, that the peaſants are generally clothed in a coarſe kind of canvas, the manufacture of the country, and that their holiday-clothes go from father to ſon; ſo that it is not uncommon to ſee a countryman in his great-grandfather's doublet and breeches; that the belief of witchcraft prevailed among them ſo much, that there were ſome executions on that account while he was in the country; that the queſtion, or torture, is uſed not only in this canton but all over Switzerland; that though the ſubjects of the ſtate are rich, the public is poor; and though they could oppoſe a ſudden invaſion, yet that their unkindly ſoil requires ſuch a number of hands to cultivate it, that they could not ſpare the reinforcements and recruits that would be neceſſary in a long war. Upon extraordinary occaſions, however, they boaſt that they can raiſe 80,000 men in 24 hours. This canton is divided into the German country, that is, that part of the canton in which the German tongue is ſpoken, and which is alſo called the *ancient canton*, extending from Morat to the county of Baden; and the Roman, called alſo the *Waal*, and *Pais de Vaud*. The former of theſe contains 35 bailiwicks and about 300 pariſhes.

Bern, a city of Switzerland, and capital of the canton of that name, is ſituated in E. long. 7. 40. N. lat. 40. 0. It is ſaid that the taking of a bear on the day on which the foundation of this city was laid, gave occaſion to its name; hence it is often in Latin called *Arctopolis*, i. e the city of the bear, and has a bear for its coat of arms. It is almoſt ſurrounded by the river Aar. The houſes are moſtly built of white free-ſtone, and, in the principal ſtreets, have piazzas or arches under them, for the conveniency of walking dry in wet weather. Moſt of the ſtreets are paved with flints, and traverſed by a canal lined with free-ſtone, which is brought from a conſiderable diſtance, and is very uſeful in carrying off the filth of the city, extinguiſhing fires, and other purpoſes. The city is large, ſtanding almoſt in the middle of the canton, and containing ſeveral churches, of which one is called the *Great Church*, and the firſt miniſter thereof *the dean*, who is the head of the city-clergy. From an inſcription near the great door of this church, it appears that the firſt ſtone of it was laid in 1421. Over the ſame door is a repreſentation of the laſt judgment, in which the ſculptor hath placed the pope among the damned. In this city is alſo a college with eight profeſſors, a large public library, and a muſeum; a ſtately granary, in which a great quantity of corn is always kept; a guildhall; a well ſtored arſenal; and ſeveral hoſpitals. In the arſenal is a wooden ſtatue of the famous Tell, which repreſents him as taking aim at the apple placed on the head of his ſon. There is alſo the ſtatue of Berchtold von Zahringen, the founder of the city; and two large horns of buffaloes or wild bulls, called in Latin *Uri*, ſuch as are uſed in war by the canton of Uri, inſtead of trumpets, and taken from it in the year 1712. Hard by alſo hang the groteſque dreſſes of thoſe who blew them. The inhabitants of Uri, who boaſt their deſcent from the old Tau, bear a buffalo's head on their riſci, coat of arms; and the perſon who blows the great horn in time of war, is called the *bull of Uri*. In the Dominican church, a hole in the wall is always ſhown to ſtrangers, by means of which, it having a communication with the cell of a monk in an adjoining monaſtery, the pious fraud of making an image of the Virgin appear to ſpeak was once carried on, which for a while anſwered the purpoſes of the monks very well; but they were at laſt detected and puniſhed. This city, though larger, is not ſo populous nor ſo well built as that of Zurich. On the eaſt ſide of it is a handſome ſtone bridge; and near the great church is a very fine platform ſome hundred feet in height, which makes a moſt delightful walk, being planted with limes, and commanding a charming proſpect, particularly of the mountains of the Griſons, covered with ſnow in the midſt of ſummer. In 1654 a ſtudent of divinity, being on horſeback, and in liquor, leaped over this terrace without receiving any other hurt than breaking a leg, and lived many years after, but the horſe was killed. In the upper part of the city are always kept a number of bears in two incloſures, with firtrees for them to clamber and play upon. Of the burghers of Bern, only thoſe are qualified for the government and magiſtracy of the city who are the deſcendants of ſuch as were made burghers before the year 1635. Other qualifications are alſo neceſſary; in particular they muſt not be under 30 years of age, and muſt be inrolled in one of the 12 companies. To obtain a country government, or to hold any conſiderable employment, the candidate alſo muſt be married. The great council, in which the ſovereignty of the canton is veſted, conſiſts, when full, of 229; but is generally much ſhort of that number, 80 or more often dying before their places are filled up. The leſſer council ſenate, or, as it is called, the *daily council*, becauſe it meets every day, Sundays and holidays excepted, conſiſts of 27 members, including the two prætors or advoyers, the four tribunes of the people, the two treaſurers, and the two heimlichers or ſecrecy-men, ſo called becauſe to them all ſecrets relating to the ſtate are diſcovered. The members of the great and little councils mutually fill up the vacancies that happen in theſe two colleges. How the bailiffs are choſen we have already taken notice. Our limits will not permit us to enter into any farther detail with reſpect to the govern-

ment: only it is to be obſerved in general, that all the officers of any note are choſen out of the great or little councils; and that all the bailiffs and caſtellans of the canton continue ſix years in office. The trade of the city is not very great, but was leſs before the French refugees ſettled there: ſome, however, doubt whether it has been a gainer by them; as by their introduction of French modes and luxury, they have helped to baniſh the ancient Helvetic ſimplicity and frugality. The territory immediately under its juriſdiction is divided into four governments, with which the four venners, or ſtandard-bearers, are inveſted. It declared for the reformation in 1528, after a ſolemn diſputation. Here the Britiſh envoy to the cantons reſides.

Bern-*Machine*, the name of an engine for rooting up trees, invented by Peter Sommer, a native of Bern in Switzerland. A repreſentation of this machine is given in Plate 47, drawn from a model in the machine-room of the Society for the Encouragement of Arts, Manufactures and Commerce. It conſiſts of three principal parts; the beam, the ram, and the lever. The beam A B C, Fig. 1. of which only one ſide can be ſeen, is compoſed of two ſtout planks of oak three inches thick at leaſt, and ſeparated by two tranſverſe pieces of the ſame wood at A and C, about three inches thick. Theſe planks are bored through with correſponding holes, as repreſented in the plate, to receive iron pins, upon which the lever acts between the two ſides of the beam, and which is ſhifted higher and higher as the tree is raiſed or rather puſhed out of its place. The ſides are well ſecured at the top and bottom by ſtrong iron clamps and hoops. The iron pins on which the lever reſts ſhould be an inch and a quarter, and the holes through which they paſs an inch and a half in diameter. The poſition of theſe holes is ſufficiently indicated by the figure. The foot of the beam, when the machine is in action, is ſecured by ſtakes repreſented at G, driven into the earth. The ram D, which is made of oak, elm, or ſome other ſtrong wood, is capped with three ſtrong iron ſpikes, repreſented at *f*, which penetrate the tree. This ram is ſix or eight inches ſquare; and a ſlit is cut lengthwiſe through the middle of it, from its lower end at K to the firſt ferule *a*, in order to allow room for the chain *g h* to play round the pulley K, which ſhould be four inches thick, and nine inches in diameter. This ram is raiſed by means of the chain *g h*, which ſhould be about ten feet long, with links four inches and three quarters in length, and an inch thick. One end of this chain is faſtened to the top of the beam at C, while the other, after paſſing through the lower part of the ram, and over the pulley K, terminates in a ring or link repreſented by Fig. 3. the two ears *m n* of which ſerve to keep it in a true poſition between the two planks of the beam. In this ring the hook P is inſerted. The hook is repreſented in profile at Fig. 2. where F is the part that takes hold of the ring. But it muſt be obſerved, that the parts of this machine, repreſented at Fig. 2 and 3, are drawn on a ſcale twice as large as the engine is drawn. The hook F, Fig. 2. ſhould be made of very tough iron, as well as the handle D, and the arch E *c*. This handle ſhould be two inches thick at *z*, where it joins to the hook, and the thickneſs ſhould leſſen by degrees up to the arch, which need not be more than half an inch thick. On each ſide of the pin *z*, is a ſemicircular notch, *x*, *y*, which reſts alternately on the pins when the machine is worked. The hole D, and the arch E *c*, ſerve to fix a long lever of wood E F, Fig. 1. by means of two iron pins; and by this contrivance the lever is either raiſed or depreſſed at pleaſure, in order to render the working of the machine eaſy in whatever part of the beam the lever may be placed: for without this contrivance the extremity of the lever E F, would, when the handle is near the top of the beam, be much higher than men ſtanding upon the ground could reach. It muſt however be remembered, that the lever is often ſhortened by this contrivance, and its power leſſened by that means.

The Bern machine is worked in the following manner: It is placed againſt a tree, in the poſition repreſented in the figure, ſo that the iron ſpikes at *f* may have hold of the tree, and the end of the beam A be ſupported by ſtakes repreſented at G. The iron handle, Fig. 2. is placed in the opening between the two planks of the beam, and the wooden lever fixed to it by means of the iron pins already mentioned. The hook F takes hold of the chain, and one of the iron pins is thruſt into the outer row of holes, by which means the outer notch *x* will reſt on the pin, which will be now the centre of motion, and the end of the lever E, Fig. 1. being preſſed downwards, the other notch *y*, Fig. 2. will be raiſed, and at the ſame time the chain, and conſequently the ram. The other iron pin is now to be thruſt into the hole in the inner row, next above that which was before the centre of motion, and the end of the lever E elevated or puſhed upwards, the latter pin on which the notch *y* reſts now becoming the centre of motion. By this alternate motion of the lever, and ſhifting the pins the chain is drawn upwards over the pulley K, and conſequently the whole force of the engine exerted againſt the tree. There is a ſmall wheel at L, in order to leſſen the friction in that part.

It is eaſy from this account to perceive, that the machine is nothing more than a ſingle pulley compounded with a lever of the firſt and ſecond order. It muſt however be remembered, that as the puſh of the engine is given in an oblique direction, it will exert a greater or leſſer force againſt the horizontal roots of the tree in proportion to the angle formed by the machine with the plane of the horizon; and that the angle of 45° is the maximum, or that when the machine will exert its greateſt force againſt the horizontal roots of the tree.

BERNACLE, in ornithology, a ſpecies of gooſe. See Anas.

BERNARD (St.), the firſt abbot of Clairvaux, was born in the year 1091, in the village of Fountaine, in Burgundy. He acquired ſo great a reputation by his zeal and abilities that all the affairs of the church appeared to reſt on his ſhoulders, and kings and princes ſeemed to have choſen him for a general arbitrator of their differences. It was owing to him that Innocent II. was acknowledged ſovereign pontiff, and after the death of Peter Leonis anti-pope, that Victor, who had been named *ſucceſſor*, made a voluntary abdication of his dignity. He convicted Abelard at the council of Sens, in the year 1140. He oppoſed the monk Raoul; he perſecuted the followers of Arnaud de Breſſe; and, in 1148, he got Gilbert de la Porvicé, biſhop of Poitiers, and Eonde l'Etoile, to be condemned in the council of Rheims. By ſuch zealous behaviour he verified (ſays Mr. Bayle) the interpretation of his mother's dream. She dreamed, when ſhe was with child of him, that ſhe ſhould bring forth a white dog, whoſe barking ſhould be very loud. Being aſtoniſhed at this dream, ſhe conſulted a monk, who ſaid to her, "Be of good courage; you ſhall have a ſon who ſhall guard the houſe of God, and bark loudly againſt the enemies of the faith." But St. Bernard went even beyond the prediction, for he barked ſometimes againſt chimerical enemies: he was more happy in exterminating the heterodox, than in ruining the infidels; and yet he attacked theſe laſt, not only with the ordinary arms of his eloquence, but alſo with the extraordinary arms of prophecy. He preached up the cruſade under Louis the Younger, and by this means he enlarged the troops of the cruſaders beyond expreſſion: but all the fine hopes with which he flattered the people were diſappointed by the event; and when complaint was made that he had brought an infinite number of Chriſtians

to ſlaughter without going out of his own country, he cleared himſelf by ſaying that the ſins of the Croiſés had hindered the effect of his prophecies. In ſhort, he is ſaid to have founded 160 monaſteries, and to have wrought a great number of miracles. He died on the 20th of Auguſt 1153, at 63 years of age. That edition of his works publiſhed in 1690, by father Mabillon, is the beſt.

Bernard (Dr. Edward), a learned aſtronomer, linguiſt, and critic, was born at Perry St. Paul, on the 2d of May 1638, and educated at Merchant-Taylors' ſchool, and St. John's college, Oxford. During his ſtay at ſchool, he had laid in an uncommon fund of claſſical learning; ſo that, on his going to the univerſity, he was a great maſter of all the elegancies of the Greek and Latin tongues, and not unacquainted with the Hebrew. On his ſettling in the univerſity, he applied himſelf with great diligence to hiſtory, philology, and philoſophy; and made himſelf maſter of the Hebrew, Syriac, Arabic, and Coptic languages, and then applied himſelf to the ſtudy of the mathematics under the famous Dr. Wallis. Having ſucceſſively taken the degrees of bachelor and maſter of arts, and afterwards that of bachelor of divinity in 1668, he went to Leyden to conſult ſeveral oriental manuſcripts left to that univerſity by Joſeph Scaliger and Levinus Warnerus. At his return to Oxford, he collated and examined the moſt valuable manuſcripts in the Bodleian library; which induced thoſe who publiſhed any ancient authors, to apply to him for his obſervations or emendations from the manuſcripts at Oxford; which he readily imparted, grudging neither time nor pains to ſerve the learned; and by this means he became engaged in a very extenſive correſpondence with the learned of moſt countries. In the year 1669, the famous Chriſtopher Wren, Savilian profeſſor of aſtronomy at Oxford, having been appointed ſurveyor-general of his majeſty's works, and being much detained at London by this employment, he obtained leave to name a deputy at Oxford, and pitched upon Mr. Bernard, which engaged the latter in a more particular application to the ſtudy of aſtronomy. In 1676, he was ſent by the earl of Arlington to France, in order to be tutor to the dukes of Grafton and Northumberland, ſons to King Charles II. by the ducheſs of Cleveland, who then lived with their mother at Paris: but the ſimplicity of his manners not ſuiting the gaiety of the ducheſs's family, he returned about a year after to Oxford, and purſued his ſtudies; in which he made great proficiency, as his many learned aſtronomical and critical works ſhow. He compoſed Tables of the Longitudes, Latitudes, Right Aſcenſions, &c. of the Fixed Stars; Obſervations in Latin on the Obliquity of the Ecliptic; and other pieces inſerted in the Philoſophical Tranſactions. He alſo wrote, 1. A Treatiſe of the Ancient Weights and Meaſures. 2. *Chronologiæ Samaritanæ Synopſis*, in two tables. 3. Teſtimonies of the Ancients concerning the Greek Verſion of the Old Teſtament by the Seventy; and ſeveral other learned works. He was a perſon of great piety, virtue, and humanity; and died on the 12th of January 1696, in the 59th year of his age, leaving a great number of learned and valuable manuſcripts behind him.

Bernard (James), profeſſor of philoſophy and mathematics, and miniſter of the Walloon church at Leyden, was born September 1ſt, 1658, at Nions in Dauphiné. Having ſtudied at Geneva, he returned to France in 1679, and was choſen miniſter of Venterol, a village in Dauphiné. Some time after, he was removed to the church of Vinſobres in the ſame province. But the perſecutions raiſed againſt the Proteſtants in France having obliged him to leave his native country, he retired to Holland, where he was received with great civility, and was appointed one of the penſionary miniſters of Gauda. In July 1688, he began a political publication intitled *Hiſtoire abregée de l'Europe*, &c. which was continued monthly till December 1688, and makes five volumes in 12mo. In 1692, he began his *Lettres Hiſtoriques*, containing an account of the moſt important tranſactions in Europe, with neceſſary reflections. He carried on this work, which was alſo publiſhed monthly, till the end of the year 1698. It was afterwards continued by other hands, and conſiſts of a great many volumes. Mr. Le Clerc having left off his *Bibliotheque Univerſelle*, in 1691, Mr. Bernard wrote the greateſt part of the 20th volume, and by himſelf carried on the five following to the year 1693. In 1698, he collected and publiſhed *Actes et Negociations de la Paix de Ryſwic*, in four volumes 12mo. In 1699 he began the *Nouvelles de la Republique des Lettres*, which continued till December 1710. Mr. Bernard having acquired great reputation by his works, as well as by his ſermons at Gauda, and the Hagre, the congregation of the Walloon church at Leyden became extremely deſirous to have him for one of their miniſters; and a vacancy happening in 1705, he was unanimouſly choſen. About the ſame time, Mr. de Volder profeſſor of philoſophy and mathematics at Leyden having reſigned, Mr. Bernard was appointed his ſucceſſor; and the univerſity preſented him with the degrees of doctor of philoſophy and maſter of arts. His public and private lectures took up a great part of his time; yet he did not neglect his paſtoral function, but compoſed his ſermons with great care: he wrote alſo two excellent treatiſes, one on a late repentance, the other on the excellence of religion. In 1716, he publiſhed a ſupplement to Moreri's dictionary in two volumes folio. The ſame year he reſumed his *Nouvelles de la Republique des Lettres*; which he continued till his death, which happened in the 60th year of his age, in 1718.

Bernard the Great (St.); a mountain in Savoy and Switzerland, between Valais and the valley of Aouſt, at the ſource of the rivers Drance and Doria. The top is always covered with ſnow; and there is a great monaſtery ſeated on it, where the monks always entertain travellers without diſtinction of religion for three days.

BERNARDINE (St.), was born at Maſſa in Tuſcany, in 1380. In 1404 he entered into a Franciſcan monaſtery near Sienna, where he became an eminent preacher; and was afterward ſent to Jeruſalem as commiſſary of the Holy Land. On his return to Italy, he viſited ſeveral cities, where he preached with ſuch applauſe, that the cities of Ferrara, Sienna, and Urbino, deſired Pope Eugenius IV. to appoint him their biſhop: but Bernardine refuſed the honour, accepting only the office of vicar-general of the friars of the obſervance for all Italy. He repaired and founded above 300 monaſteries in that country; died in 1444; was canonized in 1450 by Pope Nicholas; and his works, in 4 volumes 4to, were publiſhed at Venice in 1591.

BERNARDINES, an order of monks, founded by Robert abbot of Moleme, and reformed by St. Bernard. They wear a white robe with a black ſcapulary; and when they officiate they are clothed with a large gown, which is all white, and has great ſleeves with a hood of the ſame colour.—The Bernardines differ very little from the Ciſtercians. They had their origin toward the beginning of the 12th century.

BERNAY, a town of France in the department of Eure and late province of Normandy; ſeated on the river Carantone, in E. long. 0. 50. N. lat. 49. 6.

BERNBURG, a town of Germany, in the circle of Upper Saxony, and principality of Anhalt, where a branch of the houſe of Anhalt reſides. It is ſeated on the river Sara, in E. long. 12. 30. N. lat. 51. 55.

BERNERA, one of the Weſtern Iſles of Scotland, lying about two leagues to the ſouthward of Harries. It is about five miles in circumference; the ſoil is ſandy, but when ma-

nured with the alga marina, extremely fertile, producing an increaſe of thirty-fold of barley; nay one grain has been known to produce 14 ears when the ſeaſon was remarkably favourable. The face of the iſland is extremely agreeable in ſummer, exhibiting a pleaſing variety of corn fields and clover paſtures. Here is a freſh water lake called *Lochbruis*, diverſified with ſmall iſlands, and abounding with eels, which the natives, by the help of lights, catch in the night-time, as they fall down a rivulet towards the ſea in heaps twiſted together. There are two chapels in this iſland dedicated to St. Aſaph and St. Columbes; and near the former is a ſtone ſtanding about eight feet above the ground. At the eaſt end of this iſland there is a ſtrange reciprocation of the flux and reflux of the ſea, and another no leſs remarkable upon the weſt ſide of the long iſland. The tides from the ſouth-weſt run along northward; ſo that during the ordinary courſe of the tides the flood runs eaſt in the frith, where Bernera lies, and the ebb runs weſt: thus the ſea ebbs and flows regularly for four days before, and as long after, the full and change of the moon; the ſpring tides generally riſing 14 feet perpendicular, and the others proportionably: but for four days before, and as many after the quarter moons, there is a ſingular variation; at that time a ſoutherly moon making high water, the courſe of the tide being eaſtward, it begins to flow at half an hour after nine in the morning, and continues to flow till half an hour after three in the afternoon, when it is high water; but when it begins to ebb, the current ſtill runs eaſtward, until it is low water; ſo that the tide runs eaſtward 12 hours together, that is, from half paſt nine in the morning till half paſt nine at night; yet when the night-tide begins to flow, the current turns and runs weſtward all night for 12 hours, during both flood and ebb: thus the reciprocations continue, one flood and ebb running eaſtward and another weſtward, till within four days of the full and change of the moon; then they reſume their ordinary courſe, running eaſt during the ſix hours of flood, and weſt during the ſix hours of ebb. There is another phenomenon in theſe tides no leſs remarkable than that juſt now mentioned. Between the vernal and autumnal equinox, that is, during one half of the year, the tides about the quarter moons run all day eaſtward and all night weſtward; and during the other ſix months their courſe is reverſed, being weſtward in the day and eaſtward in the night.

BERNICLA, in ornithology, the trivial name of a ſpecies of gooſe. See Anas.

BERNICLE, in zoology, a ſpecies of lepas. See Lepas.

BERNIER (Nicholas), an eminent muſician and compoſer, was born at Mante on the Seine, in the year 1664. By his merit in his profeſſion he attained to be conductor of the muſic in the chapel of St. Stephen, and afterwards in that of the king. The regent duke of Orleans admired his works, and patronized their author. This prince having given him a motet of his own compoſition to examine, and being impatient for his obſervations thereon, went to the houſe of Bernier, and entering his ſtudy, found the abbé de la Croix there criticiſing his piece, while the muſician himſelf was in another room carouſing and ſinging with a company of his friends. The duke broke in upon and interrupted their mirth, with a reprimand of Bernier for his inattention to the taſk aſſigned him. This muſician died at Paris in 1734. His five books of Cantatas and Songs for one and two voices, the words of which were written by Rouſſeau and Fuſelier, have procured him great reputation. There are beſides, of his compoſition, Les Nuits de Sceaux, and many motets, which are ſtill much approved of.

Bernier (Francis), ſurnamed the *Mogul*, on account of his travels and reſidence in that country, was born at Angers in France; and after he had taken his degree of doctor of phyſic at Montpellier, left his country in 1654, went to Egypt, to the Holy Land, and to the kingdom of the Mogul, where he was phyſician to that monarch, attended him in his journeys, and ſtayed there 12 years. Upon his return to France, he publiſhed the Hiſtory of the countries he had viſited; and ſpent the remainder of his life in compoſing various other works, particularly an Abridgment of the Philoſophy of Gaſſendus in 8 vols. 12mo. His firſt work is eſteemed to be the beſt account we have of the countries which are the ſubject of it.

BERNINI (John Laurence), commonly called *Cavaliero Bernin*, a Neapolitan, famous for his ſkill in painting, ſculpture, architecture, and mechanics. He firſt began to be known under the pontificate of Paul V. Rome is indebted to this artiſt for ſome of its greateſt ornaments; and there are in the church of St. Peter no leſs than 15 different works of his hand. He died at Rome in 1680.

BERNO, abbot of Richenou, in the dioceſe of Conſtance, who flouriſhed about the year 1008, is celebrated as a poet, rhetor, muſician, philoſopher, and divine. He was the author of ſeveral treatiſes on muſic, particularly of one *De Inſtrumentis Muſicalibus*, beginning with the words *Muſicam non eſſe*, &c. which he dedicated to Arrabon archbiſhop of Mentz. He alſo wrote *De Menſura Monochordi*. But the moſt celebrated of his works is a treatiſe *De Muſicâ ſeu Tonis*, which he wrote and dedicated to Pelegrines archbiſhop of Cologne, beginning *Vero mundi iſti advenæ et peregrino*. This latter tract is part of the Baliol manuſcript, and follows the Enchiridion of Odo: it contains a ſummary of the doctrines delivered by Boetius, an explanation of the eccleſiaſtical tones, intermixed with frequent exhortations to piety, and the application of muſic to religious purpoſes. He was highly favoured by the emperor Henry II. for his great learning and piety; and ſucceeded ſo well in his endeavours to promote learning, that his abbey of Richenou was as famous in his time as thoſe of St. Gaul and Cluni, then the moſt celebrated in France. He died in 1048; and was interred in the church of his monaſtery, which but a ſhort time before he had dedicated to St. Mark.

BERNOUILLI (James), a celebrated mathematician, born at Baſil the 27th of December 1654. Having taken his degrees in the univerſity of Baſil, he applied himſelf to divinity, not ſo much from inclination as complaiſance to his father. He gave very early proofs of his genius for mathematics, and ſoon became a geometrician, without any aſſiſtance from maſters, and at firſt almoſt without books: for he was not allowed to have any books of this kind; and if one fell by chance into his hands, he was obliged to conceal it, that he might not incur the reprimands of his father, who deſigned him for other ſtudies. This ſeverity made him chooſe for his device, Phaeton driving the chariot of the ſun, with theſe words, *Invito patre ſidera verſo*, "I traverſe the ſtars againſt my father's inclination:" this had a particular reference to aſtronomy, the part of mathematics to which he at firſt applied himſelf. But the precautions of his father did not avail, for he purſued his favourite ſtudy with great application. In 1676 he began his travels. When he was at Geneva, he fell upon a method to teach a young girl to write, though ſhe had loſt her ſight when ſhe was but two months old. At Bourdeaux he compoſed univerſal gnomonic tables, but they were never publiſhed. He returned from France to his own country in 1680. About this time there appeared a comet, the return of which he foretold; and wrote a ſmall treatiſe upon it, which he afterwards tranſlated into Latin. He went ſoon after to Holland, where he applied himſelf to the ſtudy of the new philoſophy. After having viſited Flanders and Brabant, he went to Calais, and paſſed over from thence to England. At London he contracted an acquaintance with all the moſt eminent

men in the ſeveral ſciences; and had the honour of being frequently preſent at the philoſophical ſocieties held at the houſe of the famous Mr. Boyle. He returned to his native country in 1682; and he exhibited at Baſil a courſe of experiments in natural philoſophy and mechanics, which conſiſted of a variety of new diſcoveries. In 1682, he publiſhed his Eſſay of a New Syſtem of Comets; and the year following, his Diſſertation on the Weight of Air. Mr. Leibnitz, about this time, having publiſhed in the *Acta Eruditorum* at Leipſic ſome eſſay of his new *Calculus differentialis*, or *Infinimens petits*, but concealed the art and method of it; Mr. Bernouilli, and one of his brothers, diſcovered, by the little which they ſaw, the beauty and extent of it: they endeavoured to unravel the ſecret; which they did with ſuch ſucceſs, that Mr. Leibnitz declared, that the invention belonged to them as much as to himſelf. In 1687, the profeſſorſhip of mathematics at Baſil being vacant, Mr. Bernouilli was appointed his ſucceſſor. He diſcharged this truſt with univerſal applauſe; and his reputation drew a great number of foreigners from all parts to hear his lectures. He had an admirable talent for teaching, by adapting himſelf to the different genius and capacity of his ſcholars. In 1699, he was admitted into the Academy of Sciences at Paris as a foreign member, and in 1701 the ſame honour was conferred upon him by the Academy of Berlin. He wrote ſeveral pieces in the *Acta Eruditorum* of Leipſic, the *Journal des Sçavans*, and the *Hiſtoire de l'Academie des Sciences*. His aſſiduous application to his ſtudies brought upon him the gout, and by degrees a ſlow fever, of which he died the 16th of Auguſt 1705, in the 58th year of his age. Archimedes having found out the proportion of a ſphere to a cylinder circumſcribed about it, ordered it to be engraven upon his monument. In imitation of him, Mr. Bernouilli appointed, that a ſpiral logarithmical curve ſhould be inſcribed upon his tomb, with theſe words, *Eadem mutata reſurgo;* in alluſion to the hopes of the reſurrection, which are repreſented in ſome meaſure by the properties of the curve which he had the honour of diſcovering.

Bernouilli (Daniel), a celebrated phyſician and philoſopher, was born at Groningen, February 9th 1700. He was intended by his parents for trade, but his genius led him to different purſuits. He paſſed ſome time in Italy, and at 24 refuſed to be preſident of an academy meant to have been eſtabliſhed at Genoa. He ſpent ſeveral years at St. Peterſburg with great credit; and, in 1733, returned to Baſil, where he ſucceſſively filled the chair of phyſic, natural and ſpeculative philoſophy. In his firſt work, *Exercitationes Mathematicæ*, he took the only title he then had, *viz.* "Son of John Bernouilli," and never would ſuffer any other to be added to it. This work appeared in Italy with the great inquiſitor's privilege added to it, and it claſſed Bernouilli in the rank of inventors. He gained or divided nine prizes, which were contended for by the moſt illuſtrious mathematicians in Europe, from the Academy of Sciences. The only man who has had ſucceſs of the ſame kind is Euler, his countryman, diſciple, rival, and friend. His firſt prize he gained at 24 years of age. In 1734 he divided one with his father: but this hurt the family union; for the father conſtrued the conteſt itſelf into a want of reſpect; and the ſon did not ſufficiently conceal that he thought (what was really the caſe) his own piece better than his father's. Beſides this, he declared for Newton, againſt whom his father had contended all his life. In 1740, Mr. Bernouilli divided the prize "On the Tides of the Sea" with Euler and Maclaurin. The academy at the ſame time crowned a fourth piece, whoſe only merit was that of being Carteſian; but this was the laſt public act of adoration paid by it to the authority of the author of the Vortices, which it had obeyed perhaps too long. In 1748, Mr. Daniel Bernouilli ſucceeded his father in the academy of ſciences, and was himſelf ſucceeded by his brother John; this place, ſince its firſt erection, *i. e.* 84 years, never having been without a Bernouilli to fill it. He was extremely reſpected at Baſil; and to bow to Daniel Bernouilli, when they met him in the ſtreets, was one of the firſt leſſons which every father gave every child. He uſed to tell two little adventures, which he ſaid had given him more pleaſure than all the other honours he had received. He was travelling with a learned ſtranger, who, being pleaſed with his converſation, aſked his name: "I am Daniel Bernouilli," anſwered he, with great modeſty; "And I," ſaid the ſtranger (who thought he meant to laugh at him), "am Iſaac Newton." Another time he was giving a dinner to the famous Koenig the mathematician, who boaſted, with a ſufficient degree of ſelf-complacency, of a difficult problem he had reſolved with much trouble. Bernouilli went on doing the honours of his table; and, when they went to drink coffee, preſented him with a ſolution of the problem more elegant than his own. He died in the year 1782.

Beroot, or Bairout, a town of Phœnicia, a province of Syria in Turkey in Aſia. It is the ancient Berytus; but there are now no remains of its former beauty, except its ſituation. It ſtands in a plain, which from the foot of Lebanon runs out into the ſea, narrowing to a point, about two leagues from the ordinary line of the ſhore, and on the north ſide forms a pretty long road, which receives the river of Nahr-el-Salib, called alſo *Nahr-Bairout*. This river has ſuch frequent floods in winter, as to have occaſioned the building of a conſiderable bridge; but it is in ſo ruinous a ſtate as to be impaſſable. The bottom of the road is rock, which chafes the cables, and renders it very inſecure. From hence, as we proceed weſtward towards the point, we reach, after an hour's journey, the town of Bairout. This belonged to the Druzes, till lately that it was taken from them, and a Turkiſh garriſon placed in it. Still, however, it continues to be the emporium of the Maronites and the Druzes, where they export their cottons and ſilks, almoſt all of which are deſtined for Cairo. In return, they receive rice, tobacco, coffee, and ſpecie, which they exchange again for the corn of the Bekaa and the Hauran. This commerce maintains near 6000 perſons. The dialect of the inhabitants is juſtly cenſured as the moſt corrupt of any in the country: it unites in itſelf the 12 faults enumerated by the Arabian grammarians. The port of Beroot, formed like all the others on the coaſt by a pier, is like them choked up with ſand and ruins. The town is ſurrounded by a wall, the ſoft and ſandy ſtone of which may be pierced by a cannon ball without breaking or crumbling; which was unfavourable to the Ruſſians in their attack: but in other reſpects this wall, and its old towers, are defenceleſs. Two inconveniences will prevent Beroot from ever becoming a place of ſtrength; for it is commanded by a chain of hills to the ſouth-eaſt, and is entirely deſtitute of water, which the women are obliged to fetch from a well at the diſtance of half a quarter of a league, though what they find there is but indifferent. By digging in order to form reſervoirs, ſubterraneous ruins have been diſcovered; from which it appears, that the modern town is built on the ancient one. The ſame may be obſerved of Latakia, Antioch, Tripoli, Saide, and the greater part of the towns on the coaſt, which have been occaſioned by earthquakes that have deſtroyed them at different periods. We find likewiſe, without the walls to the weſt, heaps of rubbiſh, and ſome ſhafts of columns, which indicate that Beroot has been formerly much larger than at preſent. The plain around it is entirely planted with white mulberry trees, which are young and flouriſhing; by which means the ſilk produced here is of the very fineſt quality. In deſcending from the mountains (ſays M. Volney), no proſpect can be more delightful than to behold, from their ſummits or declivities, the rich carpet of verdure formed by the tops of theſe uſeful trees in the diſtant bottom of the valley. In

ſummer, it is inconvenient to reſide at Beroot on account of the heat and the warmth of the water: the town, however, is not unhealthy, though it is ſaid to have been ſo formerly. It has ceaſed to be unhealthy ſince the Emir Fakr-el-din planted a wood of fir trees, which is ſtill ſtanding a league to the ſouthward of the place. E. long. 35. 38. N. lat. 34. 18.

BEROSUS, prieſt of the temple of Belus at Babylon, in the time of Ptolemy Philadelphus, wrote the Hiſtory of Chaldea, which is often cited by the ancients, and of which Joſephus gives ſome curious fragments. The Athenians, according to Pliny, cauſed his ſtatue, with a golden tongue, to be placed in their Gymnaſium.

BERRETINI DA CORTONA (Pietro), painter of hiſtory and landſcape, was born at Crotona in 1596; and, according to ſome writers, was a diſciple of Andrea Commodi; though others affirm that he was the diſciple of Baccio Ciarpi, and the author of the Abregé ſays he was ſucceſſively the author of both: but he is allowed to have been as great and as enlarged a genius as any of his profeſſion, and to have painted more agreeably than moſt of the artiſts who were his cotemporaries. He went young to Rome, and applied himſelf diligently to ſtudy the antiques, the works of Raphael, Buonaroti, and Polidoro; by which he ſo improved his taſte and his hand, that he diſtinguiſhed himſelf in a degree ſuperior to any of the artiſts of his time. He worked with remarkable eaſe and freedom; his figures are admirably grouped; his diſtribution is truly elegant; the chiaro-ſcuro is judiciouſly obſerved; and through his whole compoſitions there appears uncommon grace. Yet De Piles obſerves, that it was not ſuch a grace as was the portion of Raphael and Correggio; but a general grace, conſiſting rather in a habit of making the airs of his heads always agreeable, than in a choice of expreſſions ſuitable to each ſubject. In his large compoſitions, the colouring had a good effect; but his colouring in freſco is far ſuperior to what he performed in oil: nor do his eaſel pictures appear as finiſhed as might be expected from ſo great a maſter, when compared with what he painted in a larger ſize. By the beſt judges it ſeems to be agreed, that although this maſter was frequently incorrect; though not always judicious in his expreſſions; though irregular in his draperies, and apt to deſign his figures too ſhort and too heavy; yet, by the magnificence of his compoſition, the delicate airs of his figures, the grandeur of his decorations, and the aſtoniſhing beauty and gracefulneſs of the whole together, he muſt be allowed to have been the moſt agreeable manneriſt that any age has produced. He died in the year 1669. Some of his moſt capital works are in the Barberini palace at Rome, and the Palazzo Pitti at Florence.

BERRETONI (Nicolo), hiſtory-painter, was born at Macerata in 1617, and was a diſciple of Carlo Maratti, with whom he ſtudied deſign and colouring for ſome years; and attained ſuch excellence, that he excited even the jealouſy and envy of his maſter, who ſeemed to be apprehenſive of finding a powerful competitor and rival in his pupil. His early works, after he quitted the ſchool of Maratti, were in the ſtyle and taſte of Guido; and they could not poſſibly have a more high encomium or recommendation. He died in 1682.

BERRY. See BACCA.

BERRY, a late province of France, with the title of a duchy. It is bounded on the north, by Salome; on the ſouth, by Marche; on the eaſt, by Nivernois and Bourbonnoiſe; and on the weſt, by Touraine. It is 90 miles in length from north to ſouth, and 73 in breadth from eaſt to weſt. The air is very temperate; and the ſoil produces wheat, rye, and wine little inferior to Burgundy; that of Sancerre, St. Satur, and Lavernuſſe, is the beſt. The fruits are in plenty, and pretty good. The paſtures are proper to fatten ſheep. This country produces alſo a good deal of hemp and flax. There are mines of iron and ſilver, but they are neglected. The ſtone quarries, within half a league of Bourges, are very ſerviceable. In the pariſh of St. Hilare there is a mine of ochre, made uſe of in melting metals and for painting. Near Bourges there is a cold mineral ſpring, which has a clammy fat pellicle over it every morning, of different colours. It lets fall a fine black ſmooth ſediment, which has the ſame ſmell, and almoſt the ſame taſte, as gunpowder, which makes ſome conclude it partakes of ſulphur, vitriol, and ochre. The pellicle is as thick as a crown-piece; and, when put on a red-hot fire-ſhovel, will bounce and ſparkle, as will alſo the ſediment. It is certain there is ſalt-petre in theſe waters, though vitriol ſeems to be the moſt predominant. Theſe waters, drunk on the ſpot, improve the ſtate of the blood and humours, open obſtructions, and ſtrengthen the fibres. Berry is watered by ſeveral rivers; the principal of which are the Loire, the Creuſe, the Cher, the Indre, the Orron, the Evre, the Aurette, the Maulon, the Great and Little Saudre, the Nerre, &c. Near Linlers, there is a lake 20 miles round. Berry is divided into the Upper and the Lower, and Bourges is the capital city. The inhabitants of Bourges carry on a ſmall trade with corn down the Loire; but that of the wine above mentioned is much more conſiderable, it being tranſported to Paris by means of that river and the canal of Briare. But the principal commerce conſiſts in the fat cattle which they ſend to Paris, and the great number of ſheep; theſe laſt bear fine wool, which is uſed in the manufactures of this province and other parts of the kingdom. There are two ſorts of manufactures in Berry; the one for cloths and ſerges, and the other for knit and wove ſtockings. There is likewiſe a great quantity of hemp, which is tranſported elſewhere; for they have not yet got the art of manufacturing it themſelves. At Aubigny there are 2000 perſons generally employed in the manufacture of cloth.

BERSARII, in writers of the middle age, a kind of hunters or ſportſmen, who purſued wild beaſts in foreſts and chaſes. The word ſeems derived from the barbarous Latin *berſare*, "to ſhoot with a bow;" on which principle it ſhould properly denote archers only, or bowmen. Or it might be derived from *berſa*, "the fence *or* pales of a park;" in which view it ſhould primarily import thoſe who hunt or poach in parks or foreſts. Hincmar ſpeaks of a kind of inferior officers in the court of Charlemagne, under the denomination of *berſarii*, *veltrarii*, and *beverarii*. Spelman takes the firſt to denote thoſe who hunted the wolf; the ſecond, thoſe who had the ſuperintendency of the hounds for that uſe; and the third, thoſe who hunted the beaver.

BERSELLO, a fortified town of Italy in the Modeneſe. It was taken by Prince Eugene in 1702; and by the French in 1703, who were obliged to abandon it in 1707. It is ſeated near the confluence of the Rivers Linza and Po, in E. long. 10. 30. N. lat. 44. 55.

BERSUIRE, a town of France in the department of the Sevres, and late province of Poictou. W. long. 0. 27. N. lat. 46. 52.

BERTINERO, a town of Romagnia in Italy, with a ſtrong citadel. It is the fee of a biſhop; and is ſeated on an hill in E. long. 11. 47. N. lat. 44. 8.

BERTRAND (St.), a ſmall town of France in the department of Upper Garonne, and late province of Languedoc in Gaſcony, and capital of the country of Comminges. E. long. 0. 48. N. lat. 42. 56.

BERVY, a ſea-port and parliament town in the county of Mearns in Scotland. W. long. 2. 0. N. lat. 56. 40.

BERWICK (the Duke of), was natural ſon of James II. by Mrs. Arabella Churchill, ſiſter to the great Duke of Marlborough. He followed the fate of his father, and came into

France after the revolution with James II. Here the Duke of Berwick was recommended to the court by his ſuperior merit. He was created marſhal of France, knight of the Holy Ghoſt, duke and peer of France, grandee of Spain, commander in chief of the French armies; in all which ſtations his behaviour was ſuch, that few equalled, perhaps none ſurpaſſed him. He lived in an age when the renowned Prince of Orange and many other of the greateſt men commanded againſt him. His courage was of the cool ſteady kind; always poſſeſſing himſelf; taking all advantages; not fooliſhly, raſhly, or wantonly throwing away the lives of his ſoldiers. He kept on all occaſions the moſt ſtrict diſcipline; and did not ſpare puniſhment among his ſoldiers for marauding and other crimes, when properly deſerved; for which ſome inconſiderate people have blamed him. He has been reflected upon by the very zealous and violent adherents of the Stuart family for not being ſufficiently attached to that party, which was his own family. But by a cool examination of his actions, it will appear, that his behaviour in this particular was, as in moſt parts of his life, ſenſible and juſt. When he accepted of employments, received honours, dignities, and became a naturalized Frenchman, he thought it his duty, as an honeſt man, to become a Frenchman, and a real ſubject to the monarch who gave him bread; and to be, or not to be, in the intereſt of the Stuart family, according to the will and commands of the ſovereign whom he ſerved, and in the intereſt of France according to time and circumſtances; for there is no ſerving two maſters well. But when ordered by his king to be in that family's intereſt, he acted with the greateſt ſincerity; and took the moſt effectual and ſenſible methods to ſerve that unhappy houſe, as the following anecdote, if true, and it has great appearance and probability on its ſide, proves. The Duke of Marlborough, after the ſigning of the treaty of Utrecht, was cenſured by the Britiſh parliament for ſome of the army contracts in relation to bread and forage: upon which he retired into France: and it was then credibly aſſerted, the Duke of Marlborough was brought over to the intereſt of the Stuart family; for it is now paſt a doubt, that Queen Anne had a very ſerious intention of having her brother upon the throne of England after her death: and ſeveral circumſtances, as well as the time of that Duke's landing in England, make many people believe he was gained over to the Stuart party. If the Duke of Berwick was, directly or indirectly, the means of gaining his uncle over to that intereſt, he more effectually ſerved it than that raſh mock army of unhappy gentlemen who were taken priſoners at Preſton in 1715 had it in their power to do. In a word, the Duke of Berwick was, without being a bigot, a moral and religious man; and ſhowed by his life and actions, that morality and religion are very compatible and conſiſtent with the life of a ſtateſman and a great general; and if they were oftener united in thoſe two profeſſions, it would be much happier for the reſt of mankind. He was killed by a cannonball at the ſiege of Philipſburgh in the year 1738.

Berwick, one of the beſt cultivated counties in Scotland; bounded by the river Tweed, on the ſouth; by Lothian, on the north; by the German Ocean, on the eaſt; and by Teviotdale, on the weſt. It abounds with corn and graſs, and has in it ſeveral ſeats of perſons of quality. The principal rivers are the Tweed, the Whiteater, Blackadder, Eye, and Ednel. The chief place is the town and caſtle of Dunſe. Eymouth is the ſea port, where a great deal of grain is ſhipped. Lauder is the only royal borough, though Greenlaw is the county-town. It ſends one member to parliament.

Berwick (North), a royal borough and ſea-port in the county of Eaſt Lothian in Scotland. W. long. 2. 29. N. lat. 5. 56.

Berwick-*upon-Tweed*, is a town on the borders of England and Scotland, and a county of itſelf. It ſtands on the north or Scottiſh ſide of the river Tweed; and is pleaſantly ſituated on an eaſy declivity, almoſt cloſe to the ſea. It has a ditch on the north and caſt; but on the ſouth and weſt it has high walls, regularly fortified, and planted with cannon, and to which the river ſerves as a moat. The houſes are generally well built; and the town-houſe is a handſome ſtructure, with a lofty turret, in which are eight bells, and a fine clock which tells the quarters, with four dials, one on each ſide the ſquare. The church is a neat building, but has no bells. The bridge is 947 feet long, and is ſupported by fifteen arches. The barracks form a large regular ſquare, and will hold two regiments of foot very conveniently. The town is governed by a mayor, recorder, town clerk, and four bailiffs; and has a coroner, a treaſurer, four ſerjeants at mace, and a water-bailiff. It had a ſtrong caſtle, which now lies quite in ruins. It has a market on Saturdays, extremely well ſupplied: and a fair on Friday in Trinity-week for black cattle and horſes. Corn and eggs are ſhipped from hence for London and other ports; but the principal trade is the ſalmon which are caught in the Tweed, and reckoned to be as good as any in the kingdom. Some are ſent alive, and ſome pickled in kits by perſons who ſubſiſt on that employment, and are called *ſalmon coopers*. The living is a rectory, rated at 20l. a-year in the king's books. Though this town is not admitted to be either in England or Scotland, the Engliſh judges hold aſſizes here; and it is ſubject to the biſhop of Durham. It ſends two members to parliament. W. long. 1. 35. N. lat. 55. 58.

Bery, or Bury, the villa or ſeat of habitation of a nobleman, a dwelling or manſion-houſe, being the chief of a manor: from the Saxon *beorg*, which ſignifies a *hill* or *caſtle*; for heretofore noblemen's ſeats were caſtles ſituated on hills, of which we have ſtill ſome remains; as in Herefordſhire there are the *beries* of Stockton, Hope, &c. It was anciently taken for a ſanctuary.

Bery. See Beria.

Beryl, in natural hiſtory, a ſubſtance called by our lapidaries *aqua marina*, is a pellucid gem of a blueiſh green colour, found in the Eaſt Indies and about the gold mines of Peru: we have alſo ſome from Sileſia, but what are brought from thence are oftener coloured cryſtals than real beryls; and when they are genuine, they are greatly inferior both in hardneſs and luſtre to the oriental and Peruvian kinds of beryl.

This, like moſt other gems, is to be met with both in the pebble and columnar form, but in the latter moſt frequently. In the pebble form it uſually appears of a roundiſh but flatted figure, and commonly full of ſmall flat faces, irregularly diſpoſed. In the columnar or cryſtalline form it always conſiſts of hexangular columns, terminated by hexangular pyramids. It never receives any admixture of colour into it, nor loſes the blue and green, but has its genuine tinge in the degrees from a very deep and duſky to the paleſt imaginable of the hue of ſea-water.—In its perfect ſtate the beryl approaches to the hardneſs of the garnet, but is often ſofter; and its ſize is from that of a ſmall tare to that of a pea, a horſe-bean, or even a walnut. It may be imitated by adding to 20 pounds of cryſtal-glaſs made without magneſia, ſix ounces of calcined braſs or copper, and a quarter of an ounce of prepared zaffre.—The properties of the beryl were very wonderful in the opinion of the ancient naturaliſts; it kept people from falling into ambuſcades of enemies, excited courage in the fearful, and cured diſeaſes of the eyes and ſtomach. It does none of theſe things now: becauſe people are not ſimple enough to believe it has the virtue to do them.

Beryl-*cryſtal*, in natural hiſtory, a ſpecies of what Dr. Hill calls *ellipomacroſtyla*, or imperfect cryſtals, is of very pure, clear,

and equal texture, and ſcarcely ever ſubject to the ſlighteſt films or blemiſhes. It is ever conſtant to the peculiarity of its figure, which is that of a long and ſlender column, remarkably tapering towards the top, and very irregularly hexangular. It is of a very fine tranſparence, and naturally of a pale brown; and carries ſuch evident marks of diſtinction from all brown cryſtals, that our lapidaries call it, by way of eminence, the *beryl-cryſtal*, or ſimply the *beryl*.

BES, or Bessis, in Roman antiquity, two-thirds of the as. See As.

Bes alſo denotes two-thirds of the jugerum. See Jugerum.

BESAILE, ſignifies the father of a grandfather.

Besaile, in law, a writ that lies where the great-grandfather was ſeiſed in fee of any lands, &c. at the time of his death: and after his deceaſe a ſtranger enters thereon the ſame day, and keeps out the heir.

BESANCON, a large and populous city of France, in the department of Doubs, and capital of the late province of Franche Comté and one of the moſt ancient cities of Europe. It has been the ſee of an archbiſhop, and had a parliament as well as a univerſity. It is ſeated on the river Dreux, which divides it into two parts, the greateſt of which is a peninſula. The entrance is ſhut up by a mountain, on which they have built a large citadel, which commands all the city. There are many names of places in and about the city, that are plainly corruptions of the Latin, and are marks of its antiquity, as Chamars (Campus Martis), Chamuſe (Campus Muſarum), Chandane (Campus Dianæ), &c. The metropolitan church is built at the bottom of St. Stephen's hill; and is a very handſome ſtructure with a high tower ſteeple. The great altar is placed in the middle choir, where on high days they expoſed reliques in ſilver ſhrines, enriched with gold and jewels. There are ſeveral tombs and other things remarkable in the churches; and after you have paſſed the church of Notre Dame, and the ſquare that it looks into, you come to a triumphal arch, erected in honour of the emperor Aurelian, on which are ſeveral figures of men and animals, pretty entire. It ſerves as a gate to the cloiſter of St. John the Great. The great hoſpital of the order of the Holy Ghoſt is a ſtructure worth ſeeing. The ſtreets are wide and handſome; and the houſes are well built with free-ſtone, and covered with ſlate, chiefly about the ſquare called *Battan*, which is adorned with a fountain, the water of which proceeds from the ſtatue of Bacchus. The river Dreux is paſſed over on a ſtone bridge, to enter from one part of Beſançon into the other. The market-place is at the entrance; and on the left is another ſquare, adorned with a fountain, where the great ſtreet begins, which traverſes all this part, from the bridge to St. John the Great. The new ſquare is not far from this ſtreet, from whence you go to the town-houſe, which is a large ſtructure with four wings: before the front of this is the ſtatue of Charles V. in bronze, with a globe in one hand and a ſword in the other. The imperial eagle is raiſed over a large baſon, and ſpouts out water by both his beaks. The governor's palace is the moſt magnificent in the province, and there is a fountain a little farther, adorned with the figure of a naked woman, with water ſpringing out at her nipples. E. long. 6. 10. N. lat. 47. 26.

BESANT, or Bezant, a coin of pure gold, of an uncertain value, ſtruck at Byzantium, in the time of the Chriſtian emperors; from hence the gold offered by the king at the altar is called *beſant* or *biſant*.

BESANTED, or Bezanted, in heraldry, a term which ſignifies *full of beſants*; and is uſed to denote a field, ordinary, or charge, covered with above eight beſants: for if there be but eight or fewer, their number muſt be particularly mentioned.

BESELEEL *and* Ooliah, architects, ſculptors, and painters, ſuppoſed to have made all the ornaments in braſs, ſilver, &c. of the firſt tabernacle in the wilderneſs, 1490 B. C.

BESIERS, or Beziers, an ancient and handſome town of France, in the department of Herault and late province of Languedoc. It is delightfully ſituated; and the country in which it ſtands is fertile in corn, oil, and produces excellent wine. It is ſeated on a hill near the river Orbe, in E. long. 3. 23. N. lat. 43. 21.

BESISTAN, or Berstein; thus at Conſtantinople, Adrianople, and in ſome other towns within the Grand Signior's dominions, they call thoſe places where the merchants have their ſhops, and expoſe their merchandize to ſale. Each ſort of merchants have their particular beſiſtan, which muſt alſo be underſtood of the workmen, all thoſe of the ſame trade working in the ſame place. Theſe beſiſtans are commonly large galleries, vaulted over, whoſe gates are ſhut every night. Sometimes the wardens and keepers of the beſiſtans will anſwer for the merchandize, on paying them a very moderate perquiſite for every ſhop.

BESLERIA, in botany (from Baſilius Beſler, an apothecary at Nuremberg, author of a book, intitled, *Hortus Eyſtetenſis*), a genus of the angioſpermia order, belonging to the didynamia claſs of plants. Of this genus there are three ſpecies; the melittifolia, with branching footſtalks and oval leaves; the lutea, with ſimple footſtalks growing in cluſters, and ſpear-ſhaped leaves; and the criſtata, with ſtalks growing ſingle, and a five-leaved involucrum. All theſe are natives of the warm parts of America, and cannot be preſerved in this country without artificial heat. But as they are remarkable neither for beauty nor any other property, a particular deſcription would be ſuperfluous.

BESORCH, a coin of tin, or ſome alloyed metal, current at Ormus, at the rate of $\frac{7}{49}$ parts of a farthing ſterling.

BESOZZI, or Bezutius (Ambrogio), a painter of conſiderable eminence, was born at Milan in 1648. He worked ſome time under Gioſeffo Danedi, called *Montalti*: he afterwards went to Rome, where he ſtudied from the antiques and the pictures of the greateſt maſters; and at laſt perfected himſelf in the ſchool of Ciro Ferri. His great excellence conſiſted in painting architecture, friezes, imitations of baſs-relieves, and other decorations. He died at Milan in 1706, aged 58 years.

BESSARABIA, a territory of Turkey in Europe, lying between Moldavia, the Danube, the Black Sea, and Little Tartary. It is inhabited by independent Tartars, who maintain themſelves by their cattle, huſbandry, and by robbery. Their religion, manners, and cuſtoms, are the ſame with thoſe of the Crim Tartars. When there are any forces ſent againſt them, they retire among the mountains near the Black Sea, where it is impoſſible to come at them on account of the moraſſes and defiles.

BESSARION, titular patriarch of Conſtantinople and archbiſhop of Nice, and one of thoſe illuſtrious perſons who contributed to the reſurrection of letters in the 15th century, was born at Trebiſond. He was very zealous to reunite the Greek with the Latin church, and engaged the emperor John Paleologus to intereſt himſelf in bringing this great work about. He paſſed into Italy, appeared at the council of Florence, harangued the fathers, and made himſelf admired as well by his modeſty as by his uncommon abilities. The Greek Schiſmatics conceived ſo mortal an averſion to him, that he was obliged to remain in Italy; where pope Eugenius IV. honoured him with the purple in 1439. He fixed his abode at Rome, and would have been raiſed to the Papal chair, if cardinal Alain had not oppoſed it, as injurious to the Latin church to chooſe a Greek however illuſtrious. He was em-

ployed in ſeveral embaſſies, but that to France proved fatal to him. When legate at this court, he happened to viſit the duke of Burgundy, before he ſaw Louis XI. which ſo diſconcerted the capricious haughty monarch, as to occaſion him a very ungracious reception. Nay, the king even took the cardinal legate by his moſt magnificent beard, ſaying in his fine Latin, *Barbara Græca genus retinent quod habere ſolebant:* and this affront ſo chagrined the cardinal, as to occaſion his death at Ravenna upon his return in 1472. This at leaſt is what Matthieu relates in his Hiſtory of Louis XI. Beſſarion loved the literati, and protected them. Argyropilus, Theodore of Gaza, Poggius, Laurentius Valla, &c. formed in his houſe a kind of academy. His library was large and curious; and the ſenate of Venice, to whom he gave it, preſerve it to this day with attention and regard. He left ſome works, which rank among thoſe that helped to revive letters; as, *Defenſio Doctrinæ Platonicæ*, &c. Tranſlations of ſome Pieces of Ariſtotle. Orations, Epiſtles, &c.

BESIS. See Bes.

BESTAIL, or Bestial, in ancient ſtatutes, all kinds of beaſts or cattle, eſpecially thoſe purveyed for the king's proviſion.

BESTIARII, in Roman antiquity, ſuch as fought againſt beaſts, or thoſe who were expoſed to them by ſentence of the law. There were four kinds of beſtiarii: the firſt were thoſe who made a trade of it, and fought for money; the ſecond were ſuch young men as, to ſhow their ſtrength and dexterity in managing their arms, fought againſt beaſts; the third kind was, where ſeveral beſtiarii were let looſe at once, well armed, againſt a number of beaſts; and the fourth kind were thoſe condemned to the beaſts, conſiſting either of enemies taken priſoners in war, or as being ſlaves, and guilty of ſome enormous crime; thoſe were all expoſed naked, and without the means of defence.

BESTRICIA, a town of Tranſylvania, remarkable for the gold mines in its neighbourhood. E. long. 22. 5. N. lat. 48. 0.

BETA, the Beet; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx has four leaves; there is no corolla; the ſeeds are kidney-ſhaped, and ſituated within the baſe of the calyx.

The Species are, 1. The *maritima*, or ſea-beet, grows naturally by the ſea-ſide, and in ſalt marſhes, in many parts of England, as alſo on the Baſs iſland at the mouth of the Forth in Scotland. It has been ſuppoſed by many to be only a variety of the common white beet; but Mr. Miller aſſures us he has been unable to make any variation in them by culture. 2. The *hortenſis*, or common white beet, is cultivated in gardens for the ſake of its leaves, which are frequently uſed in ſoups. The root of this ſort ſeldom grows larger than a man's thumb; the ſpikes of flowers come out from the wings of the leaves, which are long, and have narrow leaves placed between the flowers. The lower leaves of the plant are thick and ſucculent, and their footſtalks broad. The varieties of this are, the white beet, the green beet, and the Swiſs or chard beet. Theſe will vary from the one to the other, but have never been found to change to the firſt or third ſort. 3. The *vulgaris*, or red beet, with a pyramidal root, hath large, thick, ſucculent leaves, which are for the moſt part of a dark-green or purple colour. The roots of this are large, and of a deep red colour. The larger theſe roots grow, the tenderer they are; and the deeper their colour, the more they are eſteemed. The varieties of this ſpecies are, the common red beet, the turnip-rooted beet, and the green leaved red beet. 4. The *cicla*, or root of ſcarcity, which has been extolled to a ridiculous height in many publications of late years, but which has nothing in fact to recommend it beyond other kinds of beet.

The common white beet is generally ſown by itſelf in the beginning of March, upon an open ſpot of ground, not too moiſt. When the plants have put out four leaves, the ground ſhould be hoed as is practiſed for carrots, carefully cutting up all the weeds, and alſo the plants where they are too near each other, leaving them at leaſt ſix inches aſunder. In three weeks or a month's time the ground ſhould be hoed a ſecond time to cut up the weeds and thin the plants to a greater diſtance; for by this time they will be out of danger, ſo ſhould not be left nearer than eight or nine inches, if regard is had to the goodneſs of the leaves; and if it is of the Swiſs kind, with broad leaves, the plants muſt not be nearer than a foot. In ſix weeks after, the ground ſhould be hoed over a third time, which, if properly done, will deſtroy all the weeds. After this the plants will ſpread, and prevent the weeds from growing, therefore will want but little cleaning for a conſiderable time, and the leaves will ſoon be fit for uſe. The outer larger leaves ſhould be firſt gathered, leaving the ſmaller inner ones to grow large; by which method a ſmall ſpot of ground will ſupply a moderate family for a whole year, provided the plants are not allowed to run to ſeed, for in that caſe they will not be good.

The red beet is frequently ſown with onions, carrots or parſnips; but if theſe are not to be ſoon removed, the beets ought to be ſown by themſelves. This ſort requires a deep light ſoil; the ſeeds ſhould be ſown in March, and muſt be treated in the ſame manner as the former ſort: but the plants ſhould not be left nearer than a foot diſtance, or in a good land a foot and a half; for the leaves will cover the ground at that diſtance. The roots will be fit for uſe in autumn, and continue good all winter; but in the ſpring, when they begin to ſhoot, they will be hard and ſtringy.

The beets afford little nouriſhment, and are even ſaid by ſome to be prejudicial to the ſtomach. The juice expreſſed from the roots is a powerful errhine. The root of the red beet is ſometimes uſed to improve the colour of claret; and it has been found that good ſugar might be produced from the roots of the white kind by the methods practiſed abroad for procuring it from the ſugar cane. By ſome it is recommended to cultivate the white beet in large quantities as food for cattle. See Husbandry.

BETANZOS, a town of Galicia in Spain, ſeated on the Mandeo, and a bay of the ſea, in W. long. 7. 50. N. lat. 43. 21.

BETEL, or Betle, in botany, an Indian plant (a ſpecies of Piper), of great uſe and eſteem in the eaſt, where it makes a conſiderable article of commerce. See Piper.

BETELFAGUI, a town of Aſia, in Arabia Felix, famous for the vaſt quantity of coffee bought and ſold there; being the mart where the country people bring their coffee to ſell; and where the Europeans come, or ſend their factors or brokers, to purchaſe it. E. long. 57. 20. N. lat. 15. 40.

BETHESDA (called in the Greek κολυμβηθρα προβατικη, and thence in the Vulgate *Piſcina probatica*, becauſe, according to ſome, the ſheep were waſhed in it, which were appointed for ſacrifices), was the Hebrew name for a pool or public bath, which had five porticos, piazzas, or covered walks around it. This bath, for its ſingular uſefulneſs, was called בית חסרה, *Beth Chezda*, or the *houſe of Mercy*, becauſe, as Pool, in his Annotations, obſerves, the erecting of baths was an act of great kindneſs to the common people, whoſe indiſpoſitions in hot countries required frequent bathing. However, ſome will have the word Bethesda to be בית אשרה, or the *ſink-houſe*, or *drain*, becauſe the waters which came

from the temple, and the place where the victims were washed, flowed thither. From the Greek word κολυμβηθρα being used by Josephus (*Antiq.* xv. 3.) to denote the baths at Jericho, Dr. Macknight, in his Harmony of the Gospels, concludes that their opinion seems to be without a proper foundation who affirm, that this pool served for washing the sheep designed for sacrifice before they were driven into the temple, and for washing the entrails of the beasts sacrificed there: besides, he thinks it inconsistent with the situation of Bethesda, *near the sheep-gate* (or *market*, as our English translators have rendered the Greek επι τη προβατικη κολυμβηθρα, though some copies have it, Εν τη, &c.) in the south-east wall of the city; or, according to the compilers of the Universal History, in that which was on the north-east, a great way from the temple. However this may be, we are told (John v. 2, 3, &c.) that in the porticos of this bath, at the time of a certain feast (which is generally supposed to have been the passover), there lay a multitude of impotent folk, such as the blind, halt and withered, waiting for the moving of the water: for an angel went down at a certain season into the pool, and troubled the water; that is, moved it in a sensible manner. Whosoever then first, after the troubling of the water, stepped into it, was made whole of whatever disease he had. Some writers confine the miracle of the pool of Bethesda to the season of this particular feast mentioned in verse 1. of this chapter, because they understand κατα καιρον, *by times* (verse 4.), which our translators render, *a certain season*, meant *at that season*; that is, the season mentioned verse 1; and since the evangelist does not say that the waters of Bethesda had their sanative quality at any other feast, we are at liberty to make what supposition seems most convenient. Perhaps the silence of Philo and Josephus upon this miracle may induce some to think, that it happened only at one passover: for though many infirm people lay in Bethesda, if the angel, as is probable, descended frequently during that solemnity, the miracle would be no sooner known, than multitudes would come and wait at the pool to be cured by the moving of the waters: however, if the number of the sick who gathered on this occasion, and the phrase κατα καιρον, shall incline any person to believe that the waters of Bethesda had an healing quality at other passovers also, Dr. Macknight observes, that the silence of the writers before mentioned needs not be much regarded; it being well known that they have omitted greater transactions which they had an opportunity to know, *viz.* that multitude and variety of miracles which our Lord performed in the course of his ministry. That the waters of Bethesda should at this time have obtained a miraculous healing quality was, without doubt, as that writer remarks, in honour of the personal appearance of the Son of God on earth. Perhaps it was intended to show that Ezekiel's (xlvii.) vision of waters issuing out of the sanctuary was about to be fulfilled, of which waters it is said, (ib. verse 9.) "They shall be healed, and every thing shall live whither the river cometh." But it must be observed, that the fourth verse of this chapter of St. John is not in the Cambridge MS. which formerly was Beza's, nor in one or two more of great authority. See Dr. Mill's judgment of it in that part of his *Prolegomena* to which he refers the reader in his note on the text. But though it should be rejected, the difficulty for which some would have it cancelled, Dr. Macknight observes, remains still: because the seventh verse implies that cures were performed in this pool, and that only one at a time was cured, and consequently that these cures were miraculous. If so, it is as easy to conceive that an angel moved the water, and gave it its healing quality, as to fancy those cures were performed miraculously any other way. Grotius thinks, that the angel is said to have descended, not because he was ever seen to do so, but because the Jews were persuaded that God brought such things to pass by the ministration of angels; so that from that violent motion of the water, and the cure following it, the presence of an angel was with reason supposed. Dr. Hammond supposes, that the waters became medicinal by being impregnated with a healing warmth from the blood and entrails of the sacrificed beasts that were washed there; and that the αγγελος, *angel*, or *messenger*, in the text, is not to be understood of those celestial beings that are usually distinguished by that name, but only of a common messenger, *viz.* an officer or servant of the priest, who at a proper season was sent by him to stir up the pool.

BETHLEHEM, a town of Palestine, famous for the birth of Jesus Christ. It was once a flourishing town, but is now only a poor village. It is situated two leagues south-east of Jerusalem, on an eminence, in a country full of hills and valleys, and might be rendered very agreeable. The soil is the best in all these districts: fruits, vines, olives, and sesamum succeed here extremely well; but cultivation is wanting. They reckon about 600 men in this village capable of bearing arms upon occasion; and this often occurs, sometimes to resist the Pacha, sometimes to make war with the adjoining villages, and sometimes in consequence of intestine dissensions. Of these 600 men, about 100 are Latin Christians, who have a vicar dependent on the great convent of Jerusalem. Formerly their whole trade consisted in the manufacture of beads; but the reverend fathers not being able to find a sale for all they could furnish, they have resumed the cultivation of their lands. They make a white wine, which justifies the former celebrity of the wines of Judea, but it has the bad property of being very heady. The necessity of uniting for their common defence prevails over their religious differences, and makes the Christians live here in tolerable harmony with the Mahometans, their fellow-citizens. Both are of the party *Yamani*, which, in opposition to that called *Kaisi*, divides all Palestine into two factions, perpetually at variance. The courage of these peasants, which has been frequently tried, has rendered them formidable through all that country. Here is a church built by St. Helena, in the form of a cross, which is very large; and from its top may be seen all the country round about. The roof is lofty, flat, and composed of cedar on the inside, and leaded without. Both sides of the nave are supported by two rows of marble pillars, each made of one piece, and eleven in a row, insomuch that they make as it were five naves, separated from each other by these rows of pillars, in each of which is the picture of some saint. On the wall over the pillars there is a very beautiful Mosaic work, on a gold ground. The walls were formerly overlaid with fine marble, but the Turks have taken it to adorn their mosques. The three upper ends of the cross terminate in three semicircles, having in each an altar. Over the chancel there is a stately cupola, covered with lead on the outside, and within adorned with Mosaic work. Close to the church is the monastery of the Franciscans; which is large, but indifferently built. The gardens are defended with strong walls, and at the north-west of them stands a tower now almost in ruins. Their chapel is better taken care of. Through this there is a passage to a square cave, where they say the Innocents were buried. Beyond this there are passages to the tombs of St. Jerom, St. Paula, Eustochium, and Eusebius of Cremona. Beyond these there is a grot or cell, which they say was the lodging-place of St. Jerom when he translated the Bible. Another entrance leads to a vault or chapel, 12 feet wide and 40 long, whose floor is paved, and sides lined with white marble, and the roof is adorned with Mosaic work, now much decayed. At the end of this there is an arched concavity, with an altar, over which is a picture

of the nativity, and under it a vault, the middle of which is a ſtar made with ſtones of various colours, to mark the place where they ſay our Saviour was born; and near this is the manger where they pretend he was laid; it is hewn out of a rock, and is now flagged with white marble.

Bethlehem, a town of the Netherlands, in the province of Brabant, ſubject to the houſe of Auſtria, till lately conquered by the French republican army. E. long. 4. 40. N. lat. 51. 2.

BETHLEHEMITES, or Bethlemites, in Church Hiſtory, a ſort of monks introduced into England in the year 1257, habited like the Dominicans, except that, on their breaſt, they wore a ſtar with five rays, in memory of the ſtar or comet which appeared over Bethlehem at the nativity of our Saviour. They were celled at Cambridge, and had only one houſe in England. There is alſo an order of Bethlehemites ſtill ſubſiſting in Peru, who have convents at Lima; one called of the Incurables, the other of our Lady of Mount Carmel. Theſe Bethlehemites came originally from the city of Guatimala in Mexico, where they were inſtituted by the venerable Peter Joſeph of Betaneur, for the ſervice of the poor. Innocent XI. in 1687, approved the inſtitute. They have already nine convents in Peru. The Bethlehemites, though outwardly of great ſimplicity, paſs for the moſt refined politicians; inſomuch as to be called the quinteſſence of the Carmelites and Jeſuits. They are all friars. For their almoner they chooſe a ſecular prieſt, whom they hire, and who has no vote in the chapter.

BETHSAIDA. See Betharamphtha.

BETHUNE (Maximilian de), Duke of Sully, grand maſter of the artillery, and marſhal of France, ſovereign prince of Enrichemont and Bois-Bell, Marquis of Roſny, and one of the ableſt and moſt upright miniſters France ever had, was deſcended from an illuſtrious houſe, and was born in 1560. He entered very young into the ſervice of Henry of Bourbon then king of Navarre, afterwards Henry IV. of France, who was juſt ſeven years his elder. He was bred in the reformed religion, and continued in the profeſſion of it to the end of his life, though from political motives he adviſed his maſter to abjure it, as the only method of putting an end to the miſeries of France. After Henry had gained poſſeſſion of the kingdom, Sully performed all the duties of a great and good miniſter, while his maſter exerciſed all the offices of a great and good king. He had been at the battles of Coutras, Arques, and Ivry; at the ſieges of Paris, Noyon, Rouen, and Laon; and ſignalized himſelf on every important occaſion. In 1597 he was made chief overſeer of the highways of France; and the following year was raiſed to the poſt of ſuperintendant of the finances. Though he was then but 40 years of age, and had hitherto ſignalized himſelf only in the army, he put the king's finances in ſuch order, that he paid his debts, which amounted to two hundred millions of livres, and laid up great ſums in the king's treaſury. In 1601 he was made grand-maſter of the artillery, the next year governor of the Baſtile, and afterwards ſuperintendant of the fortifications. He was then ſent into England as ambaſſador extraordinary; and had, at his return, the government of Poictou. At laſt Henry IV. in 1626, erected in his favour the territory of Sully on the Loire into a duchy and peerage, and made him grand-maſter of the ports and havens. After the murder of that great prince in 1600, the Duke of Sully, who had ſerved him with the greateſt zeal and fidelity, was obliged to retire to one of his houſes, where he enjoyed a private life; but in 1634 he was made marſhal of France, upon which he reſigned the poſt of grand-maſter of the artillery. He died in his caſtle of Villebon on the 21ſt of December 1641, at 82 years of age. His Memoirs are ranked among the beſt books of French hiſtory: they contain a moſt particular account of whatever paſſed from the peace of 1570 to the death of Henry IV. in 1610; and acquire additional value from the many curious perſonal anecdotes preſerved in them. Mrs. Lennox tranſlated them into Engliſh in 1757.

Bethune, a town of France, in the department of the ſtraits of Calais, and late county of Artois, containing upwards of 5000 inhabitants. There is an entrance into this city through four gates, and it is ſurrounded with walls and fortified. The city and the caſtle taken together are of a triangular figure, but the caſtle itſelf is a very irregular building. The houſes are very indifferent, and the ſtreets ill paved; however, there is a large handſome ſquare, and ſeveral churches. In the marſhy lands near the city there are canals cut for the convenience of whitening linen. It is ſeated on a rock by the river Belſe. E. long. 2. 48. N. lat. 50. 32.

BETIS, governor of Gaza under Darius, famous for his valour and loyalty; he defended a place of conſequence with a few men againſt Alexander, who was there ſhot through the ſhoulder. Betis thinking him ſlain, returned triumphantly to the city; but in a ſecond aſſault he was wounded and brought to Alexander, who cruelly ordered him to be put to death.

BETLEY, a town of Staffordſhire in England. It is ſeated on the confines of the county, next to Cheſhire, in a barren ſandy ſoil. W. long. 2. 15. N. lat. 53. 0.

BETLIS, a ſtrong town of Armenia or Turcomania, belonging to a bey or prince of the country, who is very powerful, and is ſubject to neither the grand ſignior nor the king of Perſia. It lies on the road from Tauris to Aleppo, and the prince can ſtop caravans whenever he pleaſes; for the paſſage between the mountains is ſo narrow, that ten men can defend it againſt 1000. The town is ſeated between two mountains about a cannon-ſhot from each other, and the caſtle is on an eminence exactly in the middle. This eminence is in the ſhape of a ſugar loaf; and is ſo ſteep on all ſides, that it is impoſſible to get up but by winding round about it. The people in and about the town are ſhepherds, but are ready to take up arms at the command of their prince. E. long. 42. 40. N. lat. 37. 20.

BETON, a name given by the French engineers to a kind of mortar, which they uſe in raiſing the foundations of maſonry under water. It conſiſts of twelve parts of pozzolans or Dutch tarraſs, ſix of good ſand, nine of unſlaked lime, thirteen of ſtone ſplinters about the ſize of an egg, and three of tile duſt or cinders, or ſcales of iron out of a forge; this being well worked together, is left to ſtand for about 24 hours, or till it becomes ſo hard as not to be ſeparated without a pick-axe.

BETONICA, Betony; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The calyx is awned; the upper lip of the corolla is aſcending and flattiſh; and the tube is cylindric.

Of this genus botanical writers enumerate the following *ſpecies*. 1. The *officinalis*, purple or wood betony. 2. The *danica*, or greater Daniſh betony. 3. The *alpina*, or leaſt Alpine betony. 4. The *orientalis*, or eaſtern betony, with very long narrow leaves, and a thicker ſpike of flowers. 5. The *incana*, or hoary Italian betony, with a fleſh-coloured flower. Of theſe the firſt ſpecies only deſerves notice. It is a low plant growing in woods and ſhady places in ſeveral parts both of England and Scotland; the flowers come forth in June and July, of a purpliſh colour, and ſtand in ſpikes on the top of the ſtalks. The leaves and flowers have an herbaceous, rough-

iſh, ſomewhat bitteriſh taſte, accompanied with a very weak aromatic flavour.

The powder of the leaves of betony ſnuffed up the noſe provokes ſneezing; and hence it is ſometimes made an ingredient in ſternutatory powders. This effect does not ſeem to be owing, as is generally ſuppoſed, to any peculiar ſtimulating virtues in the herb, but to the rough hairs with which the leaves are covered. The roots of this plant differ greatly in their quality from the other parts: their taſte is very bitter and nauſeous; taken in a ſmall doſe, they vomit and purge violently, and are ſuppoſed to have ſomewhat in common with the roots of hellebore. According to Simon Pauli and Bartholinus, this plant affects thoſe who gather any conſiderable quantity of it with a diſorder reſembling drunkenneſs. Its leaves are ſometimes ſmoked like tobacco.

BETONICA *Aquatica*. See SCROPHULARIA.

BETONICA *Pauli*. See VERONICA.

BETONY. See BETONICA.

BETROTHMENT, a mutual promiſe or compact between two parties for a future marriage. The word imports as much as giving one's troth; that is, true faith, or promiſe. Betrothment amounts to the ſame with what is called by civilians and canoniſts *ſponſalia*, or "eſpouſals;" ſometimes *deſponſation*, and by the French *fiancailles*.

BETTERTON (Thomas), the celebrated actor, was the ſon of Mr. Betterton, under-cook to King Charles I. and was born in Tothill-ſtreet, Weſtminſter, in the year 1635. Having received the firſt rudiments of a genteel education, his fondneſs for reading induced him to requeſt of his parents that they would bind him an apprentice to a bookſeller, which was readily complied with, fixing on one Mr. Rhodes near Charing-croſs for his maſter. This gentleman, who had been wardrobe-keeper to the theatre in Blackfriars before the troubles, obtained a licence in 1659, from the powers then in being, to ſet up a company of players in the Cock-pit in Drury-lane, in which company Mr. Betterton entered himſelf, and, though not much above 20 years of age, immediately gave proof of the moſt extraordinary genius and merit.

Soon after the Reſtoration, two diſtinct theatres were eſtabliſhed by royal authority; one in Drury-lane, in conſequence of a patent granted to Henry Killigrew, Eſq. which was called the *King's Company*: the other in Lincoln's-inn-fields, who ſtyled themſelves the *Duke of York's Servants*, the patentee of which was the ingenious Sir William Davenant. The laſt-mentioned gentleman having long had a cloſe intimacy with and warm friendſhip for Mr. Rhodes, engaged Mr. Betterton, and all who had acted under Mr. Rhodes, into his company; which opened in 1662 with a new play of Sir William's, in two parts, called the *Siege of Rhodes*. In this piece, as well as in the ſubſequent characters which Mr. Betterton performed, he increaſed his reputation and eſteem with the public, and indeed became ſo much in favour with King Charles II. that by his majeſty's ſpecial command he went over to Paris to take a view of the French ſtage, that he might the better judge what would contribute to the improvement of our own; and it was upon this occaſion, as is generally ſuppoſed, that moving ſcenes were firſt introduced upon the Engliſh theatre, which before had been only hung with tapeſtry.

In the year 1670 he married a Mrs. Sanderſon, a female performer on the ſame ſtage; who, both as an actreſs and a woman, was every thing that human excellence was capable of arriving at, and with whom he through the whole courſe of his remaining life poſſeſſed every degree of happineſs that a perfect union of hearts can beſtow. When the duke's company removed to Dorſet-gardens, he ſtill continued with them; and on the coalition of the two companies in 1684, he acceded to the treaty, and remained among them; Mrs. Betterton maintaining the ſame foremoſt figure among the women that her huſband ſupported among the male performers. And ſo great was the eſtimation that they were both held in, that in the year 1675, when a paſtoral called *Caliſta* or the *Chaſte Nymph*, written by Mr. Crown at the deſire of Queen Catherine, conſort to Charles II. was to be performed at court by perſons of the greateſt diſtinction, our Engliſh Roſcius was employed to inſtruct the gentlemen, and Mrs. Betterton honoured with the tutorage of the ladies, among whom were the two princeſſes Mary and Anne, daughters of the Duke of York, both of whom ſucceeded to the crown of theſe realms. In grateful remembrance of this, the latter of them, when queen, ſettled a penſion of 100l. *per annum* on her old inſtructreſs.

In the year 1693, Mr. Betterton having ſounded the inclinations of a ſelect number of the actors whom he found ready to join with him, obtained, through the influence of the Earl of Dorſet, the royal licence for acting in a ſeparate theatre; and was very ſoon enabled, by the voluntary ſubſcriptions of many perſons of quality, to erect a new playhouſe within the walls of the Tennis-court in Lincoln's-inn-fields. To this ſtep Mr. Betterton is ſaid to have been induced, partly by ill treatment from the managers, and partly with a view to repair, by the more enlarged profits of a manager, the loſs of his whole fortune (upwards of 2000l.), which he had undergone in the year 1692, by adventuring it in a commercial ſcheme to the Eaſt Indies. Be this, however, as it will, the new theatre opened in 1695 with Mr. Congreve's *Love for Love*, the ſucceſs of which was amazingly great. Yet in a few years it appeared that the profits ariſing from this theatre, oppoſed as it was by all the ſtrength of Cibber's and Vanbrugh's writings at the other houſe, were very inſignificant; and Mr. Betterton growing now into the infirmities of age, and labouring under violent attacks of the gout, he gladly quitted at once the fatigues of management and the hurry of theatrical buſineſs.

The public, however, who retained a grateful ſenſe of the pleaſure they had frequently received from this theatrical veteran, and ſenſible of the narrowneſs of his circumſtances, reſolved to continue the marks of their eſteem to him by giving him a benefit. On the 7th of April 1709, the comedy of *Love for Love* was performed for this purpoſe, in which this gentleman himſelf, though then upwards of 70 years of age, acted the youthful part of Valentine; as in the September following he did that of Hamlet, his performance of which the author of the Tatler has taken particular notice of. On the former occaſion, thoſe very eminent performers, Mrs. Barry, Mrs. Bracegirdle, and Mr. Dogget, who had all quitted the ſtage ſome years before, in gratitude to one whom they had had ſo many obligations to, acted the parts of Angelica, Mrs. Frail, and Ben; and Mr. Rowe wrote an epilogue for that night, which was ſpoken by the two ladies, ſupporting between them this once powerful ſupporter of the Engliſh ſtage. The profits of this night are ſaid to have amounted to upwards of 500l. the prices having been raiſed to the ſame that the operas and oratorios are at preſent; and when the curtain drew up, almoſt as large an audience appearing behind as before it.

In the following winter Mr. Betterton was prevailed on by Mr. Owen M'Swinney, then manager of the opera-houſe in the Hay-market (at which plays were acted four times a-week), to continue performing, though but ſeldom. In conſequence of which, in the enſuing ſpring, viz. on the 25th of April 1710, another play was given out for this gentleman's benefit, viz. The *Maid's Tragedy* of Beaumont and Fletcher,

in which he himſelf performed his celebrated part of Melanthus. This, however, was the laſt time of his appearing upon the ſtage; for, having been ſuddenly ſeized with the gout, and being impatient at the thoughts of diſappointing his friends, he made uſe of outward applications to reduce the ſwellings of his feet, which enabled him to walk on the ſtage, though obliged to have his foot in a ſlipper. But although he acted that day with unuſual ſpirit and briſkneſs, and met with univerſal applauſe, yet he paid very dear for this tribute he had paid to the public; for the fomentations he had made uſe of occaſioning a removal of the gouty humour to the nobler parts, threw the diſeaſe up into his head, and terminated his life on the 28th of that month. On the 2d of May his body was interred with much ceremony in the cloyſter of Weſtminſter, and great honour paid to his memory by his friend the Tatler, who has related in a very pathetic, and at the ſame time the moſt dignified manner, the proceſs of the ceremonial. As an *author*, Mr. Betterton had a conſiderable degree of merit. His dramatic works are, 1. Amorous Widow, a comedy. 2. Diocleſian, a dramatic opera. 3. Maſque in the Opera of the Propheteſs. 4. Revenge, a comedy. 5. Unjuſt Judge, a tragedy. 6. Woman made a Juſtice, a comedy. As an *actor*, he was certainly one of the greateſt of either his own or any other age; but thoſe who are deſirous of having him painted out in the moſt lively colours to their imagination, we muſt refer to the deſcription given of him by his cotemporary and friend Colley Cibber, in the Apology for his own life.

BETUE, or Betaw, a territory of the Low Countries in the duchy of Guelderland, between the rivers Rhine and Leck. The ground is very moiſt, and the rains often render the roads impaſſable. It is divided into the Upper and Lower.

BETULA, the Birch-tree; a genus of the tetrandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 50th order, *Amentaceæ*. The calyx of the male is monophyllous, trifid, and triflorous; and the corolla is parted into four ſegments: the female calyx is monophyllous, trifid, and biflorous: the ſeeds have a membranaceous wing on both ſides.

The *Species* are, 1. The *alba*, or common birch tree, ſo very well known as to need no deſcription. It is in general of a humble growth; however, in a favourable ſoil and ſituation, it will riſe to a great height, and grow to a conſiderable ſize. There is a ſpruceneſs in its general appearance in ſummer; and in winter its bark ſometimes exhibits, in its variegations of red and white, no inelegant object. Were it not for its being ſo commonly ſeen upon poor ſoils, and in bleak inhoſpitable ſituations, as well as for the mean and degrading purpoſes to which it is univerſally put, the birch would have ſome claim to being admitted to a place among the ornamentals. 2. The *nana*, or dwarf-birch, with roundiſh leaves, grows naturally in the northern parts of Europe, and on the Alps. It ſeldom riſes above two or three feet high, having ſlender branches garniſhed with round leaves, but ſeldom produces flowers here. It is preſerved in ſome curious gardens for the ſake of variety, but is a plant of no uſe. 3. The *lenta*, or Canada birch, grows to a timber tree of 60 or more feet in height. The leaves are heart-ſhaped, oblong, ſmooth, of a thin conſiſtence, pointed, and very ſharply ſerrated. They differ in colour; and the varieties of this ſpecies go by the names of, 1. Duſky Canada birch; 2. White-paper birch; 3. Poplar-leaved Canada birch; 4. Low-growing Canada birch, &c.—4. The *nigra*, or black Virginia birch-tree, will grow to upwards of 60 feet in height. The branches are ſpotted, and more ſparingly ſet in the trees than the common ſorts. The leaves are broader, grow on long footſtalks, and add a dignity to the appearance of the tree; and as it is naturally of upright and ſwift growth, and arrives at ſo great a magnitude, Hanbury thinks it ought to have a ſhare among our foreſt-trees, and to be planted for ſtandards in open places, as well as to be joined with other trees of its own growth in plantations more immediately deſigned for relaxation and pleaſure. There are ſeveral varieties of this ſpecies, differing in the colour, ſize of the leaves, and ſhoots; all of which have names given them by nurſerymen, who propagate the different ſorts for ſale; ſuch as, 1. The broad-leaved Virginian birch; 2. The poplar-leaved birch; 3. The paper birch; 4. The brown birch, &c.—5. The *alnus*, or alder tree, will grow to a large timber tree. Like the birch, it ſuffers, as an ornamental, from an aſſociation of ideas; we not only ſee it very common, but we ſee it in low, dreary, dirty ſituations: nevertheleſs, if the alder be ſuffered to form its own head, in an open and advantageous ſituation, it is by no means an unſightly tree. In Stow Gardens, in what is called the old part, there are ſome very fine ones; and in coming round from the houſe by the road leading to Buckingham, there is one which is truly ornamental. Hacked and diſfigured in the manner in which alders in general are, they have but little effect in doing away the unſightlineſs of a ſwamp; but if they were ſuffered to riſe in groups and ſinglets, open enough to have room to form their full tops, and cloſe enough to hide ſufficiently the unſeemlineſs of the ſurface, even a moor or a moraſs ſeen from a diſtance might be rendered agreeable by them. Wherever the ſoil is or can be made paſturable, the alder ſhould by no means be permitted to gain a footing. Its ſuckers and ſeedlings poiſon the herbage; and it is a fact well known to the obſervant huſbandman, that the roots of the alder have a peculiar property of rendering the ſoil they grow in more moiſt and rotten than it would be if not occupied by this aqueous plant. Plantations of alders ſhould therefore be confined to ſwampy, low, unpaſturable places, except when they are made for the purpoſes of ornament; and in this caſe the native ſpecies ought to give place to its more ornamental varieties, of which Hanbury makes five; namely, 1. The long-leaved alder; 2. The white alder; 3. The black alder; 4. The hoary-leaved alder; 5. The dwarf alder.

The firſt ſort is eaſily cultivated: it may be raiſed either from ſeeds or layers; and it will flouriſh in almoſt any ſoil and ſituation. The method of propagating the foreign ſorts of birch is, 1. From ſeeds. We receive the ſeeds from America, where they are natives; and if we ſow them in beds of fine mould, covering them over about a quarter of an inch deep, they will readily grow. During the time they are in the ſeminary, they muſt be conſtantly weeded, watered in dry weather, and when they are one or two years old, according to their ſtrength, they ſhould be planted in the nurſery in rows in the uſual manner. Weeding muſt always be obſerved in ſummer, and digging between the rows in winter; and when the plants are about a yard or four feet high, they will be of a good ſize to be planted out for the ſhrubbery-quarters. A part, therefore, may be then taken up for ſuch purpoſes; whilſt the remainder may be left to grow for ſtandards, to anſwer ſuch other purpoſes as may be wanted. 2. Theſe trees may alſo be propagated by layers; and this is the way to continue the peculiarities in the varieties of the different ſorts. A ſufficient number of plants ſhould be procured for this purpoſe, and ſet on a ſpot of double-dug ground, three yards diſtance from each other. The year following, if they have made no young ſhoots, they ſhould be headed to within half a foot of the ground, to form the ſtools, which will then ſhoot vigorouſly the ſummer following; and in the autumn the young ſhoots ſhould be plaſhed near the ſtools, and the tender twigs layered near their ends. They will then ſtrike root, and become good plants by the autumn following; whilſt freſh twigs will have ſprung up from the ſtools, to be ready for the ſame operation.

The layers, therefore, ſhould be taken up, and the operation performed afreſh. If the plants deſigned for ſtools have made good ſhoots the firſt year, they need not be headed down, but plaſhed near the ground, and all the young twigs layered. Thus may an immediate crop be raiſed this way; whilſt young ſhoots will ſpring out in great plenty below the plaſhed part, in order for layering the ſucceeding year. This work, therefore, may be repeated every autumn or winter; when ſome of the ſtrongeſt layers may be planted out, if they are immediately wanted; whilſt the others may be removed into the nurſery, to grow to be ſtronger plants, before they are removed to their deſtined habitations. 3. Cuttings alſo, if ſet in a moiſt ſhady border the beginning of October, will frequently grow: but as this is not a ſure method, and as theſe trees are ſo eaſily propagated by layers, it hardly deſerves to be adopted.

The alder, like the other aquatic natives, is very eaſily cultivated. It may be raiſed either from ſuckers, from cuttings, or by layering; and no doubt from ſeed, though this mode of propagation is ſeldom practiſed in this country. Evelyn mentions a peculiar method of raiſing this tree from cuttings or truncheons, which he calls the *Jerſey-manner*: he ſays, "I received it from a moſt ingenious gentleman of that country: it is, to take truncheons of two or three feet long at the beginning of the winter, and to bind them in faggots, and place the ends of them in water till towards the ſpring, by which ſeaſon they will have contracted a ſwelling ſpire or knur about that part, which being ſet does (like the gennet-moil apple-tree) never fail of growing and ſtriking root." Miller recommends truncheons of three feet long, two feet of which to be thruſt into the ground. Hanbury ſays that truncheons are uncertain, and ſtrongly recommends layering; which for preſerving the varieties, as well as for ornamental plantations of alders in general, is the method that anſwers beſt.

In ſome of the northern parts of Europe the wood of the white birch is much uſed for making carriages and wheels, being hard and of long duration. In France it is generally uſed for making wooden ſhoes, and in Britain for making women's ſhoe-heels, packing-boxes, brooms, hoops, &c. It alſo makes very good fuel, and is planted along with hazel to make charcoal for forges. The bark of the birch tree ſeems in a manner incorruptible. In Sweden the houſes are covered with it, and it laſts many years. It frequently happens that the wood is entirely rotten, when the bark is perfectly ſound and good. In Kamtſchatka it is uſed for making drinking cups. It abounds with a reſinous matter, to which its durability is certainly owing. In conſequence of this matter, it is highly inflammable: and in the northern countries torches are made of this bark ſliced and twiſted together. The bark itſelf conſiſts of two different ſubſtances; a thick brittle browniſh red one; and ſeveral very thin, ſmooth, white, tranſparent membranes. In theſe laſt the inflammable property reſides. The thick brittle part is leſs reſinous, and has a roughiſh taſte. It has been thought to poſſeſs ſome medical virtues, but concerning theſe experience has as yet determined nothing certain. Upon deeply wounding or boring the trunk of the tree in the beginning of ſpring, a ſweetiſh juice iſſues forth, ſometimes, as is ſaid, in ſo large quantity as to equal the weight of the whole tree and root; one branch will bleed a gallon or more in a day. This juice is recommended in ſcorbutic diſorders, and other foulneſſes of the blood; its moſt ſenſible effect is to promote the urinary diſcharge. By proper fermentation with the addition of ſugar, this juice makes a pleaſant wine. The bark of the Canada birch is very light, tough, and durable; and the inhabitants of America uſe it for canoes. Notwithſtanding theſe uſes to which the birch is applicable when already in poſſeſſion, the planting of it is not recommended, except in bleak and barren ſituations where no other tree will thrive, and except as a ſkreen to defend from chilling blaſts plants whoſe value is more conſiderable.

Low marſhy ſituations are beſt adapted for the alder tree. In theſe it is frequently planted to make hedges, and is alſo of great uſe for ſecuring the banks of rivers. Graſs grows well beneath its ſhade: the wood is ſoft and brittle; but laſts a long time under water, and conſequently is of uſe for pipes, and to lay under the foundations of buildings ſituated upon bogs. Women's ſhoe heels, ploughmen's clogs, and various articles of turnery, are made of it. The bark gives a red colour, and with the addition of copperas, a black: it is chiefly uſed by fiſhermen to ſtain their nets. In the Highlands of Scotland near Dundonnel, Mr. Pennant ſays, the boughs cut in the ſummer, ſpread over the fields, and left to rot in the winter, are found to anſwer as a manure. In March, the ground is cleared of the undecayed parts, and then ploughed. The freſh gathered leaves are covered with a glutinous liquor; and ſome people ſtrew them on their floors to kill fleas. Theſe inſects are ſaid to be entangled in the glutinous liquor of the leaves, as birds are by birdlime. The whole plant is aſtringent, and its bark has been recommended in intermittent fevers. The bark of the black berry-bearing alder is ſaid to be the moſt certain purge for horned cattle in obſtinate conſtipations of the bowels. Horſes, cows, goats, and ſheep, eat the leaves of all the ſpecies of betula; but ſwine refuſe them. When eaten by cows, they are ſaid greatly to increaſe the quantity of the milk they yield.

BETULEIUS (Sixtus), an able grammarian, a good Latin poet, and philoſopher, born at Memmingin in the year 1500; his true name was *Birck*. He taught the belles lettres and philoſophy with reputation; and became principal of the college of Augſburg, where he died on the 16th of June 1554. He publiſhed ſeveral works in proſe; and his dramatic pieces of Joſeph, Suſannah, and Judith, are much eſteemed.

BEVECUM, a town of the Auſtrian Netherlands, in the province of Brabant. E. long. 4. 50. N. lat. 50. 45.

BEVEL, among maſons, carpenters, &c. a kind of ſquare, one leg whereof is frequently crooked, according to the ſweep of an arch or vault. It is moveable on a centre, and ſo may be ſet to any angle.

Bevel-*Angle*, any other angle beſides thoſe of 90 or 45 degrees.

BEVELAND (North and South), two iſlands in the province of Zealand, between the eaſtern and weſtern branches of the river Scheldt, making part of the United Provinces.

BEVELLING, in ſhip-building, the art of hewing timber with a proper and regular curve, according to a mould which is laid on one ſide of its ſurface. "In order to hew any piece of timber to its proper bevel, it will be neceſſary, firſt, to make one ſide *fair* and *out of winding*; a term uſed to ſignify that the ſide of a timber ſhould be a plane. If this ſide be uppermoſt, and placed horizontally, or upon a level, it is plain, if the timber is to be hewed ſquare, it may be done by a plummet and line; but if the timber is not hewed ſquare, the line will not touch both the upper and lower edge of the piece; or if a ſquare be applied to it, there will be wood wanting either at the upper or lower ſide. This is called *within* or *without* a ſquare. When the wood is deficient at the under ſide, it is called *under-bevelling*; and when it is deficient on the upper ſide, it is called *ſtanding-bevelling*: and this deficiency will be more or leſs according to the depth of the piece; ſo that, before the proper bevellings of the timbers are found, it will be ſometimes very convenient to aſſign the breadth of the timbers; nay, in moſt caſes it will be abſolutely neceſſary, eſpecially afore and abaft: though the breadth of two timbers, or the timber and room, which includes the two timbers and the ſpace between them, may be taken without any ſenſible error, as far

as the ſquare body goes. For as one line repreſents the moulding ſide of two timbers, the foreſide of the one being ſuppoſed to unite with the aftſide of the other; the two may be conſidered as one entire piece of timber." See Murray's Treatiſe on the Art of SHIP-BUILDING.

BEVERAGE, in a general ſenſe, ſignifies a *drink*: hence nectar is ſaid to be the beverage of the gods. In writers of the middle age, beverage, *beveragium*, or *biberagium*, denotes money given to an artificer, or other perſon, to drink, over and above his hire or wages.

BEVERIDGE (William), a learned Engliſh biſhop, was born in the year 1638, and educated in St. John's college Cambridge, where he diſtinguiſhed himſelf very early by his extenſive learning, and particularly by his knowledge of the Oriental languages. Upon the deprivation of Dr. Thomas Ken, biſhop of Bath and Wells, for not taking the oaths to the government in 1691, he refuſed the offer of that ſee, though he was then chaplain to King William and Queen Mary. In 1704 he was conſecrated to the biſhopric of St. Aſaph; in which high function he ſo behaved himſelf all along, and diſcharged it in ſo exemplary a manner, that he approved himſelf a truly primitive prelate. He died at his lodgings in the Cloiſters in Weſtminſter-Abbey in 1707, aged 71. As his whole life was ſpent in acts of piety and charity, ſo he gave remarkable inſtances of both at his death, leaving the bulk of his eſtate for the propagation of the goſpel, and promoting of Chriſtian knowledge, at home as well as abroad. His Private Thoughts upon a Chriſtian Life is a very popular, though in many points a very exceptionable book. He wrote ſeveral other works on various ſubjects, particularly on the Oriental languages.

BEVERLAND (Hadrian), a man of great genius, who lived about the end of the 16th century, but who proſtituted his talents in the compoſition of books of a very obnoxious kind. He was a perfect maſter of Ovid, Catullus, Petronius, and authors of that ſtamp. He is famous for his book on Original Sin, in which he maintained, that Adam's ſin conſiſted in his commerce with his wife, and that original ſin is nothing elſe but the inclination of the ſexes to each other: it was condemned to be burnt. He led a ſcandalous life, but ſeems to have repented of his wicked manners and lewd writings; for he publiſhed a treatiſe in the end of his life, *De Fornicatione cavenda*, in 1698. It is ſaid he died mad.

BEVERLEY, a town of Yorkſhire, governed by a mayor, a recorder, 12 aldermen, &c. and ſends two members to parliament. The minſter here is a very fair and neat ſtructure, and the roof is an arch of ſtone. In it are ſeveral monuments of the Percies, Earls of Northumberland, who had added a little chapel to the choir, in the windows whereof there are ſeveral pictures of that family painted on glaſs. At the upper end of the choir, on the right of the altar-place, ſtands the freed-ſtool, made of one entire ſtone, to which every one that fled had a right of protection. At the upper end of the body of the church, next the choir, hangs an ancient table, with the picture of King Athelſtane, who founded the church. Between them are written the following lines:

Als free make I thee,
As heart can wiſh, or egh can ſee.

In fact, the inhabitants pay no toll in any town or port in England. In the body of the church ſtands an ancient monument, called the *Virgin's Tomb*, becauſe two virgin-ſiſters lie buried there, who gave the town a piece of land, into which any free man may put three milk cows from Lady-Day to Michaelmas. At the lower end of the body of the church is a large font cut in agate ſtone.

On the ſouth ſide of the minſter, is a place called *Hall-Garth*, wherein they keep a court of record, called *Proveſt's Court*. In this, cauſes ariſing within the liberties may be tried for any ſum. The liberties contain above 100 towns and parts of towns, in Holderneſſe and other parts of the eaſt riding belonging to it. The town is a mile in length, having pleaſant ſprings running quite through it. It is beautified with two ſtately churches; and has a free-ſchool, with two fellowſhips, ſix ſcholarſhips, and three exhibitions in St. John's college, Cambridge, belonging to it; beſides ſix alms-houſes, where none are admitted but thoſe that give bond to leave their effects to the poor when they die. The principal trade of this town is making malt, oat-meal, and tanned leather; and the poor people chiefly ſupport themſelves by making bone-lace. About a mile eaſt from the town, there is a mineral water, which cures eruptions of the ſkin, and is beneficial in the ſcrofula. E. long. 0. 9. N. lat. 53. 50.

BEVERLY (John of), *Joannes Beverlacius*, archbiſhop of York in the eighth century, was born of a noble family at Harpham in Northumberland, and was juſtly eſteemed one of the beſt ſcholars of his time. He was firſt a monk, and afterwards abbot of the monaſtery of St. Hilda, when his merit recommended him to the favour of Alfred king of Northumberland, who, in the year 685, advanced him to the ſee of Hagulſtald or Hexham, and, in 687, tranſlated him to the archbiſhopric of York. This prelate was tutor to the famous Bede; and lived in the ſtricteſt friendſhip with Acca and other Anglo-Saxon doctors, ſeveral of whom he engaged to write comments on the Holy Scriptures. In 704, he founded a college at Beverley for ſecular prieſts; and after he had governed the ſee of York 34 years, being tired of the tumults and confuſions that prevailed in the church, diveſted himſelf of his epiſcopal character, and retired to Beverley; where he died four years after, on the 7th of May 721. Bede and other monkiſh writers aſcribe ſeveral miracles to him. Between 300 and 400 years after his death, his body was taken up by Alfric archbiſhop of York, and placed in a ſhrine richly adorned with ſilver, gold, and precious ſtones: and, in 1416, the day of his death was, by a ſynod held at London, appointed a feſtival. We are told that William the Conqueror, when he ravaged Northumberland with a numerous army, ſpared Beverley alone, out of a religious veneration for St. John of that place. This prelate wrote ſome pieces which are mentioned by Bale and Pits, viz. 1. *Pro Luca exponenda*. 2. *Homiliæ in Evangelia*. 3. *Epiſtolæ ad Hildam Abbatiſſam*. 4. *Epiſtolæ ad Herebaldum, Andenum, et Beretinum*.

BEVERUNGEN, a town of Germany, in the diocefe of Paderborn, ſeated at the confluence of the rivers Beve and Weſer, in E. long. 9. 30. N. lat. 51. 40.

BEVILE, in heraldry, a thing broken or opening like a carpenter's rule. Thus we ſay, he beareth argent, a chief bevile, vert, by the name of *beverlis*.

BEVIN (Elway), a muſician eminently ſkilled in the knowledge of practical compoſition, flouriſhed towards the end of Queen Elizabeth's reign. He was of Welch extraction, and had been educated under Tallis, upon whoſe recommendation it was that in 1589 he was ſworn in gentleman extraordinary of the chapel; from whence he was expelled in 1637, it being diſcovered that he adhered to the Romiſh communion. He was alſo organiſt of Briſtol cathedral, but forfeited that employment at the ſame time with his place in the chapel. Child, afterwards Doctor, was his ſcholar. He has compoſed ſundry ſervices, and a few anthems. Before Bevin's time the precepts for the compoſition of canons were known to few. Tallis, Bird, Waterhouſe, and Farmer, were eminently ſkilled in this moſt abſtruſe part of muſical practice. Every canon, as given to the public, was a kind of enigma. Compoſitions of this kind were ſometimes exhibited in the form of a croſs, ſometimes in that of a circle; there is now extant one reſembling a horizontal ſun-dial; and the *reſolution* (as it was called) of a canon,

which was the resolving it into its elements and reducing it into score, was deemed a work of almost as great difficulty as the original composition. But Bevin, with a view to the improvement of students, generously communicated the result of many years study and experience in a treatise which is highly commended by all who have taken occasion to speak of it. This book was published in 4to, 1631, and dedicated to Goodman bishop of Gloucester, with the following title: 'A Briefe and 'Short Instruction of the Art of Musicke, to teach how to 'make diuant of all proportions that are in use: very necessary for all such as are desirous to attain to knowledge in the 'art; and may by practice, if they can sing, soone be able to 'compose three, four, and five parts, and also to compose all 'sorts of canons that are usuall, by these directions of two or 'three parts in one upon the plain song.' The rules contained in this book for composition in general are very brief; but for the composition of canons there are in it a great variety of examples of almost all the possible forms in which it is capable of being constructed, even to the extent of 60 parts.

BEWDLEY, a town of Worcestershire in England, seated on the bank of the river Severn, in W. long. 2. 20. N. lat. 52. 25. It has its name *Bewdley*, *Beawley*, or *Beaulieu*, from its pleasant situation on the declivity of a hill overlooking the river, and commanding a fine prospect of the country, and formerly of the forest of Wyre, remarkable for its tall stately oaks and other trees, which have since been either blown or cut down. It was formerly accounted so delightful a place, that Henry VII. built a house here for prince Arthur, which he called *Tiken-hall*. Bewdley sent burgesses to parliament very early, and had charters and great privileges from Edward IV. and Henry VII. which were confirmed, with the addition of others, by Henry VIII. in whose time it was annexed to the county of Worcester. King James I. granted it a charter; of which a surrender was procured in Charles II.'s time, and the corporation was new-modelled. King James II. compelled it to accept of a new charter; but the former surrender, upon a trial, was held void, and a new charter was obtained of Queen Anne. In consequence of this it is governed by a bailiff and burgesses, recorder, steward, town-clerk, &c. The town is neat and well built; and carries on a considerable trade, by means of the Severn, in salt, glass, iron-ware, and Manchester goods; but its chief manufacture is in caps, commonly called *Monmouth caps*. It has a good market for corn, malt, leather, hops, &c.

BEWITS, in falconry, pieces of leather, to which a hawk's bells are fastened, and buttoned to his legs.

BEY, among the Turks, signifies a governor of a country or town. The Turks write it *begh*, or *bek*, but pronounce it *bey*. This word is particularly applied to a lord of a banner, whom, in the same language, they call *sangiac beg* or *bey*. Every province in Turkey is divided into seven sangiacs, or banners, each of which qualifies a bey; and these are all commanded by the governor of the province, whom they also call *begler-beg*, that is, lord of all the beghs or beys of the province: these beys are much the same as bannerets were formerly in our own country.

Bey *of Tunis*, denotes a prince or king thereof; answering to what at Algiers is called the *dey*. In the kingdom of Algiers, each province is governed by a bey, or vice-roy, who is appointed and removed at pleasure by the dey; but has a despotic power within his jurisdiction; and at the season for collecting the tribute from the Arabs, is assisted by a body of troops from Algiers.

BEYS (Giles), a celebrated printer at Paris, in the 16th century, but principally remarkable for having first introduced the consonants *j* and *v* into the English language.

BEZA (Theodore), one of the principal pillars of the reformed church, was born at Vezelai, in Burgundy, June 24th, 1519. He was brought up by his uncle Nicholas de Beza, counsellor of the parliament of Paris, till the month of December 1528, when he sent him to study at Orleans, and afterwards at Bourges, where he was under the care of Melchior Wolmar, under whom he made an extraordinary progress in polite learning, and from him imbibed the principles of Calvinism. His uncle intended him for the bar; but the law not suiting his disposition, he spent most of his time in reading the Greek and Latin authors, and in composing verses. In 1539 he took up his licentiate's degree, and went to Paris. He fell into snares in his youth, and wrote some licentious things. Sickness awakened him; and he pursued a vow he had formerly made, of entering into the reformed religion. According to this resolution he went to Geneva, and made public profession of the reformed religion. In 1549 he accepted of the Greek professorship at Lausanne, where he also read lectures in French on the New Testament to the refugees of both sexes who dwelt in that city. Having settled at Geneva, he adhered to Calvin in the strictest manner, and became in a little time his colleague in the church and in the university. He was sent to Nerac, at the solicitation of some great men of the kingdom, to convert the king of Navarre, and to confer with him upon affairs of importance. This was when the Guises had got the authority under the reign of Francis II. to the prejudice of the princes of the blood. The king of Navarre having testified, both by letters and deputies, that he desired that Beza might assist at the conference of Poissi, the senate of Geneva consented. The assembly hearkened attentively to his harangue, till, speaking of the real presence, he said, that the body of Jesus Christ was as distant from the bread and wine, as the highest heaven is from the earth. This made a murmur: some cried out, *Blasphemavit!* others got up to go away. Cardinal de Tournon, who sat in the first place, desired the king and queen either to silence Beza, or to permit him and his company to withdraw. The king did not stir, nor any of the princes, and leave was given to go on. Throughout the whole conference he behaved himself with great ability. He often preached before the queen of Navarre, the prince of Condé, and in the suburbs of Paris. After the massacre of Vassi, he was deputed to the king to complain of this violence. The civil war followed soon after, during which the Prince of Condé kept him with him; and while the prince was imprisoned, he lived with Admiral de Coligni, and did not return to Geneva till after the peace 1563. In 1571 he was chosen moderator at the national synod of Rochelle; and, the following year, assisted at that of Nismes; after this, he assisted at the conferences of Montheliard, and at those of Bern. The infirmities of old age beginning to fall heavy upon him in 1597, he could seldom speak in public: and at last he left it off entirely in the beginning of the year 1600. However, in 1597 he wrote some animated verses against the Jesuits, on occasion of the report that was made of his death, and of his having before he died made profession of the Roman faith. He lived till the 13th of October 1605. He was a man of extraordinary merit, and one who did great services to the Protestant cause. This, however, exposed him to innumerable slanders and calumnies; but he showed both to the Catholics and Lutherans, that he understood how to defend himself. He wrote, 1. A Translation of the New Testament; 2. Turned the Psalms into Latin verse; 3. Published a Treatise on the Sacraments; 4. Some Sermons on the Passion of Jesus Christ and on Solomon's Song; 5. A Version of the Canticles, in lyric verse; 6. A French tragi-comedy, intitled, The Sacrifice of Abraham; and many other works.

BEZANS, cotton cloths, which come from Bengal; some are white, and others striped with several colours.

BEZANTLER, the branch of a deer's horns next below the brow-antler.

BEZOAR, in natural hiſtory and medicine, a general name for certain animal-ſubſtances abſurdly ſuppoſed to be effectual in preventing the fatal conſequences of poiſon. The word comes from the Perſian *badzcher bazcher*, or *pahazar*, which ſignifies an antidote. The firſt mention made of bezoar is in Avenzoar, an Arabian phyſician, who gives a very romantic not to ſay ludicrous account of its origin. He deſcribes it as generated of the tears or gum of the eyes of ſtags; who, after eating ſerpents, uſed to run into the water up to the noſe, where they ſtood till their eyes began to ooze a humour, which, collecting under the eye-lids, gradually thickened and coagulated, till, being grown hard, it was thrown off by the animal in rubbing himſelf. Other opinions no leſs fabulous obtained till the time of Garcias al Horto, phyſician to the Portugueſe viceroy of the Indies, who gave the firſt genuine account of it. Kempfer afterwards gave a deſcription of it, with ſome additions.

Bezoar is a calculous concretion found in the ſtomachs of certain animals of the goat kind. See CAPRA. It is compoſed of concentric coats ſurrounding one another, with a little cavity in the middle, containing a bit of wood, ſtraw, hair, or ſome ſuch ſubſtance.

There are two ſorts; one brought from Perſia and the Eaſt-Indies, the other from the Spaniſh Weſt-Indies. The beſt, called *oriental* bezoar, is of a ſhining dark-green or olive colour, and an even ſmooth ſurface; on removing the outward coat, that which lies underneath it appears likewiſe ſmooth and ſhining. The *occidental* has a rough ſurface, and leſs of a green colour than the foregoing; it is likewiſe much heavier, more brittle, and of a looſer texture; the coats are thicker, and on breaking exhibit a number of ſtriæ curiouſly interwoven. The oriental is generally leſs than a walnut; the occidental for the moſt part larger, and ſometimes as big as a gooſe egg.

This ſtone is greatly eſteemed among the Perſians, and even of greater value than in Europe; which, with ſundry other circumſtances needleſs to relate here, has given occaſion to many to ſuſpect, that the true bezoar is never brought to us. Some authors relate with great confidence, that all the ſtones commonly ſold under this name are artificial compoſitions. That ſome of them are ſo, is evident; hence the great differences in the accounts which different perſons have given of their qualities: the ſtones examined by Slare as oriental bezoar did not diſſolve in acids; thoſe which Grew and Boyle made trial of, did; thoſe employed by Geoffroy (in ſome experiments related in the French memoirs 1710) did not ſeem to be acted on by rectified ſpirit; whilſt ſome of thoſe examined by Neumann at Berlin almoſt totally diſſolved in it. The common teſt of the goodneſs of this ſtone, is its ſtriking a deep green colour on white paper that has been rubbed with chalk. Bezoar was not known to the ancient Greeks, and is firſt taken notice of by the Arabians (as above mentioned), who extol it in a great variety of diſorders, particularly againſt poiſons. Later writers alſo beſtow extraordinary commendations on it as a ſudorific and alexipharmac; virtues to which it certainly has no pretence. It has no ſmell or taſte, is not digeſtible in the ſtomach of the animal in which it is found; and is ſcarce capable of being acted on by any of the juices of the human body. It cannot be conſidered in any other light than as an abſorbent; and is much the weakeſt of all the common ſubſtances of that claſs; inſomuch that it has been given to half a dram, and ſometimes a whole dram, without producing any ſenſible effect.

BEZOAR, in a more extenſive ſenſe, includes all ſubſtances formed *ſtratum ſuper ſtratum* in the ſtomachs or inteſtines of animals; in which ſenſe pearls, the concretions called *crabs-eyes*, &c. belong to the claſs of bezoars. To this alſo belong the hippolithus, or *bezoar equinum*, a ſtone ſometimes found in the ſtomach or inteſtines of a horſe; the monkey-bezoar, a ſtone ſaid to be found in the ſtomachs of certain monkeys in Brazil and the Eaſt-Indies, harder than the oriental bezoar, of a dark-green colour, and very coſtly on account of its ſcarcity.—*Bezoar bovinum* is a yelloviſh ſtone found in the ox's gall-bladder.—*Human bezoars* are ſtony ſubſtances found in the inteſtines of ſeveral perſons, formed from the ſtones of plums, or other fruits, retained in the cœcum or other inteſtines, and growing coated over, of which we have an inſtance given by Dr. Cole, in the Philoſ. Tranſ. N° 235.—*Bezoar microcoſmicum* is the ſame with the human calculus; and is various in its degrees of hardneſs, as well as in its ſize and figure. It has been uſed in the place of the more coſtly ſorts.—As to the *bezoar hyſtricis*, a concretion found in the gall-bladder of an Indian porcupine; and the German bezoar, or that found in mountain-deer, eſpecially on the Alps; theſe, not being ſtones, are more properly called by late writers *ægagropilæ*; the former conſiſting of woolly fibres, and a bitter friable matter, having neither laminæ nor membranes; the latter being a ball of hair or herbs, or perhaps roots, compacted in the ſtomach of the animal.—They are all, as medicines, unworthy of regard.—The *bezoar bovinum*, or ox-bezoar, is uſed by miniature-painters in forming ſeveral ſhades of yellow.

BEZOAR-*mineral*. See PHARMACY.

Foſſil BEZOAR, is a kind of figured ſtone, formed, like the animal bezoar, of ſeveral coats or ſtrata ranged round ſome extraneous body which forms a nucleus, and ſuppoſed to have the ſame virtues. It is found chiefly in Sicily, in ſand and clay pits. It is of a purple colour, with a rough ſurface, the ſize of a walnut, and light. When broken, it is found to be an irony cruſt, containing in its hollow a fine greeniſh white earth, reſembling pale bezoar. The earth is uſed, and not the ſhells. It ſeems to be of the nature of bole armeniac. It is alſo called *Sicilian earth*.

BEZOARDIC, an appellation given to whatever partakes of the nature of bezoar; alſo to thoſe compound medicines into which bezoar formerly entered as an ingredient.

BIA, in commerce, a name given by the Siameſe to thoſe ſmall ſhells which are called *cowries* throughout almoſt all the other parts of the Eaſt Indies. See COWRIES.

BIÆUM, *βιαιον*, in rhetoric, denotes a kind of counter-argument, whereby ſomething alleged for the adverſary is retorted againſt him, and made to conclude a different way: for inſtance, *Occidiſti, quia adſtitiſti interfecto.—βιαιον, Immo quia adſtiti interfecto, non occidi; nam ſi id eſſet, in fugam me conjeciſſem.* "You killed the perſon, becauſe you were found ſtanding by his body.—*Biæum*, Rather I did not kill him, becauſe I was found ſtanding by his body; ſince in the other caſe, I ſhould have fled away."

BIÆUM, in the Grecian laws, was an action brought againſt thoſe who raviſhed women, or uſed violence to any man's perſon.

BIAFAR, or BIAFRA, a kingdom of Africa, ſituated to the eaſt of Benin, to the weſt of Medra, from which it is divided by a chain of mountains, and extending ſouthward to the fourth degree of north latitude. The natives are the moſt of all negroes addicted to, and infatuated with, magic; imagining themſelves capable of cauſing rain, thunder and lightning: therefore they worſhip the devil with great zeal, and even ſacrifice their children to him.

BIAFORA, in the cuſtoms of the middle age, a form of cry or alarm to arms; on the hearing whereof, the inhabitants of towns or villages were to iſſue forth, and attend their prince. The word ſeems originally from Gaſcony; and the

Italians even now, on a ſudden inſurrection of the people, commonly cry, *Via-fora*, by an uſual change of the letter B into V.

BIARCHUS, an officer in the court of the emperors of Conſtantinople, intruſted with the care and inſpection of the proviſions of the ſoldiery.

BIALOGOROD, or AKERMAN, a ſtrong town of Beſſarabia, in European Turkey. It is ſeated on a lake called *Vidono*, near the ſea-ſide, in E. long. 22. 50. N. lat. 46. 24.

BIANA, a town of Aſia in the dominions of the Great Mogul, remarkable for its excellent indigo. E. long. 77. 0. N. lat. 26. 20.

BIANCHI (Franceſco), called *Il Frari*, an eminent painter, was born at Modena; and had the honour of being maſter to one of the moſt eſteemed painters that ever appeared, Antonio Correggio. His colouring was delicately fine; his attitudes full of grace; and his invention extremely grand. His works had an aſtoniſhing beauty, and are prized as highly as even thoſe of Correggio. He died in the year 1520.

BIANCHINI (Francis), one of the moſt learned men of his time, was born at Verona in 1662, of a noble and ancient family. His taſte for natural philoſophy and mathematics induced him to eſtabliſh the academy of Aletofili, at Verona. He went to Rome in 1684; and was made librarian to cardinal Ottoboni, who was afterwards Pope under the name of Alexander VIII. He alſo became canon of St. Mary de la Rotonda, and at length of St. Lawrence in Damaſo. He was eſteemed by the learned; and was a member of many academies. He publiſhed ſeveral ingenious diſſertations, &c. and died in the year 1729, aged 67.

BIAS, one of the ſeven ſages of Greece, flouriſhed about 608 before Chriſt. He was accuſtomed to ſay, "It is a ſickneſs of the mind to wiſh for impoſſible things." During the ſiege of Priena, his native city, being aſked why he was the only one who retired from the place without carrying any thing with him, he replied, That he carried his all with him; meaning, that his knowledge and virtue were the only bleſſings that were peculiarly his own, ſince they could not be taken from him. He expired while pleading in behalf of one of his friends.

BIAS, or *Biaſs*, in a general ſenſe, the inclination or bent of a perſon's mind to one thing more than another.—It alſo ſignifies the lead or weight put into a bowl, that draws or turns the courſe of it any way to which the bias happens to be directed.

BIBERACH, a free and imperial city of Suabia in Germany. It has a large manufacture in fuſtians, and is ſeated in a pleaſant fertile valley on the river Ruſs. E. long. 10. 2. N. lat. 48. 4.

BIBERSBERG, a town of Upper Hungary, ſituated in E. long. 17. 25. N. lat. 48. 35.

BIBIENA (Ferdinand Galli), an excellent painter and architect, was born at Bologna in 1657; and was ſurnamed *Bibiena* from a territory of that name in Tuſcany, in which his father was born. He acquired ſuch reputation by his ſkill in architecture, the decorations of the theatre, and perſpective, that the duke of Parma invited him to his court, and made him his firſt painter and architect. Bibiena at length went to the emperor's court, where he had the ſame honours and advantages. He wrote two books of architecture; and died at Bologna, at above 80 years of age. His ſons followed the ſame profeſſions with ſucceſs.

BIBLE (in Greek βιβλος, *the book*), a name applied by Chriſtians by way of eminence to the collection of ſacred writings, or the holy ſcriptures of the Old and New Teſtaments; known alſo by various other appellations, as, the Sacred Book, Holy Writ, Inſpired Writings, &c. The Jews ſtyled the Bible (that is, the *Old* Teſtament) *Mikra*; which ſignifies *Leſſon* or *Lecture*.

The ſacred volume, including the Old and New Teſtaments, is juſtly looked upon as the foundation of the Jewiſh as well as the Chriſtian religion. The Jews, it is true, acknowledged only the ſcriptures of the Old Teſtament, the correcting and publiſhing of which is unanimouſly aſcribed, both by the Jews and Chriſtians, to Ezra. Some of the ancient fathers, on no other foundation than that fabulous and apocryphal book, the ſecond book of Eſdras, pretend, that the ſcriptures were entirely loſt and deſtroyed at the Babyloniſh captivity, and that Ezra reſtored them all again by divine revelation. What is certain is, that in the reign of Joſiah there was no other book of the law extant beſides that found in the temple by Hilkiah; from which original, by order of that pious king, copies were immediately written out, and ſearch made for all the other parts of the ſcriptures (2 Kings xxii.); by which means copies of the whole became multiplied among the people, who carried them with them into their captivity. After the return of the Jews from the Babyloniſh captivity, Ezra got together as many copies as he could of the Sacred writings, and out of them all prepared a correct edition, diſpoſing the ſeveral books in their proper order, and ſettling the canon of ſcripture for his time. Theſe books he divided into three parts, viz. 1. The Law. 2. The Prophets. 3. The Cetubim or Hagiographia, that is to ſay, *The Holy Writings*.

I. *The Law contains*—1. Geneſis. 2. Exodus. 3. Leviticus. 4. Numbers. 5. Deuteronomy. II. *The writings of the Prophets* are, 1. Joſhua. 2. Judges, with Ruth. 3. Samuel. 4. Kings. 5. Iſaiah. 6. Jeremiah, with his Lamentations. 7. Ezekiel. 8. Daniel. 9. The twelve minor Prophets. 10. Job. 11. Ezra. 12. Nehemiah. 13. Eſther. III. *The Hagiographia* conſiſts of, 1. The Pſalms. 2. The Proverbs. 3. Eccleſiaſtes. 4. The Song of Solomon. This diviſion was made for the ſake of reducing the number of the ſacred books to the number of the letters in their alphabet, which amount to 22. At preſent, the Jews reckon 24 books in their canon of ſcripture, in diſpoſing of which the law ſtands as it did in the former diviſion, and the prophets are diſtributed into the former and latter prophets.

The *former prophets* are, Joſhua, Judges, Samuel, Kings. The *latter prophets* are, Iſaiah, Jeremiah, Ezekiel, and the 12 minor prophets. And the *hagiographia* conſiſts of the Pſalms, the Proverbs, Job, the Song of Solomon, Ruth, the Lamentations, Eccleſiaſtes, Eſther, Daniel, Ezra, the Chronicles.—Under the name of Ezra, they comprehend Nehemiah. It is true this order has not always been obſerved, but the variations from it are of little conſequence.

The five books of the law are divided into 54 ſections, which many of the Jews hold to have been appointed by Moſes himſelf; though others, with more probability, aſcribe it to Ezra. The deſign of this diviſion was, that one of theſe ſections might be read in their ſynagogues every ſabbath-day. The number was 54, becauſe in their intercalated years a month being then added, there were 54 ſabbaths. In other years they reduced them to 52, by twice joining together two ſhort ſections. Till the perſecution of Antiochus Epiphanes, they read only the law; but the reading of it being then prohibited, they ſubſtituted in the room of it 54 ſections out of the prophets; and when the reading of the law was reſtored by the Maccabees, the ſection which was read every ſabbath out of the law ſerved for their firſt leſſon, and the ſection out of the prophets for their ſecond. Theſe ſections were divided into verſes, of which diviſion, if Ezra was not the author, it was introduced not long after him, and ſeems to have been deſigned for the uſe of the Targumuſts or Chaldee interpreters: for after the return of the Jews from the Babyloniſh captivity

when the Hebrew language ceased to be their mother tongue, and the Chaldee grew into use instead of it, the custom was that the law should be first read in the original Hebrew, and then interpreted to the people in the Chaldee language, to which purpose these shorter sections or periods were very well adapted.

The division of the scriptures into chapters, as we at present have them, is of much later date. Some attribute it to Stephen Langton, archbishop of Canterbury, in the reigns of John and Henry III. But the true author of the scheme was Hugo de Sancto Caro, commonly called *Hugo Cardinalis*, because he was the first Dominican that ever was raised to the degree of cardinal. This Hugo flourished about the year 1240. He wrote a comment on the scriptures, and projected the first concordance, which is that of the vulgar Latin Bible. The aim of this work being for the more easy finding out any word or passage in the scriptures, he found it necessary to divide the book into sections, and the sections into subdivisions; for till that time the vulgar Latin Bibles were without any divisions at all. These sections are the chapters into which the Bible has ever since been divided. But the subdivision of the chapters was not then into verses as it is now. Hugo's method of subdividing them was by the letters A, B, C, D, E, F, G, placed in the margin at an equal distance from each other, according to the length of the chapters. The subdivision of the chapters into verses, as they now stand in our Bibles, had its origin from a famous Jewish rabbi, named Mordecai Nathan, about the year 1445. This rabbi, in imitation of Hugo Cardinalis, drew up a concordance to the Hebrew Bible, for the use of the Jews. But though he followed Hugo in his division of the books into chapters, he refined upon his invention as to the subdivision, and contrived that by verses: this being found to be a much more convenient method, it has been ever since followed. And thus, as the Jews borrowed the division of the books of the holy scriptures into chapters from the Christians, in like manner the Christians borrowed that of the chapters into verses from the Jews.

The order and division of the books of the Bible, as well of the Old as the New Testament, according to the disposition made by the council of Trent, by decree I. session iv. are as follow: but in this enumeration it is to be observed, that those books to which asterisms are prefixed, are rejected by the Protestants as apocryphal.

Genesis—Exodus—Leviticus—Numbers—Deuteronomy—Joshua—Judges and Ruth—1 Samuel, or 1 Kings—2 Samuel, or 2 Kings—1 Kings, otherwise called 3 Kings—2 Kings, otherwise called 4 Kings—1 Chronicles—2 Chronicles—1 Esdras (as the LXX and Vulgate call it), or the book of Ezra—2 Esdras, or (as we have it) the book of Nehemiah—* Tobit—* Judith—Esther—Job—Psalms—Proverbs—Ecclesiastes—Song of Solomon—* The book of Wisdom—* Ecclesiasticus—Isaiah—Jeremiah and * Baruch—Ezekiel—Daniel—Hosea—Joel—Amos—Obadiah—Nahum, which we place immediately after Micah, before Habakkuk.—Jonah, which we place immediately after Obadiah.—Micah—Habakkuk—Zephaniah—Haggai—Zechariah—Malachi—* 1 Maccabees—* 2 Maccabees.

The *books of the New Testament* are,—The Gospel of St. Matthew—St. Mark—St. Luke—St. John.——Acts of the Apostles.——The Epistle of St. Paul to the Romans—the 1 Corinthians—the 2 Corinthians—the Galatians—the Ephesians—the Philippians—the Colossians—the 1 Thessalonians—the 2 Thessalonians—1 Timothy—2 Timothy—Titus—Philemon—the Hebrews.——The general Epistle of St. James—St. Peter, I.—St. Peter, II.—St. John, I.—St. John, II.—St. John, III.—St. Jude.—The Revelation of St. John.

The apocryphal books of the Old Testament, according to the Romanists, are, the book of Enoch (see Jude 14), the third and fourth books of Esdras, the third and fourth books of Maccabees, the prayer of Manasseh, the Testament of the twelve Patriarchs, the Psalter of Solomon, and some other pieces of the same kind. The apocryphal books of the new Testament are, the epistle of St. Barnabas, the pretended epistle of St. Paul to the Loadiceans, several spurious gospels, Acts of the Apostles, and Revelations; the book of Hermas, intitled The Shepherd, Jesus Christ's Letter to Abgarus, the epistles of St. Paul to Seneca, and several other pieces of the like nature, as may be seen in the collection of the apocryphal writings of the New Testament made by Fabricius.

The books which are now lost and cited in the Old Testament are these: the book of the *Righteous*, or of Jasher, as our version of the Bible has it (Josh. x. 13. and 2 Sam. i. 18.); the book of the wars of the Lord (Numb. xxi. 14.); the annals of the kings of Israel, so often cited in the books of the Kings and Chronicles. The authors of these annals were the prophets, who lived in the kingdoms of Judah and Israel. We have likewise but a part of Solomon's 3000 proverbs and his 1005 songs (1 Kings iv. 32.); and we have entirely lost what he wrote upon plants, animals, birds, fishes, and reptiles.

It is the opinion of most learned men, that Ezra published the scriptures in the Chaldee character; for that language being grown wholly into use among the Jews, he thought proper to change the old Hebrew character for it, which hath since that time been retained only by the Samaritans, among whom it is preserved to this day. Prideaux is of opinion that Ezra made additions in several parts of the Bible, where any thing appeared necessary for illustrating, connecting, or completing the work; in which he appears to have been assisted by the same spirit in which they were first written. Among such additions are to be reckoned the last chapter of Deuteronomy, wherein Moses seems to give an account of his own death and burial, and the succession of Joshua after him. To the same cause our learned author thinks are to be attributed many other interpolations in the Bible, which created difficulties and objections to the authenticity of the sacred text, no ways to be solved without allowing them. Ezra changed the names of several places which were grown obsolete, and instead of them put their new names, by which they were then called in the text. Thus it is that Abraham is said to have pursued the kings who carried Lot away captive, as far as Dan; whereas that place in Moses's time was called *Laish*; the name *Dan* being unknown till the Danites, long after the death of Moses, became masters of it.

But though the Jewish canon of Scripture was then settled by Ezra, yet several variations have since been made in it. Malachi, for instance, could not be put into the Bible by him, because that prophet is allowed to have lived after Ezrah; nor could Nehemiah be there, mention being made, in that book, of Jaddus, as high-priest, and of Darius Codomannus, as king of Persia, who were at least 100 years later than Ezra. It may be added, that in the first book of Chronicles, the genealogy of the sons of Zerubbabel is carried down for so many generations as must necessarily bring it to the time of Alexander, and consequently this book could not be in the canon in Ezra's days. It is probable, the two books of Chronicles, Ezra, Nehemiah, Esther, and Malachi, were adopted into the Bible in the time of Simon the Just, the last of the men of the great synagogue.

In fact, the Jews were at first very reserved in communicating their scripture to strangers. Despising and shunning the Gentiles, they would not disclose to them any of the treasures concealed in the Bible. We may add, that the people bordering on the Jews, as the Egyptians, Phœnicians, Arabs, &c. were not very curious to know the laws or history of a

people, whom in their turn they hated and deſpiſed. Their firſt acquaintance with theſe books was not till after the ſeveral captivities of the Jews, when the ſingularity of the Hebrew laws and ceremonies induced ſeveral to deſire a more particular knowledge of them. Joſephus ſeems ſurpriſed to find ſuch ſlight foot-ſteps of the ſcripture-hiſtory interſperſed in the Egyptian, Chaldean, Phœnician, and Grecian hiſtory; and accounts for it hence, that the ſacred books were not as yet tranſlated into Greek or other languages, and conſequently not known to the writers of thoſe countries.

The firſt verſion of the Bible was that of the SEPTUAGINT into Greek, in the time of Ptolemy Philadelphus; though ſome maintain that the whole was not then tranſlated, but only the Pentateuch; between which and the other books in the verſion called of the Seventy, the critics find a great diverſity in point of ſtyle and expreſſion, as well as with regard to correctneſs.

Hebrew BIBLES, are either manuſcript or printed. The beſt manuſcript Bibles are thoſe copied by the Jews of Spain. Thoſe copied by the Jews of Germany are leſs exact, but more common. The two kinds are eaſily diſtinguiſhed from each other; the former being in beautiful characters, like the Hebrew Bibles of Bomberg, Stephens, and Plantin; the latter in characters like thoſe of Munſter and Gryphius. F. Simon obſerves, that the oldeſt manuſcript Hebrew Bibles are not above ſix or ſeven hundred years old; nor does rabbi Menaham, who quotes a vaſt number of them, pretend that any of them exceed ſix hundred years.

In the Diſſertatio Generalis prefixed to Dr. Kennicott's Hebrew Bible, it is ſaid, that the moſt ancient manuſcripts were written between the years 900 and 1100: but though thoſe that are the moſt ancient are not more than 800 or 900 years old, they were tranſcribed from others of a much more ancient date. The manuſcript preſerved in the Bodleian library is not leſs than 800 years old. Another manuſcript, not leſs ancient, is preſerved in the Cæſarean library at Vienna. The moſt ancient printed Hebrew Bibles are thoſe publiſhed by the Jews of Italy, eſpecially of Peſaro and Breſſe. Thoſe of Portugal alſo printed ſome parts of the Bible at Liſbon, before their expulſion.—This may be obſerved in the general, that the beſt Hebrew Bibles are thoſe printed under the inſpection of the Jews; there being ſo many *minutiæ* to be obſerved, that it is ſcarcely poſſible for any other deſcription of perſons to ſucceed in it.

In the beginning of the 16th century Dan. Bomberg printed ſeveral Hebrew Bibles in folio and quarto at Venice, moſt of which are eſteemed both by the Jews and Chriſtians: the firſt in 1517, which is the leaſt exact, and generally goes by the name of Felix Pratenſis, the perſon who reviſed it. This edition contains the Hebrew text, the targum, and the commentaries of ſeveral rabbins. In 1528 the ſame Bomberg printed the folio Bible of rabbi Benchajim, with his preface, the maſoretical diviſions, a preface of Aben Ezra, a double *maſora*, and ſeveral various readings. The third edition was printed in 1618; it is the ſame with the ſecond, but much more correct. From the former editions it was, that Buxtorf, the father, printed his rabbinical Hebrew Bible at Baſil in 1618; which, though there are many faults in it, is more correct than any of the former. In 1623 appeared at Venice a new edition of the rabbinical Bible by Leo of Modena, a rabbin of that city, who pretended to have corrected a great number of faults in the former edition; but, beſides that it is much inferior to the other Hebrew Bibles of Venice, with regard to paper and print, it has paſſed through the hands of the inquiſitors, who have altered many paſſages in the commentaries of the rabbins.

With regard to Hebrew Bibles in 4to, that of R. Stephens is eſteemed for the beauty of the characters; but it is very incorrect. Plantin alſo printed ſeveral beautiful Hebrew Bibles at Antwerp: one, in eight columns, with a preface by Arias Montanus in 1571, which far exceeds the Complutenſian in paper and print, and contents; this is called the Royal Bible, becauſe it was printed at the expence of Philip II. of Spain: another at Geneva in 1619; beſides many more of different ſizes, with and without points. Manaſſeh Ben Iſrael, a learned Portugueſe Jew, publiſhed two editions of the Hebrew Bible at Amſterdam; the one in 4to, in 1635; the other in 8vo, in 1639: the firſt has two columns, and for that reaſon is commodious for the reader. In 1639 R. Jac. Lombroſo publiſhed a new edition in 4to, at Venice, with ſmall literal notes at the bottom of each page, where he explains the Hebrew words by Spaniſh words. This Bible is much eſteemed by the Jews at Conſtantinople: in the text they have diſtinguiſhed between words where the point *camets* is to be read with a *camets-katuph*, that is by *o*, and not an *a*.

Of all the editions of the Hebrew Bible in 8vo, the moſt beautiful and correct are the two of Jo. Athias, a Jew of Amſterdam. The firſt, of 1661, is the beſt paper; but that of 1667 is the moſt exact: that, however, publiſhed ſince at Amſterdam by Vander Hooght, in 1705, is preferable to any of them.

After Athias, three Hebraizing Proteſtants engaged in reviſing and publiſhing the Hebrew Bible; *viz.* Clodius, Jablonſki, and Opitius. Clodius's edition was publiſhed at Frankfort in 1677, in 4to. At the bottom of the page it has the various readings of the former editions; but the author does not appear ſufficiently verſed in the accenting, eſpecially in the poetical books; beſides, as it was not publiſhed under his eye, many faults have crept in. That of Jablonſki, in 1699, in 4to, at Berlin, is very beautiful as to letter and print: but, though the editor pretends he made uſe of the editions of Athias and Clodius, ſome critics find it ſcarce in any thing different from the 4to edition of Bomberg. That of Opitius is alſo in 4to, at Keil, in 1709; the character is large and good, but the paper bad: it is done with a great deal of care; but the editor made uſe of no manuſcripts but thoſe of the German libraries; neglecting the French ones, which is an omiſſion common to all three. They have this advantage, however, that beſides the diviſions uſed by the Jews, both general and particular, into *paraſkes* and *peſukim*, they have alſo thoſe of the Chriſtians, or of the Latin Bibles, into chapters and verſes; the *keri ketib*, or various readings, Latin ſummaries, &c. which made them of conſiderable uſe with reſpect to the Latin editions and the concordances.

The little Bible of R. Stephens in 16to, is very much prized for the beauty of the character in which it is printed. There is, however, another edition of Geneva exceedingly like it, excepting that the print is worſe, and the text leſs correct. To theſe may be added ſome other Hebrew Bibles without points, in 8vo and 24to, which are much coveted by the Jews; not that they are more exact, but more portable than the reſt, and are uſed in their ſynagogues and ſchools: of theſe there are two beautiful editions, the one of Plantin, in 8vo, with two columns, and the other in 24to, reprinted by Raphalengius at Leyden in 1610. There is alſo an edition of them by Laurens at Amſterdam in 1631, in a larger character; and another in 12mo, at Frankfort, in 1694, full of faults, with a preface of M. Leuſden prefixed.

At Paris, in 1753, Houbigant publiſhed an elegant edition of the Hebrew Bible contained in 4 vols. folio. The text is that of Van der Hooght, without points, to which he has added marginal notes, ſupplying the variations of the Samaritan copy. Dr. Kennicott, after almoſt 20 years laborious collation of near 700 copies, manuſcript and printed, either of the whole or of particular parts of the Bible, did, in 1776, pub-

liſh the firſt volume of his Hebrew Bible in folio. The text is that of Everard Van der Hooght, already mentioned, differing from it only in the diſpoſition of the poetical parts, which Dr. Kennicott has printed in hemiſtichs, into which they divide themſelves: however, the words follow one another in the ſame order as they do in the edition of Van der Hooght. This edition is printed on an excellent type; the Samaritan text, according to the copy in the London Polyglot, is exhibited in a column parallel with the Hebrew text; thoſe parts of it only being introduced in which it differs from the Hebrew. The numerous variations both of the Samaritan manuſcripts from the printed copy of the Samaritan texts, and of the Hebrew manuſcripts from the printed text of Van der Hooght, are placed ſeparately at the bottom of the page, and marked with numbers referring to the copies from which they are taken.

Greek Bibles. A great number of editions of the Bible have been printed in Greek; but they may be all reduced to three or four principal ones, viz. that of Complutum, or Alcala de Henares, that of Venice, that of Rome, and that of Oxford. The firſt was publiſhed in 1515, by Cardinal Ximenes, and inſerted in the Polyglot Bible, uſually called the *Complutenſian Bible*: this edition is not juſt, the Greek of the Seventy being altered in many places according to the Hebrew text. It has, however, been reprinted in the Polyglot Bible of Antwerp, in that of Paris, and in the 4to Bible, commonly called *Vatablus's Bible*.

The ſecond Greek Bible is that of Venice, printed by Aldus in 1518. Here the Greek text of the Septuagint is reprinted juſt as it ſtood in the manuſcript, full of faults of the copyiſts, but eaſily amended. This edition was reprinted at Straſburg in 1526, at Baſil in 1545, at Franckfort in 1597, and other places, with ſome alterations to bring it nearer the Hebrew. The moſt commodious is that of Franckfort; there being added to it, little *ſcholia*, which ſhow the different interpretations of the old Greek tranſlators. This collection is without a name, but it is commonly ſuppoſed that Junius was the author.

The third Greek Bible is that of Rome, or the Vatican, in 1587, with Greek *ſcholia* collected from the manuſcripts in the Roman libraries by Pet. Morin. It was firſt ſet on foot by Cardinal Montalbo, afterwards Pope Sextus Quintus. This fine edition has been reprinted at Paris in 1628 by J. Morin, prieſt of the oratory, who has added the Latin tranſlation, which in the Roman was printed ſeparately, with *ſcholia*. The Greek edition of Rome has been printed in the Polyglot Bible of London; to which are added, at the bottom, the various readings of the Alexandrian manuſcript. This has been alſo reprinted in England in 4to and 12mo, with ſome alterations. It has been again publiſhed at Franeker in 1709 by Bos, who has added all the various readings he could collect.

The fourth Greek Bible is that done from the Alexandrian manuſcript, begun at Oxford by Dr. Grabe in 1707. In this the Alexandrian manuſcript is not printed ſuch as it is, but ſuch as it was thought it ſhould be; *i. e.* it is altered wherever there appeared any fault of the copyiſts, or any word inſerted from any particular dialect: this ſome think an excellence, but others a fault; urging, that the manuſcript ſhould have been given abſolutely and entirely of itſelf, and all conjectures as to the readings ſhould have been placed in the notes.

Latin Bibles, how numerous ſoever, may be all reduced to three claſſes; the ancient Vulgate, called alſo *Italica*, tranſlated from the Greek Septuagint; the modern Vulgate, the greateſt part of which is done from the Hebrew text; and the new Latin tranſlations, done alſo from the Hebrew text, in the 16th century. We have nothing remaining of the ancient Vulgate, uſed in the primitive times in the weſtern churches, but the Pſalms, Wiſdom, and Eccleſiaſtes. Nobilius has endeavoured to retrieve it from the works of the ancient Latin fathers; but it was impoſſible to do it exactly, becauſe few of the fathers kept cloſe to it in their citations.

With regard to the modern Vulgate, there are a vaſt number of editions very different from each other. Cardinal Ximenes has inſerted one in the Bible of Complutum, corrected and altered in many places. R. Stephens, and the doctors of Louvain, have taken great pains in correcting the modern Vulgate.

The beſt edition of Stephens's Latin Bible is that of 1540, reprinted in 1545, in which are added on the margin the various readings of ſeveral Latin manuſcripts which he had conſulted. The doctors of Louvain reviſed the modern Vulgate after R. Stephens; and added the various readings of ſeveral Latin manuſcripts. The beſt of the Louvain editions are thoſe at the end of which are added the critical notes of Francis Lucas of Bruges.

All theſe reformations of the Latin Bible were made before the time of Pope Sixtus V. and Clement VIII. ſince which time, none have dared to make any alterations, except in comments and ſeparate notes. The correction of Clement VIII. in 1592, is now the ſtandard throughout all the Romiſh churches. That pontiff indeed made two reformations; but it is the firſt of them that is followed. From this the Bibles of Plantin were done, and from thoſe of Plantin all the reſt; ſo that the common Bibles have none of the after corrections of the ſame Clement VIII. It is a heavy charge that lies on the editions of Pope Clement, viz. that they have ſome new texts added, and many old ones altered, to countenance and confirm what they call the Catholic doctrine; witneſs that celebrated paſſage of St. John, *tres ſunt*, &c. There are a great number of Latin Bibles of the third claſs, comprehending the verſions from the originals of the ſacred books made within theſe 200 years.

Since the Reformation there have been ſeveral Latin verſions of the Bible from the originals, by Proteſtants. The moſt eſteemed are thoſe of Munſter, Leo Juda, Caſtalio, and Tremellius; the three laſt whereof have been reprinted various times. We may add a fourth claſs of Latin Bibles, comprehending the Vulgate edition corrected from the originals. The Bible of Iſidorus Clarus is of this number: that author, not being contented with reſtoring the ancient Latin copy, has corrected the tranſlator in a great number of places, which he thought ill rendered. Some Proteſtants have followed the ſame method; and among others, Andrew and Luke Oſiander, who have each publiſhed a new edition of the Vulgate, corrected from the originals.

Oriental Bibles. At the head of the Oriental verſions of the Bible muſt be placed the Samaritan, as being the moſt ancient of all, though neither its age nor author has been yet aſcertained, and admitting no more for holy ſcripture than the Pentateuch, or five books of Moſes. This tranſlation is made from the Samaritan Hebrew text, which is a little different from the Hebrew text of the Jews. This verſion has never been printed alone; nor any where but in the Polyglots of London and Paris.

Chaldee Bibles, are only the gloſſes or expoſitions made by the Jews in the time when they ſpake the Chaldee tongue. Theſe they call by the name of *Targumim*, or *paraphraſes*, as not being any ſtrict verſions of the Scripture. They have been inſerted entire in the large Hebrew Bibles of Venice and Baſil; but are read more commodiouſly in the Polyglots, being there attended with a Latin tranſlation.

Syriac Bibles. There are extant two verſions of the Old Teſtament in the Syriac: one from the Septuagint, which is ancient, and made probably about the time of Conſtantine; the other called *antiqua et ſimplex*, made from the Hebrew, as

ſome ſuppoſe, about the time of the Apoſtles. This verſion is printed in the Polyglots of London and Paris. In 1562, Widmanſtadius printed the whole New Teſtament in Syriac, at Vienna, in a beautiful character: after him there were ſeveral other editions; and it was inſerted in the Bible of Philip II. with a Latin tranſlation. Gabriel Sionita alſo publiſhed a beautiful Syriac edition of the Pſalms, at Paris, in 1525, with a Latin interpretation.

Arabic Bibles. In the year 1516, Aug. Juſtinian, biſhop of Nebio, printed at Genoa an Arabic verſion of the Pſalter, with the Hebrew text and Chaldee paraphraſe, adding Latin interpretations. There are alſo Arabic verſions of the whole Scriptures in the Polyglots of London and Paris; and we have an edition of the Old Teſtament entire, printed at Rome in 1671, by order of the congregation *de propaganda fide*; but it is of little eſteem, as having been altered agreeably to the Vulgate edition. The Arabic Bibles among us are not the ſame with thoſe uſed with the Chriſtians in the Eaſt. Some learned men take the Arabic verſion of the Old Teſtament, printed in the Polyglots, to be that of Saadias, who lived about the year 900; at leaſt in the main. Their reaſon is, that Aben Ezra, a great antagoniſt of Saadias, quotes ſome paſſages of his verſion, which are the ſame with thoſe in the Arabic verſion of the Polyglots; yet others are of opinion, that Saadias's verſion is not extant. In 1622, Erpenius printed an Arabic Pentateuch, called alſo the Pentateuch of Mauritania, as being made by the Jews of Barbary, and for their uſe. This verſion is very literal, and eſteemed very exact. The four Evangeliſts have alſo been publiſhed in Arabic, with a Latin verſion, at Rome, in 1591, folio. Theſe have been ſince reprinted in the Polyglots of London and Paris, with ſome little alterations of Gabriel Sionita. Erpenius publiſhed an Arabic New Teſtament entire, as he found it in his manuſcript copy, at Leyden, in 1616. Some other Arabic verſions of late date are mentioned by Walton in his Prolegomena; particularly a verſion of the Pſalms preſerved in Sion College, London, and another of the Prophets at Oxford; neither of which have been printed.

Coptic Bibles. Of theſe there are ſeveral manuſcript copies in ſome of the great libraries, eſpecially in that of the late French king. Dr. Wilkins publiſhed the Coptic New Teſtament in 4to, in the year 1716, and the Pentateuch alſo in 4to, in 1731, with Latin tranſlations. He reckons theſe verſions to have been made in the end of the ſecond, or the beginning of the third century.

Ethiopic Bibles. The Ethiopians have alſo tranſlated the Bible into their language. There have been printed ſeparately, the Pſalms, Canticles, ſome chapters of Geneſis, Ruth, Joel, Jonah, Zephaniah, Malachi, and the New Teſtament; all which have been ſince reprinted in the Polyglot of London. As to the Ethiopic New Teſtament, which was firſt printed at Rome in 1548, it is a very inaccurate work, and is reprinted in the Engliſh Polyglot with all its errors.

Armenian Bibles. There is a very ancient Armenian verſion of the whole Bible, done from the Greek of the Seventy, by ſome of their doctors about the time of Chryſoſtom. This was firſt printed entire in 1664, by one of their biſhops at Amſterdam, in 4to; with the New Teſtament in octavo.

Perſian Bibles. It has been ſaid by ſome of the fathers, that all the Scripture was formerly tranſlated into the language of the Perſians; but we have nothing now remaining of the ancient verſion, which was certainly done from the Septuagint. The Perſian Pentateuch printed in the London Polyglot is, without doubt, the work of Rabbi Jacob, a Perſian Jew. It was publiſhed by the Jews at Conſtantinople, in the year 1551. In the ſame Polyglot we have likewiſe the four Evangeliſts in Perſian, with a Latin tranſlation; but this appears very modern, incorrect, and of little uſe. Walton ſays this verſion was written above 400 years ago. Another verſion of the Goſpels was publiſhed at Cambridge by Wheloc in the laſt century: there are alſo two Perſian verſions of the Pſalms made in the laſt century from the vulgar Latin.

Gothic Bibles. It is generally ſaid, that Ulphilas, a Gothic biſhop, who lived in the fourth century, made a verſion of the whole Bible, excepting the book of Kings, for the uſe of his countrymen. That book he omitted, becauſe of the frequent mention made of the wars; as fearing to inſpire too much of the military genius into that people. We have nothing remaining of this verſion but the four Evangeliſts, printed in 4to, at Dort, in 1665, from a very ancient MS.

During the exiſtence of the Roman empire in Europe, the reading of the Scriptures in the Latin tongue prevailed every where. But ſince the face of affairs in Europe has been changed, and ſo many different monarchies erected upon the ruins of the Roman empire, the Latin tongue has by degrees grown into diſuſe: whence has ariſen a neceſſity of tranſlating the Bible into the reſpective languages of each people; and this has produced as many different verſions of the Scriptures in the modern languages, as there are different nations profeſſing the Chriſtian religion. Hence we meet with French, Italian, Spaniſh, German, Flemiſh, Daniſh, Selavonian, Poliſh, Bohemian, and Ruſſian or Muſcovite Bibles; beſides the Anglo-Saxon, and modern Engliſh and Iriſh Bibles.

French Bibles. The oldeſt French Bible we hear of is the verſion of Peter de Vaux, chief of the Waldenſes, who lived about the year 1160. Raoul de Preſle tranſlated the Bible into French in the reign of Charles V. king of France, about the year 1380. Beſides theſe, there are ſeveral old Freneh tranſlations of particular parts of the Scripture. The doctors of Louvain publiſhed the Bible in French at Louvain, by order of the emperor Charles V. in 1550. There is a verſion by Iſaac le Maitre de Sacy, publiſhed in 1672, with explanations of the literal and ſpiritual meaning of the text, which was received with wonderful applauſe, and has been often reprinted. As to the New Teſtaments in French, which have been printed ſeparately, one of the moſt remarkable is that of F. Amelotte of the oratory, compoſed by the direction of ſome Freneh prelates, and printed with annotations in the year 1666, 1667, and 1670. The author pretends he had been at the pains to ſearch all the libraries in Europe, and collate the oldeſt manuſcripts. But, in examining his work, it appears that he has produced no conſiderable various readings, which had not before been taken notice of either in the London Polyglot or elſewhere. The New Teſtament of Mons printed in 1665, with the archbiſhop of Cambray's permiſſion and the king of Spain's licence, made a great noiſe in the world. It was condemned by Pope Clement IX. in 1668, and by Pope Innocent XI. in 1679, and in ſeveral biſhoprics of France at ſeveral times. The New Teſtament publiſhed at Trevoux in 1702, by M. Simon, with literal and critical annotations upon difficult paſſages, was condemned by the biſhops of Paris and Meaux in 1702. F. Bohours, a Jeſuit, with the aſſiſtance of F. F. Michael Tellier, and Peter Bernier, Jeſuits likewiſe, publiſhed a tranſlation of the New Teſtament in 1697: but this tranſlation is, for the moſt part, harſh and obſcure, which was owing to the author's keeping too ſtrictly to the original.

Some French tranſlations have alſo been publiſhed by Proteſtant authors. By Robert Peter Olivetan, one was printed at Geneva in 1535, ſince often reprinted with the corrections of John Calvin and others; another was publiſhed by Sebaſtian Caſtalio, remarkable for particular ways of expreſſion never uſed by good judges of the language. John Diodati likewiſe publiſhed a French Bible at Geneva in 1644; but ſome find fault with his method, in that he rather paraphraſes the text

than tranſlates it. Faber Stapalenſis tranſlated the New Teſtament into French, which was reviſed and accommodated to the uſe of the reformed churches in Piedmont, and printed in 1534. Laſtly, M. John Le Clerc publiſhed a New Teſtament in French at Amſterdam in 1703, with annotations taken chiefly from Grotius and Hammond; but the uſe of this verſion was prohibited in Holland by order of the States-General, as tending to revive the errors of Sabellius and Socinus.

Italian Bibles. The firſt Italian Bible publiſhed by the Romaniſts is that of Nicholas Malerme, a Benedictine monk, printed at Venice in 1471 It was tranſlated from the Vulgate. The verſion of Anthony Brucioli, publiſhed at Venice in 1532, was prohibited by the Council of Trent. The Calviniſts likewiſe have their Italian Bibles. There is one of John Diodati in 1607 and 1641, and another of Maximus Theophilus in 1551, dedicated to Francis de Medicis, Duke of Tuſcany. The Jews of Italy have no entire verſion of the Bible in Italian; the Inquiſition conſtantly refuſing to allow them the liberty of printing one.

Spaniſh Bibles. The firſt Spaniſh Bible that we hear of is that mentioned by Cyprian de Valera, which he ſays was publiſhed about the year 1500. The Epiſtles and Goſpels were publiſhed in that language by Ambroſe de Monteſin in 1512; the whole Bible by Caſſiodore de Reyna, a Calviniſt, in 1569; and the New Teſtament, dedicated to the emperor Charles V. by Francis Enzinas, otherwiſe called *Driander*, in 1543. The firſt Bible which was printed in Spaniſh for the uſe of the Jews, was that printed at Ferrara in 1553, in Gothic characters, and dedicated to Hercules d'Eſt Duke of Ferrara. This verſion is very ancient, and was probably in uſe among the Jews of Spain before Ferdinand and Iſabella expelled them out of their dominions in the year 1492.

German Bibles. The moſt ancient tranſlation of the Bible into the German, is that of Ulphilas biſhop of the Goths, about the year 360. This biſhop left out the book of Kings, which treats chiefly of war, leſt it ſhould too much encourage the martial humour of the Goths. An imperfect manuſcript of this verſion was found in the abbey of Verden near Cologn, written in letters of ſilver, for which reaſon it is called *Codex Argenteus*; and it was publiſhed by Francis Junius in 1665. The oldeſt German printed Bible extant is that of Nuremberg, printed in 1447; but who the author of it was is uncertain. John Emzer, chaplain to George Duke of Saxony, publiſhed a verſion of the New Teſtament in oppoſition to Luther. There is a German Bible of John Eckius in 1537, with Emzer's New Teſtament added to it; and one by Ulembergius of Weſtphalia, procured by Ferdinand Duke of Bavaria, and printed in 1630. Martin Luther having employed eleven years in tranſlating the Old and New Teſtament, publiſhed the Pentateuch in 1522, the hiſtorical books and the Pſalms in 1524, the books of Solomon in 1527, Iſaiah in 1529, the Prophets in 1531, and the other books in 1530: he publiſhed the New Teſtament in 1522. The learned agree, that his language is pure, and the verſion clear and free from intricacies: it was reviſed by ſeveral perſons of quality, who were maſters of all the delicacies of the German language. The German Bibles which have been printed in Saxony, Switzerland, and elſewhere, are for the moſt part the ſame as that of Luther, with very little variation. In 1604 John Piſcator publiſhed a verſion of the Bible in German, taken from that of Junius and Tremellius: but his turn of expreſſion is purely Latin, and not at all agreeable to the genius of the German language: the Anabaptiſts have a German Bible printed at Worms in 1529. John Crellius publiſhed his verſion of the New Teſtament at Racovia in 1630; and Felbinger his at Amſterdam in the year 1660.

Flemiſh Bibles. The Flemiſh Bibles of the Romaniſts are very numerous, and for the moſt part have no author's name prefixed to them, till that of Nicolas Vinck, printed at Louvain in 1548. The Flemiſh verſions made uſe of by the Calviniſts till the year 1637, were copied principally from that of Luther. But the ſynod of Dort having in 1618 appointed a new tranſlation of the Bible into Flemiſh, deputies were named for the work, which was not finiſhed till 1637.

Daniſh Bibles. The firſt Bible in the Daniſh language, was publiſhed by Peter Palladius, Olaus Chryſoſtom, John Synningius, and John Maccabæus, in 1550, in which they followed Luther's firſt German verſion. There are two other verſions, the one by John Paul Reſenius biſhop of Zealand, in 1605; the other, being the New Teſtament only, by John Michel, in the year 1524.

Swediſh Bible. In 1534 Olaus and Laurence publiſhed a Swediſh Bible from the German verſion of Martin Luther. It was reviſed in 1617, by order of king Guſtavus Adolphus, and was afterwards almoſt univerſally adopted.

Bohemian, *Poliſh*, *Ruſſian* or *Muſcovite*, and *Sclavonian* Bibles. The Bohemians have a Bible tranſlated by eight of their doctors, whom they had ſent to the ſchools of Wirtemberg and Baſil, on purpoſe to ſtudy the original languages. It was printed in Moravia in the year 1539. The firſt Poliſh verſion of the Bible, it is ſaid, was that compoſed by Hadewich wife of Jagellon Duke of Lithuania, who embraced Chriſtianity in the year 1390. In 1599 there was a Poliſh tranſlation of the Bible publiſhed at Cracow, which was the work of ſeveral divines of that nation, and in which James Wiek, a Jeſuit, had a principal ſhare. The Proteſtants, in 1596, publiſhed a Poliſh Bible from Luther's German verſion, and dedicated it to Uladiſlaus IV. king of Poland. The Ruſſians or Muſcovites publiſhed the Bible in their language in 1581. It was tranſlated from the Greek by St. Cyril, the apoſtle of the Sclavonians; but this old verſion being too obſcure, Erneſt Gliik, who had been carried priſoner to Moſcow after the taking of Narva, undertook a new tranſlation of the Bible in Sclavonian; who dying in 1705, the Czar Peter appointed ſome particular divines to finiſh the tranſlation; but whether it was ever printed, is uncertain.

Engliſh-Saxon Bibles. On an inquiry into the verſions of the Bible of our own country, it has appeared, that Adelm biſhop of Shireborn, who lived in 709, made an Engliſh-Saxon verſion of the Pſalms; and that Eadfrid, or Febert, biſhop of Lindisferne, who lived about the year 730, tranſlated ſeveral of the books of Scripture into the ſame language. It is ſaid likewiſe, that venerable Bede, who died in 785, tranſlated the whole Bible into Saxon. But Cuthbert, Bede's diſciple, in the enumeration of his maſter's works, ſpeaks only of his tranſlation of the Goſpel; and ſays nothing of the reſt of the Bible. Some pretend, that King Alfred, who lived in 890, tranſlated a great part of the Scriptures. We find an old verſion in the Anglo-Saxon of ſeveral books of the Bible, made by Elfric abbot of Malmeſbury: it was publiſhed at Oxford in 1699. There is an old Anglo-Saxon verſion of the four Goſpels, publiſhed by Matthew Parker archbiſhop of Canterbury in 1571, but the author of it is unknown. Dr. Mill obſerves, that this verſion was made from a Latin copy of the old Vulgate.

Saxon Bibles. There are writers who aſſert, that the whole Scripture was tranſlated into the Anglo Saxon by Bede about the year 701, though others contend he only tranſlated the Goſpels. We have certain books or parts of the Bible by ſeveral other tranſlators; as, 1. The Pſalms, by Adelm biſhop of Shireborn, contemporary with Bede; though by others this verſion is attributed to King Alfred, who lived 200 years after. Another verſion of the Pſalms in Anglo-Saxon, was publiſhed by Spelman in 1640. 2. The Evangeliſts, ſtill extant, done from the ancient Vulgate, before it was reviſed by St.

Jerom, by an author unknown, and publiſhed by Matth. Parker in 1571. An old Saxon verſion of ſeveral books of the Bible, made by Elfric abbot of Malmeſbury, ſeveral fragments of which were publiſhed by Will. Lilly in 1638, the genuine copy by Edm. Thwaites in 1699, at Oxford.

Indian Bible. In 1685, a tranſlation of the Bible into the North American Indian language was publiſhed in 4to at Cambridge by Elliot.

Engliſh Bibles. The firſt Engliſh Bible we read of was that tranſlated by J. Wickliffe about the year 1360; but never printed, though there are MS. copies of it in ſeveral of the public libraries. J. de Treviſa, who died about the year 1398, is alſo ſaid to have tranſlated the whole Bible; but whether any copies of it are remaining does not appear.

The firſt printed Bible in our language was that tranſlated by *Will. Tindal*, aſſiſted by Miles Coverdale, printed abroad in 1526; but moſt of the copies were bought up and burnt by Biſhop Tunſtal and Sir Thomas More. It only contained the New Teſtament, and was reviſed and republiſhed by the ſame perſon in 1530. The prologues and prefaces added to it reflect on the biſhops and clergy; but this edition was alſo ſuppreſſed, and the copies burnt. In 1532, Tindal and his aſſociates finiſhed the whole Bible except the Apocrypha, and printed it abroad: but while he was afterwards preparing for a ſecond edition, he was taken up and burnt for herely in Flanders. On Tindal's death, his work was carried on by Coverdale, and John Rogers ſuperintendant of an Engliſh church in Germany, and the firſt martyr in the reign of Queen Mary, who tranſlated the Apocrypha, and reviſed Tindal's tranſlation, comparing it with the Hebrew, Greek, Latin, and German, and adding prefaces and notes from Luther's Bible. He dedicated the whole to Henry VIII. in 1537, under the borrowed name of Thomas Matthews; whence this has been uſually called *Matthew's Bible*. It was printed at Hamburgh, and licence obtained for publiſhing it in England by the favour of Archbiſhop Cranmer and the Biſhops Latimer and Shaxton.

The firſt Bible that was printed by authority in England, and publicly read in churches, was the ſame Tindal's verſion, reviſed, compared with the Hebrew, and in many places amended, by Miles Coverdale afterwards biſhop of Exeter; and examined after him by Archbiſhop Cranmer, who added a preface to it: whence this was called *Cranmer's Bible*. It was printed by Grafton, of the largeſt volume, and publiſhed in 1540; and, by a royal proclamation, every pariſh was obliged to ſet one of the copies in their church, under the penalty of 40 ſhillings a-month; yet, two years after, the Popiſh biſhops obtained its ſuppreſſion of the King. It was reſtored under Edward VI. ſuppreſſed again under Queen Mary, and reſtored again in the firſt year of Queen Elizabeth, and a new edition of it given in 1562.

Certain Engliſh exiles at Geneva in Queen Mary's reign, Coverdale, Goodman, Gilbie, Sampſon, Cole, Whittingham, and Knox, made a new tranſlation, printed there in 1560, the New Teſtament having been printed in 1557; hence called the *Geneva Bible*; containing the variations of readings, marginal annotations, &c. on account of which it was much valued by the puritan party in that and the following reigns.

At length archbiſhop Parker alſo reſolved on a new tranſlation for the public uſe of the church, and engaged the biſhops and other learned men to take a part in it. Printed with ſhort annotations in 1568, in a large folio, it made what was afterwards called the *Great Engliſh Bible*, or more commonly the *Biſhops' Bible*. The following year it was alſo publiſhed in 8vo, in a ſmall but fine black letter: and here the chapters were divided into verſes; but without any breaks for them, in which the method of the Geneva Bible was followed, which was the firſt Engliſh Bible where any diſtinction of verſes was made. It was afterwards printed in large folio, with corrections, and ſeveral prolegomena, in 1572: this is called *Matthew Parker's Bible*. The initial letters of each tranſlator's name were put at the end of his part: *e. gr.* at the end of the Pentateuch, W. E. for William Exon; that is, William biſhop of Exeter, whoſe allotment ended there: at the end of Samuel, R. M. for Richard Menevenſis, or biſhop of St. David's, to whom the ſecond allotment fell: and the like of the reſt. The Archbiſhop overſaw, directed, examined, and finiſhed the whole. This tranſlation was uſed in the churches for 40 years, though the Geneva Bible was more read in private houſes, being printed above 30 times in as many years. King James bore it an inveterate hatred on account of the notes; which at the Hampton-court conference he charged as partial, untrue, ſeditious, &c. The Biſhops' Bible too had its faults. The King frankly owned he had yet ſeen no good tranſlation of the Bible in Engliſh; but he thought that of Geneva the worſt of all.

After this tranſlation of the Bible by the biſhops, two other private verſions were made of the New Teſtament: the firſt by Laur. Thomſon, made from Beza's Latin edition, together with the notes of Beza, publiſhed in 1582 in 4to, and afterwards in 1589, varying very little from the Geneva Bible; the ſecond edited by the Roman Catholics at Rheims in 1584, called the *Rhemiſh Bible*, or *Rhemiſh Tranſlation*. Theſe finding it impoſſible to keep the people from having the Scriptures in the vulgar tongue, reſolved to give a verſion of their own as favourable to their cauſe as might be. It was printed on a large paper, with a fair letter and margin. One complaint againſt it was its retaining a multitude of Hebrew and Greek words untranſlated, for want, as the editors expreſs it, of proper and adequate terms in the Engliſh to render them by; as the words *azymes*, *tunike*, *rational*, *holocauſt*, *prepuce*, *paſche*, &c. However, many of the copies were ſeized by the Queen's ſearchers and confiſcated; and Th. Cartwright was ſolicited by ſecretary Walſingham to refute it: but, after a good progreſs had been made, Archbiſhop Whitgift prohibited his further proceeding in it, as judging it improper the doctrine of the church of England ſhould be committed to the defence of a puritan, and appointed Dr. Fulke in his place, who refuted the Rheimiſts with great ſpirit and learning. Cartwright's refutation was alſo afterwards publiſhed in 1618, under Archbiſhop Abbot. About 30 years after their New Teſtament, the Roman Catholics publiſhed a tranſlation of the Old at Douay, 1609 and 1610, from the Vulgate, with annotations; ſo that the Engliſh Roman Catholics have now the whole Bible in their mother-tongue; though it is to be obſerved they are forbidden to read it without ſpecial permiſſion from their clergy.

The laſt Engliſh Bible was that which proceeded from the Hampton-court conference in 1603, where many exceptions being made to the Biſhops' Bible, King James gave order for a new one; not, as the preface expreſſes it, for a tranſlation altogether new, nor yet to make of a bad one a good one, but to make a good one better, or of many good ones one beſt. Fifty-four learned perſons were appointed for this office by the King, as appears by his letter to the Archbiſhop, dated in 1604; which being three years before the tranſlation was entered upon, it is probable ſeven of them were either dead or had declined the taſk, ſince Fuller's liſt of the tranſlators makes but 47; who being ranged under ſix diviſions, entered on their province in 1607. It was publiſhed in 1613, with a dedication to James, and a learned preface, and is commonly called *King James's Bible*. After this, all the other verſions dropped and fell into diſuſe, except the Epiſtles and Goſpels in the Common Prayer Book, which were ſtill continued according

the Biſhops' tranſlation till the alteration of the Liturgy in 1661, and the Pſalms and Hymns, which are to this day continued as in the old verſion.

The judicious Selden, in his Table Talk, ſpeaking of the Bible, ſays, "The Engliſh tranſlation of the Bible is the beſt tranſlation in the world, and renders the ſenſe of the original beſt, taking in for the Engliſh tranſlation the Biſhops' Bible, as well as King James's. The tranſlators in King James's time took an excellent method. That part of the Bible was given to him who was moſt excellent in ſuch a tongue (as the Apocrypha to Andrew Downs), and then they met together, and one read the tranſlation, the reſt holding in their hands ſome Bible either of the learned tongues, or French, Spaniſh, Italian, &c. If they found any fault, they ſpoke; if not, he read on." Accordingly King James's Bible is that now read by authority in all the churches in Great Britain.

Welch Bibles. There was a Welch tranſlation of the Bible made from the original in the time of Queen Elizabeth, in conſequence of a bill brought in to the houſe of commons for this purpoſe in 1563. It was printed in folio in 1588. Another verſion, which is the ſtandard tranſlation for that language, was printed in 1620. It is called *Parry's Bible*. An impreſſion of this was printed in 1690, called *Biſhop Lloyd's Bible*. Theſe were in folio. The firſt 8vo impreſſion of the Welch Bible was made in the year 1630.

Iriſh Bible. About the middle of the 16th century, Bedell, biſhop of Kilmore, ſet on foot a tranſlation of the Old Teſtament into the Iriſh language; the New Teſtament and the Liturgy having been before tranſlated into that language. The biſhop appointed one King to execute this work, who, not underſtanding the oriental languages, was obliged to tranſlate it from the Engliſh. This work was received by Bedell, who, after having compared the Iriſh tranſlation with the Engliſh, compared the latter with the Hebrew, the LXX, and the Italian verſion of Diodati. When this work was finiſhed, the biſhop would have been himſelf at the charge of the impreſſion, but his deſign was ſtopped upon advice given to the lord lieutenant and the archbiſhop of Canterbury, that it would ſeem a ſhameful thing for a nation to publiſh a Bible tranſlated by ſuch a deſpicable hand as King. However, the manuſcript was not loſt, for it went to preſs in the year 1685, and was afterwards publiſhed.

Erſe Bible. There has been lately finiſhed at Edinburgh, a verſion of the Bible, in the Gaelic or Erſe language.

BIBLIANDER (Theodore), profeſſor of divinity at Zurich in the 16th century. As he underſtood the oriental languages, he ſet about a new edition of the Koran; the text of which he corrected, by collating the Arabic and Latin copies. To this edition he ſubjoined the life of Mahomet and his ſucceſſors; and prefixed an apology by way of preface, which has been loudly decried.

BIBLIOGRAPHIA, a branch of archæographia, employed in the judging and peruſing of ancient manuſcripts, whether written in books, paper, or parchment. But the ſenſe of the term is now extended; and it ſignifies a work intended to give information concerning the firſt or beſt editions of books, and the ways of ſelecting and diſtinguiſhing them properly. In ſhort, it is uſed for a *notitia* or deſcription of printed books, either in the order of the alphabet, of the times when printed, or of the ſubject matters. In this ſenſe, bibliographia amounts to much the ſame with what is otherwiſe called *bibliotheca*.—Literary journals afford alſo a kind of bibliographia.

BIBLIOMANCY, a kind of divination performed by means of the Bible. This amounts to much the ſame with what is otherwiſe called *ſortes biblicæ* or *ſortes ſanctorum*. It conſiſted in taking paſſages of Scripture at hazard, and drawing indications thence concerning future things; as in Auguſtin's *tolle & lege*. It was much uſed at the conſecration of biſhops.—F. J. Davidius, a Jeſuit, has publiſhed a bibliomancy under the borrowed name of *Veridicus Chriſtianus*.

BIBLIOTHECA, in its original and proper ſenſe, denotes a library, or ſuitable place for depoſiting books.

Bibliotheca, in matters of literature, denotes a treatiſe giving an account of all the writers on a certain ſubject: thus, we have bibliothecas of theology, law, philoſophy, &c. There are likewiſe univerſal bibliothecas, which treat indifferently of all kinds of books; alſo ſelect bibliothecas, which give account of none but authors of reputation. Many of the bibliothecas agree, in moſt reſpects, with what are otherwiſe called memoirs or journals of literature, except that theſe laſt are confined to new books; but there are other bibliothecas, that differ in nothing from catalogues of the writers on certain ſubjects.

BIBLISTS, ſo the Roman-catholics call thoſe Chriſtians who make the Scripture the ſole rule of faith; in which ſenſe, all Proteſtants either are or ought to be biblists.

BIBLUS, βίβλος, in botany, an aquatic plant in Egypt, called alſo *papyrus*; of the ſkin whereof the ancient Egyptians made their paper. See Papyrus.

BICANER, a city of Aſia, on the river Ganges, belonging to the great Mogul. E. long. 87. 20. N. lat. 28. 40.

BICE, or Bise, among painters, a blue colour prepared from the lapis armenus. Bice bears the beſt body of all bright blues uſed in common work, as houſe-painting, &c. but it is the paleſt in colour. It works indifferently well, but inclines a little to ſandy, and therefore requires good grinding. Next to ultramarine, which is too dear to be uſed in common work, it lies beſt near the eye of all other blues.

BICEPS, the name of ſeveral muſcles: as the biceps humeri, or cubiti; biceps tibiæ; &c. See Anatomy, *Table of the Muſcles*.

BICESTER, a ſtraggling town of Oxfordſhire in England, ſeated on the road between Oxford and Buckingham.

BICHET, a quantity or meaſure of corn, which differs according to the places where it is uſed. The bichet is not a wooden meaſure, as the minot at Paris, or the buſhel at London; but it is compounded of ſeveral certain meaſures. It is uſed in many parts of France, &c.

BICLINIUM, in Roman antiquity, a chamber with two beds in it; or when two beds only were round a table.

BICORNES, an order of plants in the *Fragmenta methodi naturalis* of Linnæus, ſo termed from the antheræ having in appearance two horns. See Botany, Part III.

BIDACHE, a ſmall town of France in the department of the lower Pyrenees and late province of Baſque. It has a caſtle, and is ſeated on the river Bidouſe twelve miles Eaſt of Bayonne. W. long. 10. 0. N. lat. 41. 31.

BIDAL, or Bidale, in our ancient cuſtoms, denotes the invitation of friends to drink ale at ſome poor man's houſe, who in conſideration hereof expects ſome contribution for his relief. This cuſtom ſtill obtains in the weſt of England, and is mentioned in ſome of our ancient ſtatutes.

BIDDIFORD, a town of Devonſhire, ſeated on the river Toridge, over which there is a fine ſtone-bridge with 24 arches. It is a large and populous place, and carries on a conſiderable trade. W. long. 4. 10. N. lat. 51. 10.

BIDDING, or Offering, denotes the raiſing the price of a thing at a ſale or auction. The French call this *encherir*. It anſwers to what the Romans called *licitari*: they uſed to bid by holding up the hand or finger. The term is alſo uſed for proclaiming or notifying; in which ſenſe we meet with *bidding of the* banns, the ſame with what is otherwiſe called *aſking*.

BIDDING-*Prayer*. It was one part of the office of the deacons in the primitive Chriſtian church, to be a ſort of monitors and directors of the people in the exerciſe of their public devotions in the church. To that end they made uſe of certain known forms of words, to give notice when each part of the ſervice began. This was called by the Greeks κηρυττειν, and by the Latins *prædicare*: which therefore do not ordinarily ſignify to *preach*, as ſome miſtake it; but to perform the office of a crier (κηρυξ, or *præco*) in the aſſembly: whence Syneſius and others call the deacons ιερολογικους, the *holy criers* of the church, appointed to bid or exhort the congregation to pray and join in the ſeveral parts of the ſervice of the church. Agreeable to this ancient practice is the form *Let us pray*, repeated before ſeveral of the prayers in the Engliſh liturgy.

BIDDING *of the Beads*, a charge or warning which the pariſh-prieſt gave to his pariſhioners at certain ſpecial times, to ſay ſo many pater-noſters, &c. on their beads.

BIDDLE (John), one of the moſt eminent Engliſh writers among the Socinians, was born at Wotton-under-Edge in Glouceſterſhire, and educated in the free ſchool of that place. Being a hopeful youth, he was taken notice of; particularly by Lord George Berkeley, who allowed him an exhibition of ten pounds a-year. This cauſed him vigorouſly to apply himſelf to his ſtudies; and he was, while at ſchool, author of a tranſlation of Virgil's Bucolics, and of the two firſt ſatires of Juvenal. He continued at ſchool till he was 13 years of age. However, having manifeſted in that early period a ſingular piety and contempt of ſecular affairs, he was ſent to the univerſity of Oxford, and entered a ſtudent in Magdalen-hall. In 1641, the magiſtrates of Glouceſter choſe him maſter of the free ſchool of that city; and he was much eſteemed: but falling into ſome opinions concerning the Trinity different from thoſe commonly received, and expreſſing his thoughts with too much freedom, he ſuffered various perſecutions and impriſonments in the time of the commonwealth. During one of theſe confinements, which laſted for ſeveral years, being reduced to great indigence, he was employed by Roger Daniel of London to correct the impreſſion of the Greek Septuagint Bible, which that printer was about to publiſh with great accuracy. In 1651 the parliament publiſhed a general act of oblivion, which reſtored him to his full liberty. He was afterwards impriſoned on account of his tenets; and at laſt the Protector baniſhed him for life to St. Mary's caſtle in the iſle of Scilly, and ſent him thither in October 1655. Soon after, he was allowed 100 crowns a-year for ſubſiſtence. In 1658 he was ſet at full liberty. After the reſtoration of King Charles II. he was fined in 100l. and each of his hearers in 20l. to lie in priſon till paid; which being put in execution, the want of freſh air and exerciſe made him contract a diſeaſe, of which he died on the 22d of September 1662, in the 47th year of his age. His life was publiſhed in Latin in 1682, by Mr. Farrington of the Inner Temple, who repreſents him as poſſeſſed of extraordinary piety, charity, and humility. He would not diſcourſe of thoſe points in which he differed from others with thoſe that did not appear religious according to their knowledge; and was a ſtrict obſerver himſelf, and a ſevere exacter in others, of reverence in ſpeaking of God and Chriſt. He had ſo happy a memory, that he retained word for word the whole New Teſtament, not only in Engliſh, but in Greek, as far as the fourth chapter of the Revelations of St. John.

BIDENS, WATER-HEMP AGRIMONY; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-oppoſitifoliæ*. The receptacle is palcaceous; the pappus has erect ſcabrous awns; and the calyx is imbricated. Of this genus Linnæus enumerates 13 ſpecies; but none of them appear to merit notice except the tripartita, frequently found by the ſides of rivulets, ditches, and lakes, both in Scotland and England. This grows to the height of two feet; and has its leaves divided into three, or often five, lanceolate ſerrated lobes, with yellow flowers, which are ſucceeded by flattiſh angular ſeeds, having two beards ariſing from the angles, which are hooked or barbed downwards; and generally they have another ſhorter beard ariſing from the middle of the back of the ſeed. "As this plant (ſays the author of the Flora Scotica) is found by a chemical analyſis to poſſeſs much the ſame qualities as the celebrated verbeſina acmela, a plant belonging to a genus very nearly related to this, it is probable it would have the ſame good effects in expelling the ſtone and gravel. A decoction of this plant with alum dyes yarn of a yellow colour. The yarn muſt be firſt ſteeped in alum water, then dried and ſteeped in a decoction of the plant, and afterwards boiled in the decoction. The ſeeds have been known ſometimes to deſtroy the *cyprinus auratus*, or gold-fiſh, by adhering to their gills and jaws."

BIDENTAL, in Roman antiquity, a place blaſted with lightning; which was immediately conſecrated by an haruſpex, with the ſacrifice of a bidens. This place was afterwards accounted ſacred, and it was unlawful to enter it or to tread upon it; for which reaſon it was commonly ſurrounded with a ditch, wall, hedge, ropes, &c.

BIDENTALES, in Roman antiquity, were prieſts inſtituted to perform certain ceremonies and expiations when thunder fell on any place. Their principal office was the ſacrificing a ſheep of two years old, which in Latin is called *bidens*; from whence the place ſtruck with thunder got the name of *bidental*.

BIDENTES, in middle-age writers, denotes two yearlings, or ſheep of the ſecond year. The wool of theſe bidentes, or two years old ſheep, being the firſt ſheering, was ſometimes claimed as a heriot to the king on the death of an abbot. Among the ancient Romans, the word was extended further to any ſorts of beaſts uſed for victims, eſpecially thoſe of that age: whence we meet with *fues bidentes*.

BIDET, a nag or little horſe, formerly allowed each trooper and dragoon, for his baggage and other occaſions.

BIDLOO (Godfrey), author of ſeveral treatiſes in anatomy, was born at Amſterdam, March 12th, 1649. In 1688 he was profeſſor of anatomy at the Hague; and in 1694, at Leyden; when king William III. of England appointed him his phyſician; which he would not accept but on condition of holding his profeſſorſhip, which was readily granted him. He publiſhed in Latin, 1. The Anatomy of the Human Body, demonſtrated in 105 cuts, explained by the diſcoveries of the ancient and modern writers. 2. An Oration upon the Antiquity of Anatomy. 3. A Letter to Anthony Leewenhoeck on the animals ſometimes found in the liver of ſheep and other animals. 4. Two Decades of Diſſertations in Anatomy and Chirurgery; and other pieces. He died at Leyden in 1713.

BIDON, a liquid meaſure, containing about five pints of Paris, that is, about five quarts Engliſh wine-meaſure. It is ſeldom uſed but among ſhips crews.

BIE (de Adrian), an eminent painter, was born at Liere in 1594. After learning the rudiments of the art from different maſters, he travelled to Rome, where he ſpent ſix years in ſtudying the works of the beſt maſters. His induſtry was then rewarded with proportionable ſucceſs; for he found encouragement among the moſt honourable perſons at Rome, and in every part of Italy through which he travelled, from perſons of the firſt diſtinction. His penciling was ſo exceedingly neat, and his touch and colouring ſo very delicate, that he was frequently employed to paint on jaſper, agate, porphyry, and other precious articles.

BIEEZ, a town of Poland, in the palatinate of Cracovia. It is ſeated on the river Weſeloke, in E. long. 2. 21. N. lat. 49. 50.

BIEL. See BIENNA.

BIELA, a town of Ruſſia, and capital of a province of the ſame name, ſeated on the river Opſchaw, in E. long. 34. 55. N. lat. 55. 0.

BIELA OSERO, or BELOZERO, a town of the Ruſſian empire, capital of a duchy, and ſituated on a lake of the ſame name, at the mouth of the river Conſa, in E. long. 39. 10. N. lat. 58. 55.

BIELA, a town of Piedmont in Italy, and capital of the Bellcſe near the river Cerva, in E. long. 8. 3. N. lat. 45. 22.

BIELSKI, a town of Poland, in the palatinate of Polachia, near one of the ſources of the river Narew. E. long. 22. 55. N. lat. 53. 50.

BIELSKOI, a town of Ruſſia, in the province of Smolenſko. E. long. 35. 5. N. lat. 56. 40.

BIENNA, a town of Switzerland, ſeated on a lake of the ſame name. The inhabitants are Proteſtants, and in alliance with thoſe of Bern, Soleure, and Friburg. E. long. 7. 14. N. lat. 47. 11.

BIENNIAL PLANTS; plants, as the title *biennial* imports, that are only of two years duration. Numerous plants are of this tribe, which being raiſed one year from ſeed, generally attain perfection either the ſame, or in about the period of a twelvemonth, or a little leſs or more, and the following ſpring or ſummer ſhoot up ſtalks, flower, and perfect ſeeds; ſoon after which they commonly periſh; or if any particular ſort ſurvive another year, they aſſume a dwindling and ſtraggling growth, and gradually die off; ſo that biennials are always in their prime the firſt or ſecond ſummer. Biennials conſiſt both of eſculents and flower plants. Of the eſculent kinds, the cabbage, ſavoy, carrot, parſnip, beet, onion, leek, &c. are biennials. Of the flowery tribe, the Canterbury-bell, French honey-ſuckle, wall-flower, ſtock-July-flower, ſweet-William, China-pink, common-pink, matted-pink, carnation, ſcabious, hollyhock, tree-mallow, vervain-mallow, tree-primroſe, honeſty, or moonwort, &c. are all of the biennial tribe; all of which being ſown in March, April, or May, riſe the ſame year, and in ſpring following ſhoot up into ſtalks, flower, and perfect ſeeds in autumn; after which moſt of them dwindle: though ſometimes the wall-flowers, hollyhocks, carnations, and pinks, ſurvive and flower the following year; but the plants become ſtraggling, the flowers ſmall and badly coloured: it is therefore eligible to raiſe a ſupply annually from ſeed; although wall-flowers, carnations, and pinks, may be continued by ſlips and layers.

BIER, a wooden machine for carrying the bodies of the dead to be buried. The word comes from the French *biere*, which ſignifies the ſame. It is called in Latin *feretrum*, *a ferendo*.—Among the Romans the common bier, whereon the poorer ſort were carried, was called *ſandapila*; that uſed for the richer ſort, *lectica*, *lectica funebris*, ſometimes *lectus*. The former was only a ſort of wooden cheſt, *vilis arca*, which was burnt with the body: the latter was enriched and gilded for pomp. It was carried bare, or uncovered, when the perſon died a natural and eaſy death; when he was much diſfigured or diſtorted, it was concealed from the view.

BIER is more particularly uſed for that whereon the bodies of ſaints are placed in the church to reſt, and expoſed to the veneration of the devout. This is alſo called in middle-age writers, *lectus*, *feretrum*, *lectica*, and *loculus*; and was uſually enriched with gold, ſilver, and precious ſtones, which was the cauſe that the bier of St. Benedict was pillaged, and all its ornaments carried off.

BIEROLIET, a town of the Netherlands in Dutch Flanders, where William Bruckfield, or *Beukelings*, who invented the method of pickling herrings, died in 1397. E. long. 3. 42. N. lat. 51. 25.

BIFERÆ, plants that flower twice a-year, in ſpring and autumn, as is common between the tropics.

BIFRONS, a perſon double-fronted, or two faced. The term is more peculiarly an appellation of Janus, who was repreſented by the ancients with two faces, as being ſuppoſed to look both backwards and forwards: though other reaſons for it are recited by Plutarch. Sometimes he was painted with four faces, *quadrifrons*, as reſpecting the four ſeaſons.

BIGA, in Roman antiquity, a chariot drawn by two horſes abreaſt. Chariot-races, with two horſes, were introduced into the Olympic games in the 93d Olympiad: but the invention was much more ancient, as we find that the heroes in the Iliad fight from chariots of that kind. The moon, night, and the morning, are by mythologiſts ſuppoſed to be carried in *bigæ*, the ſun in *quadrigæ*. Statues in *bigæ* were at firſt only allowed to the gods, then to conquerors in the Grecian games; under the Roman emperors, the like ſtatues, with *bigæ*, were decreed and granted to great and well-deſerving men, as a kind of half triumph, being erected in moſt public places of the city. Figures of *bigæ* were alſo ſtruck on their coins. The drivers of *bigæ* were called *ligarii*; a marble buſt of one Florus a *ligarius* is ſtill ſeen at Rome.

BIGAMY, properly ſignifies being *twice married*; but with us is uſed as ſynonymous to polygamy, or having a plurality of wives at once. Such ſecond marriage, the former huſband or wife being alive, is ſimply void, and a mere nullity, by the eccleſiaſtical law of England; and yet the legiſlature has thought it juſt to make it felony, by reaſon of its being ſo great a violation of the public œconomy and decency of a well ordered ſtate. For polygamy can never be endured under any rational civil eſtabliſhment, whatever ſpecious reaſons may be urged for it by the eaſtern nations, the fallaciouſneſs of which has been fully proved by many ſenſible writers: but in northern countries the very nature of the climate ſeems to declaim againſt it; it never having obtained in this part of the world, even from the time of our German anceſtors, who, as Tacitus informs us, "*prope ſoli barbarorum ſingulis uxoribus contenti ſunt.*" It is therefore puniſhed by the laws both of ancient and modern Sweden with death. And in Britain it is enacted by ſtatute 1 Jac. I. c. 11, that if any perſon being married, do afterwards marry again, the former huſband or wife being alive, it is felony, not within the benefit of clergy. The firſt wife in this caſe ſhall not be admitted as an evidence againſt her huſband, becauſe ſhe is the true wife; but the ſecond may, for ſhe indeed is no wife at all: and ſo, *vice verſa*, of a ſecond huſband. This act makes an exception to five caſes, in which ſuch ſecond marriage, though in the three firſt it is void, is yet no felony. 1. Where either party hath been continually abroad for ſeven years, whether the party in England hath notice of the other's being alive or no. 2. Where either of the parties has been abſent from the other ſeven years within this kingdom, and the remaining party hath had no knowledge of the other's being alive within that time. 3. Where there is a divorce (or ſeparation *a menſa et thoro*) by ſentence in the eccleſiaſtical court. 4. Where the firſt marriage is declared abſolutely void by any ſuch ſentence, and the parties looſed *a vinculo*. Or, 5. Where either of the parties was under the age of conſent at the time of the firſt marriage; for in ſuch caſe, the firſt marriage was voidable by the diſagreement of either party, which the ſecond marriage very clearly amounts to. But, if at the age of conſent the parties had agreed to the marriage, which completes the contract, and is indeed the real marriage; and afterwards one of them

ſhould marry again; Judge Blackſtone apprehends that ſuch ſecond marriage would be within the reaſon and penalties of the act.

BIGATI, in antiquity, a kind of ancient Roman ſilver coins, on one ſide whereof was repreſented a *biga*, or chariot drawn by two horſes. The *bigatus* was properly the Roman denarius, whoſe impreſſion, during the times of the commonwealth, was a chariot driven by Victory, and drawn either by two horſes or four; according to which it was either denominated *ligatus* or *quadrigatus*.

BIGGLESWADE, a town of Bedfordſhire in England, ſeated on the river Ivel, over which there is a handſome bridge. The town is much more conſiderable now than formerly, on account of its commodious inns for paſſengers, it lying on the principal road from London to York. W. long. 0. 15. N. lat. 52. 5.

BIGHT, among ſeamen, denotes one roll or round of a cable or rope, when coiled up.

BIGNON (Jerome), a French writer, was born at Paris in 1590. He gained an uncommon knowledge, under the care of his father, in philoſophy, mathematics, hiſtory, civil law, and divinity, in a very ſhort time; and was almoſt at the end of his ſtudies at an age when it is uſual to ſend children to ſchool. At ten years of age he gave the public a ſpecimen of his learning, in a Deſcription of the Holy Land; and two years after, he publiſhed a Diſcourſe concerning the principal antiquities and curioſities of Rome; and A Summary Treatiſe concerning the election of Popes. Henry IV. deſired to ſee him, and appointed him page to the danphin, who was afterwards Louis XIII. He appeared at court with all the politeneſs of manners imaginable. He wrote at that time a Treatiſe of the precedency of the kings of France, which he dedicated to Henry IV. who gave him an expreſs order to continue his reſearches on that ſubject: but the death of that prince interrupted his deſign. He publiſhed, in 1613, the Formulæ of Marculphus. He was in 1620 made advocate-general in the grand council; and diſcharged that poſt with ſuch reputation, that the king nominated him ſome time after counſellor of ſtate, and at laſt advocate-general in the parliament. He reſigned his offices in 1641; and the year following was appointed chief keeper of the king's library. He was obliged to reſume his office of advocate-general, and held it till his death. He was employed in the moſt important affairs of ſtate. At laſt this great man, who had always made religion the baſis of his other virtues, died with the moſt exemplary devotion in the year 1656.

BIGNONIA, TRUMPET-FLOWER, or SCARLET JASMINE; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking in the 40th order, *Perſonatæ*. The calyx is quinquefid and cup-form: the corolla is bell-ſhaped at the throat, quinquefid, and bellied underneath: the ſiliqua is bilocular; and the ſeeds have membranous wings.

Of this genus Linnæus enumerates 17 *ſpecies*, of which the following are the moſt remarkable: 1. The *radicans*, or climbing aſh-leaved bignonia, is a native of Virginia and Canada. See Plate 56. It riſes 30 or 40 feet high, having pinnated oppoſite leaves of four pair of ſerrated lobes, and an odd one: all the ſhoots and branches being terminated by beautiful cluſters of large trumpet-ſhaped ſcarlet flowers. The humming birds delight to feed on theſe flowers, and by thruſting themſelves too far into them are ſometimes caught. Of this ſpecies there is a variety with ſmaller flowers. 2. The *ſempervirens*, or evergreen climbing Virginia bignonia, is a native of Virginia, Carolina, and the Bahama iſlands. The ſtalks are more ſlender than thoſe of the former ſpecies; yet they riſe, upon proper ſupports, to the height of 20 or 30 feet; the flowers are trumpet-ſhaped, erect, and of a yellow colour, proceeding from the ſides and ends of the ſtalks and branches. 3 The *catalpa*, is a native of the ſame countries. It has a ſtrong woody ſtem and branches, riſing 20 feet high, ornamented with large heart-ſhaped leaves, five or ſix inches long, and almoſt as broad, placed by threes, with whitiſh yellow-ſtriped flowers coming out in panicles towards the end of the branches. This deſerves a place in all curious ſhrubberies, as during the ſummer ſeaſon no tree makes a more beautiful appearance: for which reaſon it ſhould be placed conſpicuouſly; or ſome might be planted ſingly upon ſpacious lawns or other large parts of graſs-ground, and permitted to take their natural growth. 4. The *unguis*, or claw-bignonia, a deciduous climber, is a native of Barbadoes and the other Weſt India iſlands. It riſes by the help of claw-like tendrils, the branches being very ſlender and weak; and by theſe it will over top buſhes, trees, &c. twenty or thirty feet high. The branches, however, ſhow their natural tendency to aſpire, for they wind about every thing that is near them: ſo that, together with the aſſiſtance nature has given them of tendrils, it is no wonder they arrive at ſo great an height. Theſe branches, or rather ſtalks, have a ſmooth ſurface, are often of a reddiſh colour, particularly next the ſun, and are very tough. The tendrils grow from the joints; they are bowed, and are divided into three parts. The leaves grow in pairs at the joints, and are four in number at each. Theſe are of an oblong figure, have their edges entire, and are very ornamental to the plant; for they are of an elegant green colour: their under ſurface is much paler than their upper; and their footſtalks, midrib, and veins, alter to a fine purple. The flowers are monopetalous and bell-ſhaped. The tube is very large, and the rim is divided and ſpreads open. They grow from the wings of the leaves in Auguſt, two uſually at each joint; and they are ſucceeded in the countries where they grow naturally by long pods. 5. The *capreolata*, or tendril bignonia, a native of North America, is another fine climber, which riſes by the aſſiſtance of tendrils or claſpers. The leaves grow at the joints oppoſite by pairs, though thoſe which appear at the bottom frequently come out ſingly. They are of an oblong figure, and continue on the plant all winter. The flowers are produced in Auguſt from the wings of the leaves; they are of the ſame nature, and of the ſhape nearly of the former; are large, of a yellow colour, and ſucceeded by ſhort pods.

Of the climbers, the methods of *culture* are the following: 1. If the ſhoots are laid upon the ground, and covered with a little mould, they will immediately ſtrike root, and become good plants for ſetting out where they are wanted. 2. They will all grow by cuttings. The bottom part of the ſtrongeſt young ſhoots is the beſt; and by this method plenty may be ſoon raiſed. 3. They are to be raiſed by ſeeds; but this is a tedious method, eſpecially of the pinnated-leaved ſorts; for it will be many years before the plants raiſed from ſeeds will blow. As to the catalpa, whoever has the convenience of a bark-bed may propagate it in plenty, 1. By cuttings; which being planted in pots, and plunged into the beds in the ſpring, will ſoon ſtrike root, and may afterwards be ſo hardened to the open air, that they may be ſet abroad in the ſhade before the end of ſummer: in the beginning of October, they ſhould be removed into a green-houſe, or under ſome ſhelter to be protected from the winter's froſt. In the ſpring, after the bad weather is paſt, they may be turned out of the pots, and planted in the nurſery-way, in a well ſheltered place; and if the ſoil be rich, and rather inclined to be moiſt, it will be the better. Here they may ſtand for four or five years, the rows being dug in winter and weeded in ſummer, when they will be

of a proper ſize to be planted out to ſtand. Theſe cuttings will often grow in a rich, ſhady, moiſt border; ſo that whoever can have plenty of them, ſhould plant them pretty thick in ſuch a place, and he may be tolerably ſure, by this way, of raiſing many plants. 2. From ſeed; which muſt be procured from America, and ſhould be ſown in a fine warm border of light rich mould, or elſe in pots or boxes; the ſeedling plants requiring more than common care.

BIGORRE, a late territory or county of France, now forming the department of the Upper Pyrenees. It is bounded on the eaſt by the valley of Aure, the viſcounty of Nebouſſa, Riviere Verdun, and Pardiac; by Bearn on the weſt; on the ſouth, by the valleys of Brotou and Penticouſe in Arragon; and on the north, by the county of Riviere-Bas incorporated with Armagnac. It is 40 miles long from north to ſouth, and 30 in breadth from eaſt to weſt. It is divided into three parts, the mountains, the plains, and the Ruſtan. The mountains are incloſed between thoſe of the valley of Aure on the eaſt, thoſe of Arragon on the ſouth, and of Bearn on the weſt. This part contains two principal valleys, Lavedan and Barege. The valley of Bigorre is of an oval form, and has the hills of Ruſtan on the eaſt. The remarkable towns are Tarbes the capital, Bagneres, Lourd, &c. The mountains are a barrier between France and Spain, and there are four different paſſages which the inhabitants are obliged to guard. Bigorre yields marble, jaſper, ſtone, and ſlate: there are alſo mines of ſeveral ſorts, but they are not worked. The rivers are the Adour, the Elches, the Arroſet, and the Gave of Lavedan; there are alſo three lakes.

BIGOT, a perſon obſtinately and perverſely wedded to ſome opinion or practice, particularly of a religious nature. Camden, perhaps, has hit upon the true original of the word. He relates, that when Rollo, Duke of Normandy, received Giſla, the daughter of Charles *the Fooliſh*, in marriage, together with the inveſtiture of that dukedom, he would not ſubmit to kiſs Charles's foot: and when his friends urged him by all means to comply with that ceremony, he made anſwer in the Engliſh tongue, NE SE BY God, i. e. *Not ſo by God*. Upon which, the king and his courtiers deriding him, and corruptly repeating his anſwer, called him *bigot*; from whence the Normans were called, *bigodi*, or *bigots*.

BIGOT, in Italian *bigontia*, is uſed to denote a Venetian liquid meaſure, containing the fourth part of the amphora, or half the boot.

BIHAEZ, a ſtrong town of Croatia in Hungary, ſeated in an iſle formed by the river Anna, in E. long. 16. 2. N. lat. 44. 35.

BILANDER, in navigation, a ſmall merchant-ſhip with two maſts, diſtinguiſhed from other veſſels of the ſame kind by the form of the main-ſail. Few veſſels are now rigged in the manner of bilanders: the name has been variouſly applied in different countries.

BILBOA, a large, handſome, and rich town of Spain, capital of Biſcay, with a well frequented harbour. It is remarkable for the wholeſomeneſs of its air, and the fertility of the ſoil about it. The inhabitants have always preſerved themſelves from a mixture with the Jews and Moors; and therefore will admit no family to ſettle among them but who can prove themſelves to be of Chriſtian extraction, nor will they admit any ſlaves among them as in the other parts of Spain. The exports are wool, and ſword-blades, with ſome other manufactures of iron and ſteel. The town is ſeated at the mouth of the river Ibaicabal, in W. long. 4. 20. N. lat. 43. 23.

BILBOWS, a puniſhment at ſea, anſwering to the ſtocks at land. The offender is laid in irons, or ſtocks, which are more or leſs ponderous according to the quality of the offence of which he is guilty.

BILDESTON, a town of Suffolk in England, ſeated on a creek on the river Breton. The principal manufacture is in woollen goods, eſpecially blankets. E. long. 0. 45. N. lat. 52. 20.

BILDGE of a ſhip, the bottom of her floor, or the breadth of the place the ſhip reſts on when ſhe is a-ground. Therefore, *bildge-water* is that which lies on her floor, and cannot go to the well of the pump: and *bildge-pumps*, or burr-pumps, are thoſe that carry off the bildge-water. They likewiſe ſay the ſhip is *bildged*, when ſhe has ſome of her timber ſtruck off on a rock or anchor, and ſprings a leak.

BILE, a yellow, bitter juice, ſeparated from the blood by the liver. It is collected in the porus biliarius and gall-bladder, and thence diſcharged by the common duct into the duodenum, for the purpoſe of aiding the periſtaltic motion of the inteſtines. See ANATOMY.

BILEDULGERID, or BELAD AL JERID, the *Country of dates*, a kingdom of Africa. It is almoſt of a ſquare form, extending itſelf more than 80 leagues every way, from 28. 30. to 32. 50. north latitude, and from 6 to 12 degrees of weſt longitude. It is bounded on the north by the kingdom of Tunis, on the eaſt by a ridge of lofty mountains which divide it from Tripoli and part of Gudamis, on the weſt by the countries of Zeb and Mezeb, and on the ſouth by the province of Verghela. The whole country is barren, ſandy, and mountainous, producing little or nothing beſides dates, which grow here in ſuch profuſion, that the face of half the kingdom is covered over with date-trees, and from hence the whole country takes its name. The climate is hot and unhealthy: the people lean, ſwarthy, and ſhrivelled in their complexions; with their eyes inflamed, owing to the reflection of the ſun-beams from the white hard ſoil; and the ſhowers of duſt and ſand driven by the high winds that blow here at certain ſeaſons are frequently ſo violent as to bury men and cattle under them. Another inconvenience with which the inhabitants are afflicted, for which no other reaſon is given beſides their conſtant living on dates, is, an inveterate ſcurvy in their gums, whence all their teeth drop out; though it frequently ſpreads over their whole bodies, and then they become the moſt unhappy and loathſome objects. They are almoſt entirely free from other diſeaſes: ſo that, when not afflicted with this, they live to a good old age; though it is obſervable, that they diſcover a furrowed countenance, ſhrivelled ſkin, hoary locks, and other ſymptoms of old age, very early in life, and before decrepitude, infirmity, or any decay of their faculties, appear. The plague is not known in Biledulgerid, though ſo frequent in Barbary, and though a conſtant intercourſe is kept up between the two countries; whence it would ſeem, that in certain caſes this terrible diſtemper is not ſo infectious as it is uſually thought to be. The ſame may be ſaid of the ſmall-pox, a diſeaſe little leſs contagious and fatal in hot countries than the plague itſelf. The natives are repreſented as a lewd, treacherous, thieviſh, and ſavage people, who delight in murder and robbery. They are moſtly a mixture of Africans and wild Arabs who mingled themſelves with them. The former live with ſome regularity and civil order in a kind of villages compoſed of a number of little huts; the latter in tents, ranging from place to place in queſt of food and plunder. The Arabs, who pride themſelves in their ſuperiority of birth and talents above the primitive inhabitants, are wholly independent and free, frequently hiring themſelves in the ſervice of the neighbouring princes at war; from which policy ariſe the moſt valuable branches of their public revenue, if any thing can be called common or public in a nation of lawleſs robbers. The reſt purſue no other occupation beſides hunting and plundering; the firſt of which is their common employment, eſpecially hunting of oſtriches, which are ſaid to be of a prodigious ſtature in this country, and as high as a

man mounted on a tall horſe. The inhabitants eat the fleſh of theſe animals; barter their feathers for corn, pulſe, and other things they want; uſe their hearts in their necromantic and religious rites, their fat as a medicine of ſovereign virtue, their talons for ear pendants and other ornaments, and their ſkins they convert into pouches and knapſacks, ſo that every part of the animal is employed for ſome uſeful purpoſe. Beſides dates and oſtriches, the Arabs live likewiſe on the fleſh of goats and camels; drinking either the liquor or broth in which that fleſh is boiled, or the milk of their camels; for they ſeldom taſte water, that element being more ſcarce in this country than milk itſelf. In the whole country there is ſcarce a town of any note, or even a ſtream of water that deſerves notice, or that is not dried up ſix months in the year.

BILEVELT, a town of Germany, in the circle of Weſtphalia and county of Ravenſburg, ſubject to the king of Pruſſia, in E. long. 8. 20. N. lat. 52. 0.

BILINGUIS, in a general ſenſe, ſignifies one that ſpeaks two languages; but in law, is uſed for a jury that paſſes in any caſe between an Engliſhman and a foreigner, whereof part ought to be Engliſh and part ſtrangers.

BILIOUS, in general, denotes ſomething belonging to, or partaking of, the nature of bile. Hence, bilious fevers are thoſe occaſioned by an over-ſupply or a morbid alteration in the qualities of the bile.

BILL, in mechanics, an inſtrument made of iron, edged in the form of a creſcent, and adapted to a handle. It is uſed by plumbers, to perform ſeveral parts of their work; by baſket-makers, to cut the largeſt pieces of cheſnut-trees and other wood; and by gardeners, to prune trees. When ſhort, it is called a *hand-bill*; and when long, a *hedge-bill*.

Bill, in law, a declaration in writing, expreſſing either ſome wrong the complainant has ſuffered from the defendant, or a fault committed by the perſon complained of againſt ſome law or ſtatute. This bill is ſometimes exhibited to juſtices at the general aſſizes, by way of indictment, or referred to others having juriſdiction; but is more generally addreſſed to the lord chancellor. It contains the fact complained of, the damage ſuſtained, and a petition or proceſs againſt the defendant for redreſs; and is uſed both in criminal and civil caſes. In the former, the words "*a true bill*" are indorſed by the grand jury upon a preſentment, implying that they find the ſame founded on probable evidence, and therefore worthy of further conſideration. In Scots law, every ſummary application in writing, by way of petition to the court of ſeſſion, is called a *bill*.

Bill *of Attainder*. See Attainder.

Bill *of Appeal*. See Appeal.

Bill ſignifies alſo a paper, either written or printed, in very large characters, which is poſted up in ſome open and public place, to give notice of the ſale of any merchandize or ſhip, or of the ſailing of any veſſel into foreign parts.

Bill, in trade, both wholeſale and retail, as alſo among workmen, ſignifies an account of merchandizes or goods delivered to a perſon, or of work done for one.

Bill, in commerce, denotes a ſecurity for money under the hand and ſometimes ſeal of the debtor, without any condition or forfeiture in caſe of non-performance; in which it is diſtinguiſhed from a bond or obligation. It has been uſually defined, a writing wherein one man is bound to another to pay a ſum of money, on a day that is future, or preſently on demand, according to the agreement of the parties at the time when it is drawn; on which, in caſe of failure, diligence or execution may be immediately done to force payment. Theſe bills muſt be on ſtamped paper of a value proportioned to the amount of the ſum expreſſed.

Bank-Bill is a note or obligation ſigned on behalf of the company of the bank, by one of their caſhiers, for value received. Or it is an obligation to pay on demand either to the bearer or to order; in Scotland, it is underſtood to be to order.

Bill *of Entry*, an account of the goods entered at the cuſtom-houſe, both inwards and outwards. In this bill muſt be expreſſed the merchant exporting or importing; the quantity of merchandiſe, and the divers ſpecies thereof; and whither tranſported or from whence.

Bill *of Exchange*, is a ſecurity originally invented among merchants in different countries, for the more eaſy remittance of money from the one to the other, which has ſince ſpread itſelf into almoſt all pecuniary tranſactions. It is an open letter of requeſt from one man to another, deſiring him to pay a ſum named therein to a third perſon on his account; by which means a man at the moſt diſtant part of the world may have money remitted to him from any trading country, If A lives in Jamaica, and owes B who lives in England 1000l.; ſhould C be going from England to Jamaica, he may pay B this 1000l. and take a bill of exchange drawn by B in England upon A in Jamaica, and receive it when he comes thither. Thus does B receive his debt, at any diſtance of place, by transferring it to C; who carries over his money in paper-credit, without danger of robbery or loſs. This method is ſaid to have been brought into general uſe by the Jews and Lombards, when baniſhed for their uſury and other vices: in order the more eaſily to draw their effects out of France and England into thoſe countries in which they had choſen to reſide. But the invention of it was a little earlier; for the Jews were baniſhed out of Guienne in 1287, and out of England in 1290, and in 1236 the uſe of paper credit was introduced into the Mogul empire in China.—In common ſpeech, ſuch a bill is frequently called a *draught*; but a bill of exchange is the more legal as well as mercantile expreſſion. The perſon, however, who writes this letter is called, in law, the *drawer*; and he to whom it is written, the *drawee*; and the third perſon or negotiator to whom it is payable (whether ſpecially named or the bearer generally) is called the *payee*.

Theſe bills are either foreign or inland; foreign, when drawn by a merchant reſiding abroad upon his correſpondent in England, or *vice verſa*; and inland, when both the drawer and the drawee reſide within the kingdom. Formerly foreign bills of exchange were much more regarded in the eye of the law than inland ones, as being thought of more public concern in the advancement of trade and commerce. But now by two ſtatutes, the one 9 and 10 W. III. c. 17. the other 3 and 4 Ann. c. 9. inland bills of exchange are put upon the ſame footing as foreign ones; what was the law and cuſtom of merchants with regard to the one, and taken notice of merely as ſuch, being by thoſe ſtatutes expreſsly enacted with regard to the other. So that there is now in law no manner of difference between them. In drawing foreign bills of exchange, it is cuſtomary to give two or three of the ſame date and tenor to be ſent by different conveyances, that in caſe of accidents the perſon to whom they are ſent may not be diſappointed; in which caſe it is mentioned in the body of the bill, that it is the 1ſt, 2d, or 3d bill of exchange; ſo that when one is paid it diſcharges all the reſt. Bills of exchange for any ſum muſt be on ſtamped paper.

Bill *of Lading*, an acknowledgment ſigned by the maſter of a ſhip, and given to a merchant, &c. containing an account of the goods which the maſter has received on board from that merchant, &c. with a promiſe to deliver them at an intended place for a certain ſalary. Each bill of lading muſt be treble, one for the merchant who loads the goods, another to be ſent to the perſon to whom they are conſigned, and the third to remain in the hands of the maſter of the ſhip. It muſt be obſerved, however, that a bill of lading is uſed only when the

goods ſent on board a ſhip are but part of the cargo: for when a merchant loads a whole veſſel for his own perſonal account, the deed paſſed between him and the maſter of the ſhip is called *charter-party*. See CHARTER-*party*.

BILLS *of Mortality*, are accounts of the number of births and burials within a certain diſtrict, every week, month, quarter, or year. In this ſenſe we ſay *weekly bills*, *monthly bills*, *quarterly bills*, *yearly bills*. The London *bills of mortality*, which were the firſt, are compoſed by the company of pariſh-clerks, and expreſs the number of chriſtenings of each ſex, and the number of deaths from each diſeaſe.

BILL *of Parcels*, an account given by the ſeller to the buyer, containing the particulars of all the ſorts and prices of the goods bought.

BILL *of Sale*, is when a perſon wanting a ſum of money delivers goods as a ſecurity to the lender, to whom he gives this bill, impowering him to ſell the goods, in caſe the ſum borrowed is not repaid, with intereſt, at the appointed time.

BILL *of Store*, a licence granted at the cuſtom-houſe to merchants, by which they have liberty to carry, cuſtom-free, all ſuch ſtores and proviſions as they may have occaſion for during their voyage.

BILL *of Sufferance*, a licence granted to a merchant, at the cuſtom-houſe, ſuffering him to trade from one Engliſh port to another without paying cuſtom.

Lombard BILLS, are inſtruments of an uncommon kind and figure, uſed in Italy and Flanders, and of late years in France; conſiſting of a piece of parchment, cut to an acute angle about an inch broad at top, and terminating in a point at bottom; chiefly given where private perſons are concerned in the fitting out a ſhip on any long voyage. The manner is thus: The party, who is deſirous to be concerned in the cargo or venture, carries his money to the merchant, who fits out the ſhip, where it is entered down in a regiſter: at the ſame time the merchant writes down on a piece of parchment, upwards of an inch broad, and ſeven or eight inches long, the name of the lender and the ſum lent; which being cut diagonal-wiſe, or from corner to corner, each party retains his half. On the return of the veſſel, the lender brings his moiety to the merchant; which being compared with the other, he receives his dividend accordingly. Much the ſame is practiſed in Holland by thoſe who lend money on pledges: the name of the borrower and the ſum are written on a like ſlip of parchment, which is cut in two, and half given to the borrower, and the other half ſtitched to the pledge; that, upon comparing them together again, the borrower may receive his goods on paying the money ſtipulated.

BILL *in Parliament*, a paper containing propoſitions offered to the houſes to be paſſed by them, and then preſented to the king to paſs into a law.

In order to bring a bill into the houſe, if the relief ſought by it is of a private nature, it is firſt neceſſary to prefer a petition; which muſt be preſented by a member, and uſually ſets forth the grievance deſired to be remedied. This petition (when founded on facts that may be in their nature diſputed) is referred to a committee of members, who examine the matter alleged, and accordingly report it to the houſe; and then (or, otherwiſe, upon the mere petition) leave is given to bring in the bill. In public matters, the bill is brought in upon motion made to the houſe, without any petition at all. Formerly all bills were drawn in the form of petitions, which were entered upon the parliament-rolls, with the king's anſwer thereunto ſubjoined; not in any ſettled form of words, but as the circumſtances of the caſe required: and at the end of each parliament the judges drew them into the form of a ſtatute, which was entered on the ſtatute rolls. In the reign of Henry V. to prevent miſtakes and abuſes, the ſtatutes were drawn up by the judges before the end of the parliament; and in the reign of Henry VI. bills in the form of acts, according to the modern cuſtom, were firſt introduced.

Such perſons as have been directed to bring in the bill, preſent it in a competent time to the houſe, drawn out on paper, with a multitude of blanks, or void ſpaces, where any thing occurs that is dubious, or neceſſary to be ſettled by the parliament itſelf (ſuch eſpecially as the preciſe date of times, the nature and quantity of penalties, or of any ſums of money to be raiſed); being indeed only the ſkeleton of the bill. In the houſe of lords, if the bill begins there, it is (when of a private nature) referred to two of the judges, who examine and report the ſtate of the facts alleged, to ſee that all neceſſary parties conſent, and to ſettle all points of technical propriety. This is read a firſt time, and at a convenient diſtance a ſecond time; and after each reading, the ſpeaker opens to the houſe the ſubſtance of the bill, and puts the queſtion, Whether it ſhall proceed any farther? The introduction of the bill may be originally oppoſed, as the bill itſelf may at either of the readings; and, if the oppoſition ſucceeds, the bill muſt be dropped for that ſeſſion; as it muſt alſo, if oppoſed with ſucceſs in any of the ſubſequent ſtages.

After the ſecond reading, it is committed: that is, referred to a committee: which is either ſelected by the houſe in matters of ſmall importance; or elſe, upon a bill of conſequence, the houſe reſolves itſelf into a committee of the whole houſe. A committee of the whole houſe is compoſed of every member; and, to form it, the ſpeaker quits the chair (another member being appointed chairman), and may ſit and debate as a private member. In theſe committees the bill is debated clauſe by clauſe, amendments made, the blanks filled up, and ſometimes the bill entirely new modelled. After it has gone through the committee, the chairman reports it to the houſe with ſuch amendments as the committee have made; and then the houſe conſiders the whole bill again, and the queſtion is repeatedly put upon every clauſe and amendment. When the houſe hath agreed or diſagreed to the amendments of the committee, and ſometimes added new amendments of its own, the bill is then ordered to be engroſſed, or written in a ſtrong hand, on one or more long rolls (or preſſes) of parchment ſewed together. When this is finiſhed, it is read a third time, and amendments are ſometimes then made to it; and if a new clauſe be added, it is done by tacking a ſeparate piece of parchment on the bill, which is called a *rider*. The ſpeaker then again opens the contents; and, holding it up in his hands, puts the queſtion, Whether the bill ſhall paſs? If this is agreed to, the title to it is then ſettled; which uſed to be a general one for all the acts paſſed in the ſeſſion, till in the fifth year of Hen. VIII. diſtinct titles were introduced for each chapter. After this, one of the members is directed to carry it to the lords, and deſire their concurrence. Thus, attended by ſeveral more, he carries it to the bar of the houſe of peers, and there delivers it to their ſpeaker, who comes down from his woolſack to receive it.

The bill there paſſes through the ſame forms as in the other houſe (except engroſſing, which is already done); and, if rejected, no more notice is taken, but it paſſes *ſub ſilentio*, to prevent unbecoming altercations. But if it is agreed to, the lords ſend a meſſage by two maſters in chancery (or ſometimes two of the judges) that they have agreed to the ſame: and the bill remains with the lords, if they have made no amendment to it. But if any amendments are made, ſuch amendments are ſent down with the bill to receive the concurrence of the commons. If the commons diſagree to the amendments, a conference uſually follows between members deputed from each houſe; who for the moſt part ſettle and adjuſt the difference: but if both houſes remain inflexible, the bill is dropped. If

the commons agree to the amendments, the bill is ſent back to the lords by one of the members, with a meſſage to acquaint them therewith. The ſame forms are obſerved, *mutatis mutandis*, when the bill begins in the houſe of lords. But when an act of grace or pardon is paſſed, it is firſt ſigned by his majeſty, and then read once only in each of the houſes, without any new engroſſing or amendment. And when both houſes have done with any bill, it always is depoſited in the houſe of peers, to wait the royal aſſent; except in the caſe of a bill of ſupply, which, after receiving the concurrence of the lords, is ſent back to the commons.

The royal aſſent may be given two ways: 1. In perſon; when the king comes to the houſe of peers, in his crown and royal robes, and ſending for the commons to the bar, the titles of all the bills that have paſſed both houſes are read; and the king's anſwer is declared by the clerk of the parliament in Norman-French: a badge, it muſt be owned (now the only one remaining), of conqueſt; and which one could wiſh to ſee fall into total oblivion; unleſs it be reſerved as a ſolemn memento to remind us that our liberties are mortal, having been once deſtroyed by a foreign force. If the king conſents to a public bill, the clerk uſually declares, *Le roy le veut*, "The king wills it ſo to be;" if to a private bill, *Soit fait come il eſt déſiré*, "Be it as it is deſired." If the king refuſes his aſſent, it is in the gentle language of *Le roy s'aviſera*, "The king will adviſe upon it." When a bill of ſupply is paſſed, it is carried up and preſented to the king by the ſpeaker of the houſe of commons; and the royal aſſent is thus expreſſed, *Le roy remercie ſes loyal ſubjects, accepte leur benevolence, et auſſi le veut*; "The king thanks his loyal ſubjects, accepts their benevolence, and wills it ſo to be." In caſe of an act of grace, which originally proceeds from the crown, and has the royal aſſent in the firſt ſtage of it, the clerk of the parliament thus pronounces the gratitude of the ſubject: *Les prélats, ſeigneurs, et commons, en ce préſent parlement aſſemblies, au nom de touts vous autres ſubjects, remercient tres humblement votre majeſté, et prient à Dieu vous donner en ſanté bone vie et longue*; "The prelates, lords, and commons, in this preſent parliament aſſembled, in the name of all your other ſubjects, moſt humbly thank your majeſty, and pray to God to grant you in health and wealth long to live." 2. By the ſtatute 33 Hen. VIII. c. 21. the king may give his aſſent by letters patent under his great ſeal, ſigned with his hand, and notified in his abſence to both houſes aſſembled together in the upper houſe. And when the bill has received the royal aſſent in either of theſe ways, it is then, and not before, a ſtatute or act of parliament.

This ſtatute or act is placed among the records of the kingdom; there needing no formal promulgation to give it the force of a law, as was neceſſary by the civil law with regard to the emperor's edicts: becauſe every man in Britain is, in judgment of law, party to the making of an edict of parliament, being preſent thereat by his repreſentatives. However, a copy thereof is uſually printed at the king's preſs for the information of the whole land. And formerly, before the invention of printing, it was uſed to be publiſhed by the ſheriff of every county; the king's writ being ſent to him at the end of every ſeſſion, together with a tranſcript of all the acts made at that ſeſſion, commanding him, *ut ſtatuta illa, et omnes articulos in eiſdem contentos, in ſingulis locis ubi expedire viderit, publicè proclamari, et firmiter teneri et obſervari faciat*. And the uſage was to proclaim them at his county court, and there to keep them, that whoever would might read or take copies thereof; which cuſtom continued till the reign of Henry VII.

An act of the Britiſh parliament thus made is the exerciſe of the higheſt authority that this kingdom acknowledges upon earth. It has power to bind every ſubject in the land, and the dominions thereunto belonging; nay, even the king himſelf, if particularly named therein. And it cannot be altered, amended, diſpenſed with, ſuſpended, or repealed, but in the ſame forms and by the ſame authority of parliament: for it is a maxim in law, that it requires the ſame ſtrength to diſſolve as to create an obligation. It is true, it was formerly held, that the king might in many caſes diſpenſe with penal ſtatutes; but now by ſtatute 1 Wil. and M. ſt. 2. c. 2. it is declared, that the ſuſpending or diſpenſing with laws by regal authority, without conſent of parliament, is illegal.

Bill *of Rights*. See the article Liberty.

BILLERICAY, a town of Eſſex in England, ſeated on a hill, in E. long. 0. 25. N. lat. 51. 35.

BILLET, in heraldry, a bearing in form of a long ſquare. Billets are ſuppoſed to repreſent pieces of cloth of gold or ſilver; but Guillim thinks they repreſent a letter ſealed up; but other authors take them for bricks. *Billeté* ſignifies that the eſcutcheon is all over ſtrewed with billets, the number not aſcertained.

Billet-*Wood*, ſmall wood for fuel, cut three feet and four inches long, and ſeven inches and a half in compaſs; the aſſize of which is to be inquired of by juſtices.

BILLETING, in military affairs, is the quartering of ſoldiers in the houſes of a town or village.—Among fox hunters, it ſignifies the ordure and dung of a fox.

BILLIARDS, an ingenious kind of game, played on a rectangular table, with little ivory balls, which are driven into hazards or holes, according to certain rules of the game. This game was invented by the French, when it was played in a different manner from what it is at preſent, by having a paſs or iron fixed on the table, through which the balls at particular periods of the game uſed to be played; but now this method is quite left off.

The French, the Germans, the Dutch, and the Italians, brought this game into vogue throughout moſt parts of Europe, and became great proficients. In a few years afterwards it became a favourite diverſion in many parts of England, particularly with perſons of the firſt rank. The table on which the game is now played is generally about twelve feet long and ſix feet wide, or rather in the exact form of an oblong; it is covered with fine green cloth, and ſurrounded with cuſhions to prevent the balls rolling off, and to make them rebound. There are ſix holes, nets, or pockets: theſe are fixed at the four corners, and in the middle, oppoſite to each other, to receive the balls, which when put into theſe holes or pockets are called hazards. The making of a hazard, that is putting the adverſary's ball in, at the uſual game reckons for two in favour of the player.

The game of billiards is played with ſticks, called *maces*, or with *cues*. The firſt conſiſts of a long ſtraight ſtick, with a head at the end, and is the moſt powerful inſtrument of the two: the cue is a thick ſtick diminiſhing gradually to a point of about half an inch diameter; this inſtrument is played over the left hand, and ſupported by the fore-finger and thumb. It is the only inſtrument in vogue abroad, and is played with amazing addreſs by the Italians and ſome of the Dutch; but in England the mace is the prevailing inſtrument, which the foreigners hold in contempt, as it requires not near ſo much addreſs to play the game with, as when the cue is made uſe of; but the mace is preferred for its peculiar advantage, which ſome profeſſed players have artfully introduced, under the name of *trailing*, that is, following the ball with the mace to ſuch a convenient diſtance from the other ball as to make it an eaſy hazard. The degrees of trailing are various, and undergo different denominations amongſt the connoiſſeurs at this game; namely, the ſhove, the ſweep, the long ſtroke, the trail, and the dead trail or turn up, all which ſecure an advantage to a good player according to their various gradations: even the butt end of the

cue becomes very powerful, when it is made uſe of by a good trailer.

Rules generally obſerved at the common game.—1. For the lead, the balls muſt be put at one end, and the player muſt ſtrike them againſt the farthermoſt cuſhion, in order to ſee which will be neareſt the cuſhion that is next to them. 2. The neareſt to the cuſhion is to lead and chooſe the ball if he pleaſes. 3. The leader is to place his ball at the nail, and not to paſs the middle pocket; and if he holes himſelf in leading, he loſes the lead. 4. He who follows the leader muſt ſtand within the corner of the table, and not place his ball beyond the nail. 5. He who plays upon the running ball loſes one. 6. He who touches the ball twice, and moves it, loſes one. But theſe two rules are ſeldom or ever enforced, eſpecially in England. 7. He who does not hit his adverſary's ball, loſes one. 8. He who touches both balls at the ſame time, makes a foul ſtroke, in which caſe if he ſhould hole his adverſary, nothing is gained by the ſtroke; but if he ſhould put himſelf in, he loſes two. 9. He who holes both balls loſes two. 10. He who ſtrikes upon his adverſary's ball, and holes himſelf, loſes two. 11. He who plays at the ball without ſtriking it, and holes himſelf, loſes three. 12. He who ſtrikes both balls over the table, loſes two. 13. He who ſtrikes his ball over the table, and does not hit his adverſary's ball, loſes three. 14. He who retains the end of his adverſary's ſtick when playing, or endeavours to baulk his ſtroke, loſes one. 15. He who plays another's ball on ſtroke without leave, loſes one. 16. He who takes up his ball, or his adverſary's without leave, loſes one. 17. He who ſtops either ball when running loſes one, and being near the hole loſes two. 18. He who blows upon the ball when running loſes one, and if near the hole loſes two. 19. He who ſhakes the table when the ball is running, loſes one. 20. He who ſtrikes the table with the ſtick, or plays before his turn, loſes one. 21. He who throws the ſtick upon the table, and hits the ball, loſes one. 22. If the ball ſtands upon the edge of the hole, and after being challenged it falls in, it is nothing, but muſt be put up where it was before. 23. If any perſon not being one of the players, ſtops a ball, the ball muſt ſtand in the place where it was ſtopped. 24. He who plays without a foot upon the floor and holes his adverſary's ball, gets nothing for it, but loſes the lead. 25. He who leaves the game before it is ended, loſes it. 26. Any perſon may change his ſtick in play. 27 If any difference ariſe between players, he who marks the game or the majority of the company muſt decide it. 28. Thoſe who do not play muſt ſtand from the table, and make room for the players. 29. If any perſon lays any wager, and does not play, he ſhall not give advice to the players upon the game.

Different kinds of games played at billiards.—Beſides the common winning game, which is twelve up, there are ſeveral other kinds of games, viz. the loſing-game, the winning and loſing, choice of balls, bricole, carambole, Ruſſian carambole, the bar-hole, the one-hole, the four game, and hazards.

The *loſing game*, is the common game nearly reverſed; that is to ſay, except hitting the balls, which is abſolutely neceſſary, the player gains by loſing. By putting himſelf in, he wins two; by putting his adverſary in, he loſes two; but if he pockets both balls, he gets four. This game depends greatly upon particular degrees of ſtrength, and is therefore very neceſſary to be known to play the winning game well.

The *winning and loſing game* is a combination of both games; that is to ſay, all balls that are put in by ſtriking firſt the adverſary's ball, reckon towards game; and holing both balls reckons four. At this game and the loſing, knocking over or forcing the balls over the cuſhion, goes for nothing, the ſtriker only loſes the lead.

Choice of balls, is chooſing each time which ball the player pleaſes, which is doubtleſs a great advantage, and is generally played againſt loſing and winning.

Bricole, is being obliged to hit a cuſhion, and make the ball rebound or return to hit the adverſary's ball, otherwiſe the player loſes a point. This is a great diſadvantage, and is reckoned between even players to be equal to receiving about eight or nine points.

Carambole, is a game not very long ſince introduced from France. It is played with three balls, one being red, which is neutral, and is placed upon a ſpot on a line with the ſtringing nail (*i. e.* that part of the table from whence the player ſtrikes his ball at firſt ſetting off, and which is generally marked with two braſs nails). Each antagoniſt at the firſt ſtroke of a hazard, plays from a mark which is upon a line with it at the other end of the table. The chief object at this game is, for the player to hit with his own ball the two other balls, which is called a *carambole*, and by which the player wins two. If he puts in the red ball he gets three, and when he holes his adverſary's ball he gets two; ſo that ſeven may be made at one ſtroke, by caramboling and putting in both balls. This game reſembles the loſing, depending chiefly upon particular ſtrengths, and is generally played with the cue. The game is ſixteen up; nevertheleſs it is reckoned to be ſooner over than the common game. The next object of this game, after making what we have diſtinguiſhed by the *carambole*, is the *baulk*; that is, making the white ball, and bringing the player's own ball and the red one below the ſtringing nail, from whence the adverſaries begin. By this means the opponent is obliged to play bricole from the oppoſite cuſhion, and it often happens that the game is determined by this ſituation.

The *Ruſſian carambole*, is a game that has ſtill more lately been introduced from abroad, and is played in the following manner: The red ball is placed as uſual on the ſpot made for that purpoſe; but the player, when he begins, or after having been holed, never places his ball on any particular place or ſpot; he being at liberty to put it where he pleaſes. When he begins to play, inſtead of ſtriking at the red ball, he leads his own gently behind it, and his antagoniſt is to play at which he thinks proper; if he plays at the red ball and holes it, he ſcores three as uſual towards the game, which is twenty-four inſtead of ſixteen points; and the red ball is put upon the ſpot again, at which he may ſtrike again or take his choice which of the two balls to puſh at, always following his ſtroke till both balls are off the table. He is entitled to two points each time that he caramboles, the ſame as at the other game; but if he caramboles and puts his own ball into any hole, he loſes as many as he might have got had he not holed himſelf: for example, if he ſtrikes at the red ball, which he holes, at the ſame time caramboles and holes himſelf, he loſes five points; and if he holes both balls when he caramboles, and likewiſe his own, he loſes ſeven, which he would have got if he had not holed his own ball. In other reſpects it is played like the common carambole game.

The *bar hole*, is ſo called from the hole being barred which the ball ſhould be played for, and the player ſtriking for another hole; when this game is played againſt the common game, the advantage for the latter, between equal players, is reckoned to be about ſix.

The player at the *one-hole*, though it ſeems to thoſe who are not judges of the game to be a great diſadvantage, has in fact the beſt of it; for as all balls that go into the one hole reckon, the player endeavours to lay his ball conſtantly before that hole, and his antagoniſt frequently finds it very difficult to keep one or other ball out, particularly on the leads, when the one hole player lays his ball (which he does as often as he can) on the brink of the hole; leading for that purpoſe from the oppoſite end, which in reality he has no right to do; for the lead

ſhould be given from the end of the table at which the hazard is made: but when a player happens to be a novice, this advantage is often taken.

The *four-game*, conſiſts of two partners on each ſide, at the common winning game; who play by ſucceſſion after each hazard, or two points loſt. The game is fifteen up; ſo that the point or hazard is an odd number, which makes a miſs at this game of more conſequence than it is at another; being as much at four, ſix, or eight, as it is at five, ſeven, or nine, at the ſingle game.

Hazards, are ſo called becauſe they depend entirely upon the making of hazards, there being no account kept of any game. Any number of perſons may play, by having balls that are numbered; but the number ſeldom exceeds ſix, to avoid confuſion. The perſon whoſe ball is put in, pays ſo much to the player according to what is agreed to be played for each hazard; and the perſon who miſſes, pays half the price of a hazard to him whoſe ball he played at. The only general rule is not to lay any ball a hazard for the next player, which may be in a great meaſure avoided, by always playing upon the next player, and either bringing him cloſe to the cuſhion or putting him at a diſtance from the reſt of the balls. The table, when hazards are played, is always paid for at the rate of ſo much an hour.

BILLINGHAM, a town of Northumberland in England, ſeated in W. long. 1. 35. N. lat. 55. 20.

BILLON, in the hiſtory of coins, a compoſition of precious and baſe metals, where the latter predominate. Wherefore gold under twelve carats fine, is called *billon of gold*; and ſilver under ſix penny-weights, *billon of ſilver*. So little attention was paid formerly to the purity of gold and ſilver, that the term *billon of gold* was applied only to that which was under twenty-one carats, and *billon of ſilver* to that which was lower than ten penny-weights.

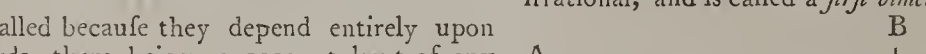
Billon, or Billom, a town in the department of Puy-de-Dome, and late province of Auvergne in France, ſituated in E. long. 3. 30. N. lat. 45. 36.

BILSDON, a ſmall town of Leiceſterſhire in England, ſituated in W. long. 0. 15. N. lat 52. 40.

BILSEN, a town of Germany, in the circle of Weſtphalia and biſhopric of Liege, ſeated on the river Demer, in E long. 5. 42. N. lat. 50. 48.

BILSON (Thomas), biſhop of Wincheſter, in which city he was born and educated. In 1565 he was admitted perpetual fellow of New College, and in 1570 completed his degrees in arts. He was made bachelor of divinity in 1579, and doctor the year following. His firſt preferment was that of maſter of Wincheſter ſchool; he was next made prebendary, and afterwards warden, of Wincheſter college. In 1596 he was conſecrated biſhop of Worceſter; and, about a year after, tranſlated to the ſee of Wincheſter, and ſworn of queen Elizabeth's privy council. He was one of the principal managers of the Hampton-court conference in 1604; and the Engliſh tranſlation of the Bible in the reign of king James I. was finally corrected by this prelate, and Dr. Miles Smith biſhop of Glouceſter. He died in the year 1616; and was buried in Weſtminſter abbey, near the entrance of St. Edmund's chapel, on the ſouth ſide of the monument of king Richard II. The ſeveral authors who have mentioned biſhop Bilſon, agree in giving him the character of a learned divine, an able civilian, and an upright man. His ſtyle is in general much more eaſy and harmonious than that of cotemporary eccleſiaſtics. His works are, 1. *Several Latin Poems and Orations*. Manuſcript, in Ant. Wood's library. 2. *The true difference between Chriſtian Subjection and Unchriſtian Rebellion*. Oxf. 1585, 4to. Lond. 1586, 8vo. 3. *The perpetual Government of Chriſt's Church*. Lond. 1593, 4to, Black Letter. 4. *The Effect of certain Sermons touching the full Redemption of Mankind by the Death and Blood of Chriſt*, &c. Lond. 1599, 4to. 5. *The Survey of Chriſt's Suffering for Man's Redemption, and of his Deſcent to Hades or Hell*. Lond. 1604, fol. 6. *A Sermon preached before King James* I. *and his Queen at their Coronation*. Lond. 1603, 8vo.

BIMEDIAL, in mathematics. If two medial lines, as AB and BC, commenſurable only in power, containing a rational rectangle, are compounded, the whole line AC will be irrational, and is called a *firſt bimedial line*.



See Euclid, lib. x. prop. 38.

BIMINI, one of the Lucaya iſlands in North America, near the channel of Bahama. It is about eight miles in length, and as much in breadth, covered with trees, and inhabited by the native Americans. It is very difficult of acceſs on account of the ſhoals, but is a very pleaſant place. W. long. 79. 30. N. lat. 25. 0.

BIMLIPATAN, a ſea-port town of Golconda in the Eaſt Indies, ſeated on the weſt ſide of the bay of Bengal. Here the Dutch have a very ſmall factory, deſigned for buying up the cloth manufactured by the inhabitants. E. long. 83. 5. N. lat. 18. 0.

BINAROS, a ſmall town of Spain, in the kingdom of Valentia, remarkable for good wine. It is ſeated near the ſea, in E. long. 0. 15. N. lat. 40. 24.

BINARY arithmetic, that wherein unity or 1 and 0 are only uſed. This was the invention of M. Leibnitz, who ſhows it to be very expeditious in diſcovering the properties of numbers, and in conſtructing tables: and Mr. Dangecourt, in the hiſtory of the Royal Academy of Sciences, gives a ſpecimen of it concerning arithmetical progreſſionals; where he ſhows, that becauſe in binary arithmetic only two characters are uſed, therefore the laws of progreſſion may be more eaſily diſcovered by it than by common arithmetic. All the characters uſed in binary arithmetic are 0 and 1; and the cypher multiplies every thing by 2, as in the common arithmetic by 10. Thus 1 is one; 10, two; 11, three; 100, four; 101, five; 110, ſix; 111, ſeven; 1000, eight; 1001, nine; 1010, ten; which is built on the ſame principles with common arithmetic. Hence immediately appears the reaſon of the celebrated property of the duplicate geometrical proportion in whole numbers; *viz.* that one number of each degree being had, we may thence compoſe all the other whole numbers above the double of the higheſt degree. It being here, e. g. as if one ſhould ſay, 111 is the ſum of 4, 2, and 1, which property may ſerve eſſayers to weigh all kinds of maſſes with a little weight; and may be uſed in coins, to give ſeveral values with ſmall pieces. This method of expreſſing numbers once eſtabliſhed, all the operations will be eaſy: in multiplication particularly, there will be no need for a table, or getting any thing by heart. The author, however, does not recommend this method for common uſe, becauſe of the great number of figures required to expreſs a number; adding, that if the common progreſſion were from 12 to 12, or from 10 to 16, it would be ſtill more expeditious; but its uſe is in diſcovering the properties of numbers, in conſtructing tables, &c. What makes the binary arithmetic the more remarkable is, that it appears to have been the ſame with that uſed 4000 years ago among the Chineſe, and left in *ænigma* by Fohi, the founder of their empire, as well as of their ſciences.

100	4
10	2
1	1
111	7

Binary *Meaſure*, in muſic, is a meaſure which is beaten equally, or where the time of riſing is equal to that of falling. This is uſually called *common time*.

Binary *Number*, that compoſed of two units.

BINCH, a ſmall fortified town of the Low Countries, in the county of Hainault, ſubject to the houſe of Auſtria. E. long. 3. 21. N. lat. 50. 23.

BIND, a country word for a ſtalk of hops.

Bind *of Eels*, a quantity, conſiſting of 250, or 10 ſtrikes, each containing 25 eels.

BIND-WEED, in botany. See Convolvulus.

BINDBROKE, a town of Lincolnſhire in England, ſeated in E. long. 0. 10. N. lat. 53. 32.

BINDING-JOISTS, in architecture, are thoſe joiſts in a floor, into which the trimmers of ſtair-caſes, or well-holes of the ſtairs, and chimney-ways, are framed: they ought to be ſtronger than common joiſts.

Binding, in the art of defence, a method of ſecuring or croſſing the adverſary's ſword with a preſſure, accompanied with a ſpring from the wriſt. See Beating. Unleſs a man, by ſome kind of croſs, ſecure, as it were, or render his adverſary's ſword incapable to offend him during the time of his performing a leſſon upon him, it is impoſſible for him to be certain but that he may receive from his adverſary, either a fortuitous *contretemps*, or an exchanged thruſt, before the recovery of his body, or going off after a thruſt. The great objection made by ſome people, particularly thoſe time-catchers, againſt the frequent uſe of binding, is, that when a man, in performing it, cleaves too much to his adverſary's ſword, he is liable to his adverſary's ſlipping of him, and conſequently of receiving either a plain thruſt, or one from a feint.

Binding is a term in falconry, which implies tiring, or when a hawk ſeizes.

Binding *of Books*. See Book-*Binding*.

BING, in the alum-works, denotes a heap of alum thrown together in order to drain.

BINGAZI, a ſea-port town of Africa, in the kingdom of Tripoli. E. long. 19. 10. N. lat. 32. 20.

BINGEN, an ancient and handſome town of Germany, in the archbiſhopric of Mentz, ſeated at the place where the river Nave falls into the Rhine. E. long. 7. 48. N. lat. 50. 3.

BINGHAM (Joseph), a learned divine, born at Wakefield in Yorkſhire, in September 1668, educated at Univerſity college in Oxford, and afterwards preſented by John Radcliffe, M. D. to the rectory of Headbournworthy, near Wincheſter. In this country retirement he began his learned and laborious work, *Origines Eccleſiaſticæ*; or, The Antiquities of the Chriſtian church. The firſt volume of this was publiſhed in 1708, and it was completed afterwards in nine volumes more. He publiſhed alſo ſeveral other books. But notwithſtanding his great learning and merit, he had no other preferment than that of Headbournworthy till the year 1712, when he was collated to the rectory of Hayant, near Portſmouth, by Sir Jonathan Trelawney biſhop of Wincheſter, to whom he dedicated ſeveral of his books. He died Auguſt 17th, 1723, in the 55th year of his age.

Bingham, a town of Nottinghamſhire in England, ſeated in the vale of Belvoir, in W. long. 1. 10. N. lat. 50. 3.

BINGLEY, a town in the weſt riding of Yorkſhire, ſeated on the river Aire, in W. long. 1. 35. N. lat. 53. 20.

BINN, *linna*, a ſort of cheſt or cupboard, wherein to lock up bread, meat, or other proviſions. The word is alſo uſed for a place boarded up to put corn in.

Binn, or Bin. The peaſe and oatmeal, uſed at ſea, are apt to ſpoil in caſks. Dr. Hales propoſes to prevent this, by putting them into large binns, with falſe bottoms of hair cloth laid on bars, whereby freſh air may be blown upwards through them, at proper times, with ſmall ventilators.

BINNACLE, a wooden caſe or box, which contains the compaſſes, log-glaſſes, watch-glaſſes, and lights to ſhow the compaſſes at night. See plate 60. As this is called *bittacle* in all the old ſea-books, even by mariners, it appears evidently to be derived from the French term *habitacle* (a ſmall habitation), which is now uſed for the ſame purpoſe by the ſeamen of that nation. The binnacle repreſented in the Plate, is furniſhed with three apartments, with ſliding ſhutters: the two ſide ones, *a*, *b*, have always a compaſs in each *d*, to direct the ſhip's way; while the middle diviſion, *c*, has a lamp or candle with a pane of glaſs on either ſide to throw a light upon the compaſs in the night. Hence the man who ſteers may obſerve it in the darkeſt weather, as it ſtands immediately before the helm on the quarter deck. There are always two binnacles on the deck of a ſhip of war, one being deſigned for the man who ſteers, and the other for the perſon who ſuperintends the ſteerage, whoſe office is called *conning*.

BINOCULAR telescope, a kind of dioptric teleſcope fitted with two tubes, joined in ſuch a manner that one may ſee a diſtant object with both eyes at the ſame time. See Optics.

BINOMIAL, a quantity conſiſting of two terms or members connected by the ſign + or −, viz, plus or minus; as $a + b$, or $3a - 2c$, or $a^2 + b$, or $a^2 - 2\sqrt{c}$, &c; denoting the ſum or the difference of the two terms. But the difference is alſo ſometimes named a *reſidual*, and by Euclid an *apotome*. The term binomial was firſt introduced by Robert Recorde; ſee his algebra, page 462.

Binomial *Line*, or *Surd*, is that in which at leaſt one of the parts is a ſurd. Euclid enumerates ſix kinds of binomial lines or ſurds, in the 10th book of his Elements, which are exactly ſimilar to the ſix reſiduals or apotomes there treated of alſo, and of which mention is made under the article Apotome. Thoſe apotomes, however, become binomials by only changing the ſign of the latter term from minus to plus, which therefore are as below.

Euclid's 6 *Binomial Lines.*

First binomial $3 + \sqrt{5}$,
2d binomial $\sqrt{18} + 4$,
3d binomial $\sqrt{24} + \sqrt{18}$,
4th binomial $4 + \sqrt{3}$,
5th binomial $\sqrt{6} + 2$,
6th binomial $\sqrt{6} + \sqrt{2}$.

To extract the Square Root of a Binomial, as of $a + \sqrt{b}$, or $\sqrt{c} + \sqrt{b}$. Various rules have been given for this purpoſe. The firſt is that of Lucas De Burgo, in his *Summa de Arith.* &c, which is this: When one part, as a, is rational, divide it into two parts ſuch, that their product may be equal to $\frac{1}{4}$th of the number under the radical b; then ſhall the ſum of the roots of thoſe parts be the root of the binomial ſought: or their difference is the root when the quantity is reſidual. That is, if $c + e = a$, and $ce = \frac{1}{4}b$; then is $\sqrt{c} + \sqrt{e} = \sqrt{a + \sqrt{b}}$ the root ſought. As if the binomial be $23 + \sqrt{448}$; then the parts of 23 are 16 and 7, and their product is 112, which is $\frac{1}{4}$th of 448; therefore the ſum of their roots $4 + \sqrt{7}$ is the root ſought of $23 + \sqrt{448}$.

De Burgo gives alſo another rule for the ſame extractions, which is this: The given binomial being, for example, $\sqrt{c} + \sqrt{b}$, its root will be $\sqrt{\frac{1}{2}\sqrt{c} + \frac{1}{2}\sqrt{c-b}} + \sqrt{\frac{1}{2}\sqrt{c} - \frac{1}{2}\sqrt{c-b}}$. —So in the foregoing example, $23 + \sqrt{448}$, here $\sqrt{c} = 23$, and $\sqrt{b} = \sqrt{448}$; hence $\frac{1}{2}\sqrt{c} = 11\frac{1}{2}$, and $\frac{1}{2}\sqrt{c-b} = \frac{1}{2}\sqrt{23^2 - 448} = \frac{1}{2}\sqrt{81} = 4\frac{1}{2}$;

therefore $\sqrt{\frac{1}{2}\sqrt{c} + \frac{1}{2}\sqrt{c-b}} = \sqrt{11\frac{1}{2} + 4\frac{1}{2}} = \sqrt{16} = 4$,

and $\sqrt{\frac{1}{2}\sqrt{c} - \frac{1}{2}\sqrt{c-b}} = \sqrt{11\frac{1}{2} - 4\frac{1}{2}} = \sqrt{7}$;

consequently $4 + \sqrt{7}$ is the root sought, as before. Again, if the binomial be $\sqrt{18} + \sqrt{10}$; here $c = 18$, and $b = 10$; therefore $\frac{1}{2}\sqrt{c} = \frac{1}{2}\sqrt{18} = \frac{3}{2}\sqrt{2}$, and $\frac{1}{2}\sqrt{c-b} = \frac{1}{2}\sqrt{8} = \sqrt{2}$; hence, $\sqrt{\frac{1}{2}\sqrt{c} + \frac{1}{2}\sqrt{c-b}} = \sqrt{\frac{3}{2}\sqrt{2} + \sqrt{2}} = \sqrt{\frac{5}{2}\sqrt{2}} = \sqrt[4]{\frac{25}{2}}$, and $\sqrt{\frac{1}{2}\sqrt{c} - \frac{1}{2}\sqrt{c-b}} = \sqrt{\frac{3}{2}\sqrt{2} - 2} = \sqrt{\frac{1}{2}\sqrt{2}} = \sqrt[4]{\frac{1}{2}}$; consequently $\sqrt[4]{\frac{25}{2}} + \sqrt[4]{\frac{1}{2}}$ or $\frac{\sqrt{5}+1}{\sqrt[4]{2}}$ is the root of $\sqrt{18} + \sqrt{10}$ sought. And this latter rule has been used by all other authors, down to the present time.

To extract the Cubic and other higher Roots of a Binomial. This is useful in resolving cubic and higher equations, and was introduced with the resolution of those equations by Tartalea and Cardan. The rules for such extractions are in great measure tentative; and some of the principal ones are the following.

Tartalea's Rule for the Cube Root of a Binomial $p + q$. This rule is given in his 9th book of Miscellaneous Questions, quest. 40; and it is made out from either of the terms, p or q, of the binomial, taken singly, in this manner: Separate either term, as p, into two such parts that the one of them may be a cubic number, and the other part divisible by 3 without a remainder; then the cube root of the said cubic part will be one term of the root, and the other term will be the square root of the quotient arising from dividing the aforesaid third part by the first term just found. So if p be divided into $r^3 + 3s$, then the root is $r + \sqrt{\frac{s}{r}}$. For example, to example, to extract the cube root of $\sqrt{108} + 10$. Suppose the part 10 be taken: this separates into the parts 1 and 9, the former of which is a cube, and the latter divisible by 3; that is $r^3 = 1$, and $3s = 9$; hence $r = 1$, and $s = 3$: consequently $r + \sqrt{\frac{s}{r}} = 1 + \sqrt{3}$ is the cubic root of $\sqrt{108} + 10$ sought. Again, to use the other term $\sqrt{108}$: this divides into $\sqrt{27} + \sqrt{27}$, of which the former is a cube, and the latter divisible by 3; that is, $r^3 = \sqrt{27}$, and $3s = \sqrt{27}$; therefore $r = \sqrt{3}$, and $s = \frac{1}{3}\sqrt{27} = \sqrt{3}$ also: hence $r + \sqrt{\frac{s}{r}} = \sqrt{3} + \sqrt{\frac{\sqrt{3}}{\sqrt{3}}} = \sqrt{3} + 1$ the cube root, the same as before.

Bombelli's Rule for the Cubic Root of the Binomial $a + \sqrt{-b}$. First find $\sqrt[3]{a^2 + b}$; then, by trials, search out a number c, and a square root $\sqrt{d}$, such that the sum of their squares $c^2 + d$ be $= \sqrt[3]{a^2 + b}$, and also $c^3 - 3cd$ be $= a$; then shall $c + \sqrt{-d}$ be the cube root of $a + \sqrt{-b}$ sought. For example, to find the cube root of $2 + \sqrt{-121}$: here $\sqrt[3]{a^2 + b} = \sqrt[3]{125} = 5$; then taking $c = 2$, and $d = 1$, it is $c^2 + d = 5 = \sqrt[3]{a^2 + b}$, and $c^3 - 3cd = 8 - 6 = 2 = a$, as it ought; therefore $2 + \sqrt{-1}$ is the cube root of $2 + \sqrt{-121}$ sought. Bombelli gave also a rule for the cube root of the binomial $a + \sqrt{b}$, but it is good for nothing.

Albert Gerard's Rule for the Cube Root of a Binomial. This is given in his *Invention Nouvelle en l'Algebre*, and is explained by him thus: Let $72 + \sqrt{5120}$ be the given binomial whose cubic root is sought.

The square of 72 the greater term is	5184
and of the less term is	5120
their difference	64
its cube root	4,

which 4 must be the difference between the squares of the two terms of the root sought; and as the rational part 72 of the given binomial is the greater term, therefore the rational part of the required root will be the greater part also; consequently the cubic root sought must be one of the binomials here set in the margin, where the difference of the squares of the terms is always 4, as required; and to find out which of them it must be, proceed thus: The first, $2 + \sqrt{0}$ must be rejected, because 1 term of it is 0 or nothing; also because 5 exceeds the cube root of 72, or $\sqrt{20}$ exceeds the cube root of $\sqrt{5120}$, therefore $5 + \sqrt{20}$, and all after it must be rejected too; so that the root must be either $3 + \sqrt{5}$ or $4 + \sqrt{12}$, if the given quantity has a binomial root: to know which of these is to be taken, it must be considered that the rational term of the root must measure the rational term given; and also the irrational term of the root must measure the irrational term given; then, on examination it is found that both 3 and 4 measure or divide the 72 without a remainder, but that only the $\sqrt{5}$, and not $\sqrt{12}$, measures $\sqrt{5120}$; consequently none but $3 + \sqrt{5}$ can be the cube root of the given quantity $72 + \sqrt{5120}$; which is found to answer, by cubing the said root $3 + \sqrt{5}$.

$2 + \sqrt{0}$
$3 + \sqrt{5}$
$4 + \sqrt{12}$
$5 + \sqrt{20}$

Dr. Wallis's Rule for the Cube Root of a Binomial $a \pm m\sqrt{b}$ or $a \pm m\sqrt{-b}$. In these forms the greatest rational part m is extracted out of the radical part, leaving only b the least radical part possible under the radical sign. He then observes that if the given quantity have a binomial root, it must be of this form $c \pm n\sqrt{b}$, with the same radical b. Then to find the value of c and n, he raises this root to the 3d power, which gives $c^3 + 3cn^2b \pm \overline{3c^2n + n^3b} \cdot \sqrt{b}$, which must be $= a \pm m\sqrt{b}$ the given quantity; hence putting the rational part of the one quantity equal to that of the other, and also the radical part of the one equal to that of the other, gives $c^3 + 3cn^2b = a$, and $3c^2n + n^3b = m$. Then assuming several values of n, from the last equation he finds the value of c; hence if these values of c and n, substituted in the first equation, make it just, they are right; but if not, another value of n is assumed, and so on, till the first equation hold true. And it is to be noted that n is always an integer or else the half of an integer. For example, if the cube root of $135 \pm \sqrt{1825}$ be required, or $135 \pm 78\sqrt{3}$; here $a = 135$, $m = 78$, and $b = 3$; hence $3c^2n + n^3b = m$ is $3c^2n + 3n^3 = 78$, or $c^2n + n^3 = 26$; then assuming $n = 1$, this last equation becomes $c^2 + 1 = 26$, from whence c is found $= 5$; which values of c and n being substituted in the first equation $c^3 + 3cn^2b = a$, makes $5^3 + 3 \cdot 5 \cdot 3 = 170$, but ought to be 135, shewing that c is too great, and consequently n taken too little. Let n therefore be assumed $= 2$, so shall $2c^2 + 8 = 26$, and $c = 3$; and the first equation becomes $3^3 + 3 \cdot 3 \cdot 2^2 \cdot 3 = 27 \cdot 5 = 135 = a$ as it ought, which shews that the true value of n is 2, and that of c is 3; hence then the cube root of $135 \pm 78\sqrt{3}$ or $c \pm n\sqrt{b}$ is $3 \pm 2\sqrt{3}$ or $3 \pm \sqrt{12}$. And in like manner is the process instituted when the number in the radical is negative, as the cube root of $81 \pm 30\sqrt{-3}$, which is $\frac{9}{2} \pm \frac{1}{2}\sqrt{-3}$.

Another rule for extracting the cube root of an imaginary binomial was also given by Demoivre, at the end of Saunderson's Algebra, by means of the trisection of an arc or angle.

Sir I. Newton's Rule for any Root of a Binomial $a \pm b$. In his Universal Arith. is given a rule for the square root of a binomial, which is the same as the 2d of Lucas de Burgo, before given; and also a general rule for any root of a binomial, which I have not met with elsewhere; and it is this: Of the given quantity $a \pm b$, let a be the greater term, and c the index of the root to be extracted. Seek the least number n whose power n^c can be divided by $aa - bb$ without a remainder, and let the quotient be q; Compute $\sqrt[c]{\overline{a + b} \cdot \sqrt{q}}$ in the nearest integer

number, which call r; divide $a\sqrt{q}$ by its greateſt rational diviſor, calling the quotient s; and let the neareſt integer number above $\frac{r+\frac{n}{r}}{2s}$ be t: ſo ſhall $\frac{ts \pm \sqrt{t^2s^2-n}}{\sqrt[2c]{q}}$ be the root ſought, if the root can be extracted. And this rule is demonſtrated by *s'Graveſande* in his commentary on Newton's Arithmetic. And many numeral examples, illuſtrating this rule, are given in s'Graveſande's Algebra, abovementioned, pa. 160, as alſo in Newton's Univerſ. Arith. pa. 53, 2d edit. and in Maclaurin's Algebra, pa. 118. Other rules may be found in Schooten's Commentary on the Geometry of Des Cartes, and elſewhere.

Impoſſible or *Imaginary* BINOMIAL, is a binomial which has one of its terms an impoſſible or an imaginary quantity; as $a + \sqrt{-b}$.

BINOMIAL *Curve*, is a curve whoſe ordinate is expreſſed by a binomial quantity; as the curve whoſe ordinate is $x^2 \times \overline{b+dx^c}^c$. Stirling, Method. Diff. pa. 58.

BINOMIAL *Theorem*, is uſed to denote the celebrated theorem given by Sir I. Newton for raiſing a binomial to any power, or for extracting any root of it by an approximating infinite ſeries. It was known by Stifelius, and others, about the beginning of the 16th century, how to raiſe the integral powers, not barely by a continued multiplication of the binomial given, but Stifelius formed alſo a table of numbers by a continued addition, which ſhewed by inſpection the coefficients of the terms of any power of the binomial, contained within the limits of the table; but ſtill they could not independent of a table, and of any of the lower powers, raiſe any power of a binomial at once, by determining its terms one from another only, viz, the 2d term from the 1ſt, the 3d from the 2d, and ſo on as far as we pleaſe, by a general rule; and much leſs could they extract general algebraic roots in infinite ſeries by any rule whatever.

For although the nature and conſtruction of that table, which is a table of figurate numbers, was ſo early known, and employed in the raiſing of powers, and the extracting the roots of pure numbers; yet it was only by raiſing the numbers one from another by continual additions, and then taking them from the table when wanted, till Mr. Briggs firſt pointed out the way of raiſing any line in the table by itſelf, without any of the preceding lines; and thus teaching to raiſe the terms of any power of a binomial, independent of any of the other powers; and ſo gave the ſubſtance of the binomial theorem in words, wanting only the algebraic notation in ſymbols; as is ſhewn at large at pa. 75 of the hiſtorical introduction to Dr. Hutton's Mathematical Tables. Whatever was known however of this matter, related only to pure or integral powers, no one before Newton having thought of extracting roots by infinite ſeries. He happily diſcovered that, by conſidering powers and roots in a continued ſeries, roots being as powers having fractional exponents, the ſame binomial ſeries would equally ſerve for them all, whether the index ſhould be fractional or integral, or whether the ſeries be finite or infinite. The truth of this method however was long known only by trial in particular caſes, and by induction from analogy; nor does it appear that even Newton himſelf ever attempted any direct proof of it: however, various demonſtrations of the theorem have ſince been given by the more modern mathematicians, ſome of which are by means of the doctrine of fluxions, and others, more legally, from the pure principles of algebra only: for a full account of which, ſee vol. i. pa. 71 &c, of Dr. Hutton's Mathematical Tracts.

This theorem was firſt diſcovered by Sir I. Newton in 1669, and ſent in a letter of June 13, 1676, to Mr. Oldenburgh, Secretary to the Royal Society, to be by him communicated to Mr. Leibnitz; and it was in this form:

$$\overline{p+pq}^{\frac{m}{n}} = p^{\frac{m}{n}} + \frac{m}{n}aq + \frac{m-n}{2n}bq + \frac{m-2n}{3n}cq + \frac{m-3n}{4n}dq +$$

&c: where $p + pq$ ſignifies the quantity whoſe root, or power, or root of any power, is to be found; p being the firſt term of that quantity; q the quotient of all the reſt of the terms divided by that firſt term; and $\frac{m}{n}$ the numeral index of the power or root of the quantity $p + pq$, whether it be integral or fractional, poſitive or negative; and laſtly, a, b, c, d, &c, are aſſumed to denote the ſeveral terms in their order as they are found, viz, $a =$ the firſt term $p^{\frac{m}{n}}$, $b =$ the 2d term $\frac{m}{n}aq$, $c =$ the 3d term $\frac{m-n}{2n}bq$, and ſo on. As Newton's general notation of indices was not commonly known, he takes this occaſion to explain it; and then he gives many examples of the application of this theorem, one of which is the following.

Ex. 1. To find the value of $\sqrt{c^2+x^2}$ or $\overline{c^2+x^2}^{\frac{1}{2}}$, that is, to extract the ſquare root of $c^2 + x^2$ in an infinite ſeries. Here $p = c^2$, $q = \frac{x^2}{c^2}$ $m = 1$, and $n = 2$; therefore

$$a = p^{\frac{m}{n}} = \overline{c^2}^{\frac{1}{2}} = c,\ b = \frac{m}{n}aq = \frac{x^2}{2c},\ c = \frac{m-n}{2n}bq = \frac{-x^4}{8c^3},\ \&c;$$

and therefore the root ſought is $c + \frac{x^2}{2c} - \frac{x^4}{8c^3} + \frac{x^6}{16c^5} - \frac{5x^8}{128c^7} +$ &c.

A variety of other examples are alſo given in the ſame place, by which it is ſhewn that the theorem is of univerſal application to all ſorts of quantities whatever.

This theorem is ſometimes repreſented in other forms, as

$$p^{\frac{m}{n}} \times : 1 + \frac{m}{n}q + \frac{m}{n}\cdot\frac{m-n}{2n}q^2 + \frac{m}{n}\cdot\frac{m-n}{2n}\cdot\frac{m-2n}{3n}q^3 + \&c;$$

which comes to the ſame thing. Or alſo thus:

$$p^{\frac{m}{n}} + \frac{m}{n}p^{\frac{m-n}{n}}r + \frac{m}{n}\cdot\frac{m-n}{2n}p^{\frac{m-2n}{n}}r^2 \&c;$$

where the binomial is $\overline{p+r^n}^{\frac{m}{n}}$.

In another letter to Mr. Oldenburgh, of Oct. 24, 1676, Newton explains the train of reaſoning by which he obtained the ſaid theorem, as follows: "In the beginning of my mathematical ſtudies, when I was peruſing the works of the celebrated Dr. Wallis (ſee his Arith. of Infinites, prop. 118, and 121, alſo his Algebra, chap. 82), and conſidering the ſeries by the interpolation of which he exhibits the area of the circle and hyperbola; for inſtance, in this ſeries of curves, whoſe common baſe or axis is x, and the ordinates reſpectively $\overline{1-xx}^{0}$, $\overline{1-xx}^{\frac{1}{2}}$, $\overline{1-xx}^{1}$, $\overline{1-xx}^{\frac{3}{2}}$, $\overline{1-xx}^{2}$, $\overline{1-xx}^{\frac{5}{2}}$, &c; I perceived that if the areas of the alternate curves, which are x,

$x - \frac{1}{3}x^3$,
$x - \frac{2}{3}x^3 + \frac{1}{5}x^5$,
$x - \frac{3}{3}x^3 + \frac{3}{5}x^5 - \frac{1}{7}x^7$,

&c; could be interpolated, we ſhould obtain the areas of the intermediate ones; the firſt of which, or $\overline{1-xx}^{\frac{1}{2}}$, is the area of the circle: now in order to this, it appeared that in all the ſeries the firſt term was x; that the 2d terms $\frac{0}{3}x^3$, $\frac{1}{3}x^3$, $\frac{2}{3}x^3$, $\frac{3}{3}x^3$, &c, were in arithmetical progreſſion; and conſequently that the firſt two terms of all the ſeries to be interpolated would be

$$x - \frac{\frac{1}{2}x^3}{3},\quad x - \frac{\frac{2}{2}x^3}{3},\quad x - \frac{\frac{3}{2}x^3}{3} \quad \&c.$$

"Now for the interpolation of the reſt, I conſidered that

the denominators 1, 3, 5, 7, &c, were in arithmetical progreſſion; and that therefore only the numeral coefficients of the numerators were to be inveſtigated. But theſe in the alternate areas, which are given, were the ſame with the figures of which the ſeveral powers of 11 conſiſt, viz, of 11^0, 11^1, 11^2, 11^3 &c; that is, the firſt 1,

the ſecond 1, 1
the third 1, 2, 1
the fourth 1, 3, 3, 1
the fifth 1, 4, 6, 4, 1
&c.

"I enquired therefore how, in theſe ſeries, the reſt of the terms may be derived from the firſt two being given; and I found that by putting m for the 2d figure or term, the reſt would be produced by the continued multiplication of the terms of this ſeries,

$$\frac{m-0}{1} \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4} \times \frac{m-4}{5} \text{ &c.}$$

"For inſtance, if the 2d term $m = 4$; then ſhall $4 \times \frac{m-1}{2}$, or 6, be the 3d term; and $6 \times \frac{m-2}{3}$, or 4, the 4th term; and $4 \times \frac{m-3}{4}$, or 1, the 5th term; and $1 \times \frac{m-4}{5}$, or 0, the 6th; which ſhews that in this caſe the ſeries terminates.

"This rule therefore I applied to the ſeries to be interpolated. And ſince, in the ſeries for the circle, the 2d term was $\frac{\frac{1}{2}x^3}{3}$ I put $m = \frac{1}{2}$, which produced the terms $\frac{1}{2} \times \frac{\frac{1}{2}-1}{2}$ or $-\frac{1}{8}$; $-\frac{1}{8} \times \frac{\frac{1}{2}-2}{3}$ or $+\frac{1}{16}$; $+\frac{1}{16} \times \frac{\frac{1}{2}-3}{4}$ or $-\frac{5}{128}$; and ſo on *ad infinitum*. And hence I found that the required area of the circular ſegment is

$$x - \frac{\frac{1}{2}x^3}{3} - \frac{\frac{1}{8}x^5}{5} - \frac{\frac{1}{16}x^7}{7} - \frac{\frac{5}{128}x^9}{9} - \text{ &c.}$$

"And in the ſame manner might be produced the interpolated areas of the other curves: as alſo the areas of the hyperbola and the other alternates in this ſeries

$$\overline{1+xx}^{\frac{0}{2}},\ \overline{1+xx}^{\frac{1}{2}},\ \overline{1+xx}^{\frac{2}{2}},\ \overline{1+xx}^{\frac{3}{2}},\ \text{&c.}$$

And in the ſame way alſo may other ſeries be interpolated, and that too if they ſhould be taken at the diſtance of two or more terms.

"This was the way then in which I firſt entered upon theſe ſpeculations; which I ſhould not have remembered, but that in turning over my papers a few weeks ſince, I chanced to caſt my eyes on thoſe relating to this matter.

"Having proceeded ſo far, I conſidered that the terms

$$\overline{1-xx}^{\frac{0}{2}},\ \overline{1-xx}^{\frac{2}{2}},\ \overline{1-xx}^{\frac{4}{2}},\ \overline{1-xx}^{\frac{6}{2}},\ \text{&c,}$$

that is, $1 - x^2$

$1 - 2x^2 + x^4$

$1 - 3x^2 + 3x^4 - x^6$, &c, might be interpolated in the ſame manner as the areas generated by them: and for this, nothing more was required but to omit the denominators 1, 3, 5, 7, &c, in the terms expreſſing the areas; that is, the coefficients of the terms of the quantity to be interpolated, $\overline{1-xx}^{\frac{1}{2}}$, or $\overline{1-xx}^{\frac{3}{2}}$, or generally $\overline{1-xx}^{m}$, will be produced by the continued multiplication of the terms of this ſeries

$$m \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4} \text{ &c.}$$

"Thus, for example, there would be found

$$\overline{1-xx}^{\frac{1}{2}} = 1 - \tfrac{1}{2}x^2 - \tfrac{1}{8}x^4 - \tfrac{1}{16}x^6 \text{ &c.}$$

$$\overline{1-xx}^{\frac{3}{2}} = 1 - \tfrac{3}{2}x^2 + \tfrac{3}{8}x^4 + \tfrac{1}{16}x^6 \text{ &c.}$$

$$\overline{1-xx}^{\frac{1}{3}} = 1 - \tfrac{1}{3}x^2 - \tfrac{1}{9}x^4 - \tfrac{5}{81}x^6 \text{ &c.}$$

"Thus then I diſcovered a general method of reducing radical quantities into infinite ſeries, by the theorem which I ſent in the beginning of the former letter, before I knew the ſame by the extraction of roots.

"But having diſcovered that way, this other could not long remain unknown: for, to prove the truth of thoſe operations, I multiplied $1 - \frac{1}{2}x^2 - \frac{1}{8}x^4 - \frac{1}{16}x^6$ &c, by itſelf, and the product is $1 - x^2$, all the reſt of the terms vaniſhing after theſe, *in infinitum*. In like manner, $1 - \frac{1}{3}x^2 - \frac{1}{9}x^4 - \frac{5}{81}x^6$ &c, twice multiplied by itſelf, produced $1 - x^2$. But as this was a certain proof of thoſe concluſions, ſo I was naturally led to try converſely whether theſe ſeries, which were thus known to be the roots of the quantity $1 - x^2$, could not be extracted out of it after the manner of arithmetic; and upon trial I found it to ſucceed. The proceſs for the ſquare root is here ſet down

$$\begin{array}{l|l} 1 - x^2 & 1 - \frac{1}{2}x^2 - \frac{1}{8}x^4 - \frac{1}{16}x^6 \text{ &c.} \\ 1 & \\ \hline 0 - x^2 & \\ \quad - x^2 + \frac{1}{4}x^4 & \\ \hline \quad - \frac{1}{4}x^4 & \\ \quad - \frac{1}{4}x^4 + \frac{1}{8}x^6 + \frac{1}{64}x^8 & \\ \hline \quad - \frac{1}{8}x^6 - \frac{1}{64}x^8 & \end{array}$$

"Theſe methods being found, I laid aſide the other way by interpolation of ſeries, and uſed theſe operations only as a more genuine foundation. Neither was I ignorant of the reduction by diviſion, which is ſo much eaſier." See Collins's *Commercium Epiſtolicum*.

And this is all the account that Newton gives of the invention of this theorem, which is engraved on his monument in Weſtminſter Abbey, as one of his greateſt diſcoveries.

BINTAN, an iſland of Aſia, in the Eaſt Indies, to the ſouth of the peninſula of Malacca, ſituated in E. long. 103. 50. N. lat. 1. 0.

BIOGRAPHER, one who writes the lives of particular perſons, as Plutarch, Suetonius, &c. See the next article.

BIOGRAPHY, a ſpecies of hiſtory which records the lives and characters of remarkable perſons. This is at once the moſt entertaining and inſtructive kind of hiſtory. It admits of all the painting and paſſion of romance; but with this capital difference, that our paſſions are more keenly intereſted, becauſe the characters and incidents are not only agreeable to nature, but ſtrictly true. No books are ſo proper to be put into the hands of young people, or are ſo likely to improve their morals, as thoſe of biography.

BION, a bucolic poet, native of Smyrna, lived at the ſame time with Ptolemy Philadelphus, whoſe reign laſted from the fourth year of the 123d Olympiad to the ſecond year of the 133d. He was an incomparable poet, if we may believe the lamentations of his diſciple Moſchus. His few pieces which are left do not contradict this teſtimony. See Moschus.

Bion, ſurnamed *Boryſthenites*, becauſe he was of Boryſthenes, was a philoſopher of a great deal of wit, but of very little re-

ligion: he flouriſhed about the 120th Olympiad; but falling ſick, he, like other profane perſons, became ſuperſtitious.

BIORNBURG, a town of North Finland in Sweden, ſeated on the river Kune near its mouth in the Gulf of Bothnia. E. long. 22. 35. N. lat. 62. 6.

BIOTHANATI (from *βια violence*, and *θανατος death*), in ſome medical writers, denotes thoſe who die a violent death. The word is alſo written, and with more propriety, *biathanati*; ſometimes *biæothanti*.

In a more particular ſenſe, it denotes thoſe who kill themſelves, more properly called *autothanati*. In this ſenſe it is that the word is uſed both by Greek and Latin writers. By the ancient diſcipline of the church, they were puniſhed by denying them burial, and refuſing all commemoration of them in the prayers and offices of the church.

Biothanati (ſuppoſed by ſome to be derived from *βιος life*, and *θανατος death*, and alluding to the belief of a future life after death), was alſo a name of reproach given by the Heathens to the primitive Chriſtians, for their conſtancy and forwardneſs to lay down their lives in martyrdom.

BIOTHANATOS is alſo uſed in ſome writers of the barbarous age for wicked, damnable, or accurſed.

BIOUAC, Bivouac, or Biovac, in the military art, a nightly guard performed by the whole army, when there is an apprehenſion of danger from the enemy. The word is formed by corruption from the German *weywaght*, a *double watch* or *guard*.

BIPARTIENT, is a number that divides another into two equal parts without a remainder. So 2 is a bipartient to 4, and 5 a bipartient to 10.

BIPENNIS, a two-edged axe, uſed anciently by the Amazons in fight; as alſo by the ſeamen, to cut aſunder the ropes and cordage of the enemy's veſſels. The bipennis was a weapon chiefly of the Oriental nations, made like a double axe, or two axes joined back to back, with a ſhort handle. Modern writers uſually compare it to our halbard or partizan; from which it differed in that it had no point, or that its ſhaft or handle was much ſhorter.

BIQUADRATE, or Biquadratic *Power*, is the ſquared ſquare, or 4th power of any number or quantity. Thus 16 is the biquadrate or 4th power of 2, or it is the ſquare of 4 which is the 2d power of 2.

Biquadratic *Root*, of any quantity, is the ſquare root of the ſquare root, or the 4th root of that quantity. So the biquadratic root of 16 is 2, and the biquadratic root of 81 is 3.

Biquadratic *Equation*, is that which riſes to 4 dimenſions, or in which the unknown quantity riſes to the 4th power; as $x^4 + ax^3 + lx^2 + cx + d = 0$.

Any biquadratic equation may be conceived to be generated or produced from the continual multiplication of four ſimple equations,

$$\text{as } \overline{x-p} \times \overline{x-q} \times \overline{x-r} \times \overline{x-s} = 0;$$

or from that of two quadratic equations,

$$\text{as } \overline{x^2+px+q} \times \overline{x^2+rx+s} = 0;$$

or, laſtly, from that of a cubic and a ſimple equation,

$$\text{as } \overline{x-p} \times \overline{x^3+qx^2+rx+s} = 0:$$

which was the invention of Harriot. And, on the contrary, a biquadratic equation may be reſolved into four ſimple equations, or into two quadratics, or into a cubic and a ſimple equation, having all the ſame roots with it.

1. *Ferrari's Method for Biquadratic Equations.*

The firſt reſolution of a biquadratic equation was given in Cardan's Algebra, chap. 39, being the invention of his pupil and friend Lewis Ferrari, about the year 1540. This is effected by means of a cubic equation, and is indeed a method of depreſſing the biquadratic equation to a cubic, which Cardan demonſtrates, and applies in a great variety of examples. The principle is very general, and conſiſts in completing one ſide of the equation up to a ſquare, by the help of ſome multiples or parts of its own terms, and an aſſumed unknown quantity; which it is always eaſy to do; and then the other ſide is made to be a ſquare alſo, by aſſuming the product of its 1ſt and 3d terms equal to the ſquare of half the 2d term; for it conſiſts only of three terms, or three different denominations of the original letter; then this equality will determine the value of the aſſumed quantity by a cubic equation: other circumſtances depend on the artiſt's judgment. But the method will be farther explained by the following examples, extracted from Cardan's book.

Ex. 1. Given $x^4 + 6x^2 + 36 = 60x$, to be reſolved. Add $6x^2$ to both ſides of the equation, ſo ſhall

$x^4 + 12x^2 + 36$ or $\overline{x^2+6}^2 = 6x^2 + 60x$.

Aſſume y, and add $x^2 + 6 \cdot 2y + y^2$ to both ſides, then is $\overline{x^2+6}^2 + \overline{x^2+6} \cdot 2y + y^2 = 6x^2 + 60x + \overline{x^2+6} \cdot 2y + y^2$, or $\overline{x^2+6+y}^2 = \overline{6+2y} \cdot x^2 + 60x + 12y + y^2$.

Make now the 1ſt × 3d term = ¼ ſq. 2d,

this gives $\overline{6+2y} \cdot \overline{12y+y^2} \cdot x^2 = 900x^2$,

or $y^3 + 15y^2 + 36y = 450$; and hence

$y = \sqrt[3]{287\frac{1}{2} + \sqrt{80449\frac{1}{4}}} + \sqrt[3]{287\frac{1}{2} - \sqrt{80449\frac{1}{4}}} - 5$.

From which x may be found by a quadratic equation.

Ex. 2. Given $x^4 = x + 2$.

Before applying Ferrari's method to this example, Cardan reſolves it by another way as follows: ſubtract 1,

then is $x^4 - 1 = x + 1$; divide by $x + 1$,

then is $x^3 - x^2 + x - 1 = 1$, or $x^3 + x = x^2 + 2$; and hence

$$x = \sqrt[3]{\sqrt{\frac{2241}{2916}} + \frac{47}{54}} - \sqrt[3]{\sqrt{\frac{2241}{2916}} - \frac{47}{54}} + \frac{1}{3}.$$

But to reſolve it by Ferrari's rule:

Becauſe $x^4 = x + 2$, therefore

$x^4 + 2yx^2 + y^2$ or $\overline{x^2+\ldots}^2 = 2yx^2 + x + \overline{2+y^2}$;

hence $2y^3 + 4y = \frac{1}{4}$, or $y^3 + 2y = \frac{1}{8}$; and the root is

$$y = \sqrt[3]{\sqrt{\frac{2075}{6912}} + \frac{1}{16}} - \sqrt[3]{\sqrt{\frac{2075}{6912}} - \frac{1}{16}}:$$

by means of which x is found by a quadratic equation.

Ex. 3. Given $x^4 + 32x^2 + 16 = 48x$.—Add 240, then $x^4 + 32x^2 + 256$ or $\overline{x^2+16}^2 = 48x + 240$; complete ſquare again, then

$\overline{x^2+16}^2 + 2y \cdot \overline{x^2+16} + y^2 = 2yx^2 + 48x + \overline{y^2+32y+240}$;

make the laſt ſide a ſq. by the rule, which gives

$y^3 + 32y^2 + 240y = 24 \times 12 = 288$.

Put now $z = y + 10\frac{2}{3}$, and the laſt transforms to $z^3 = 101\frac{1}{3}z + 420\frac{16}{27}$; then the value of z found from this, gives the value of y, and hence the value of x, as before.

2. *Des Cartes's Rule for Biquadratic Equations.*

Another ſolution was given of biquadratic equations by Des Cartes, in the 3d book of his Geometry. In this ſolution he reſolved the given biquadratic equation into two quadratics, by means of a cubic equation, in this manner: Firſt, let the 2d term or 3d power be taken away out of the equation, after which it will ſtand thus,

$x^4 + px^2 + qx + r = 0$. Find y in this cubic equation $y^6 + 2py^4 + \frac{+p^2}{-4r}\Big\} y^2 - q^2 = 0$;

and then the values of x in these two quadratics. $\left\{\begin{array}{l} x^2 - yx + \frac{1}{2}y^2 + \frac{1}{2}p + \frac{q}{2y} = 0, \\ x^2 + yx + \frac{1}{2}y^2 + \frac{1}{2}p - \frac{q}{2y} = 0; \end{array}\right.$

and these values of x will be the roots of the given biquadratic equation.

Ex. Let the equation be $x^4 - 17x^2 - 20x - 6 = 0$. Hence $p = -17$, $q = -20$, and $r = -6$; and the cubic equ. is $x^6 - 34y^4 + 313y^2 - 400 = 0$, the root of which is $y^2 = 16$, or $y = 4$; hence the two quadratics are $\left\{\begin{array}{l} x^2 - 4x - 3 = 0 \\ x^2 + 4x + 2 = 0, \end{array}\right.$ the four roots of which are $2 \pm \sqrt{7}$ and $-2 \pm \sqrt{2}$.

3. *Euler's Method for Biquadratic Equations.*

The celebrated Leonard Euler gave, in the 6th volume of the Petersburgh Ancient Commentaries, for the year 1738, an ingenious and general method of resolving equations of all degrees, by means of the equation of the next lower degree, and among them of the biquadratic equation by means of the cubic; and this last was also given more at large in his treatise of Algebra, translated from the German into French in 1774, in 2 volumes 8vo. The method is this: Let $x^4 - ax^2 - bx - c = 0$, be the given biquadratic equation, wanting the 2d term. Take $f = \frac{1}{2}a$, $g = \frac{1}{16}aa + \frac{1}{4}c$, and $h = \frac{1}{64}bb$; with which values of f, g, h, form the cubic equation $z^3 - fz^2 + gz - h = 0$. Find the three roots of this cubic equation, and let them be called p, q, r. Then shall the four roots of the proposed biquadratic be these following, viz,

When $\frac{1}{8}b$ is positive:	When $\frac{1}{8}b$ is negative:
1st. $\sqrt{p} + \sqrt{q} + \sqrt{r}$	$\sqrt{p} + \sqrt{q} - \sqrt{r}$,
2d. $\sqrt{p} + \sqrt{q} - \sqrt{r}$	$\sqrt{p} - \sqrt{q} + \sqrt{r}$,
3d. $\sqrt{p} - \sqrt{q} + \sqrt{r}$	$-\sqrt{p} + \sqrt{q} + \sqrt{r}$,
4th. $\sqrt{p} - \sqrt{q} - \sqrt{r}$	$-\sqrt{p} - \sqrt{q} - \sqrt{r}$,

Ex. Let the equation be $x^4 - 25x^2 + 60x - 36 = 0$. Here $a = 25$, $b = -60$, and $c = 36$; therefore $f = \frac{25}{2}$, $g = \frac{625}{16} + 9 = \frac{769}{16}$, and $h = \frac{225}{4}$. Conseq. the cubic equation will be

$$z^3 - \frac{25}{2}z^2 + \frac{769}{16}z - \frac{225}{4} = 0.$$

The three roots of which are

$$z = \frac{9}{4} = p, \text{ and } z = 4 = q, \text{ and } z = \frac{25}{4} = r;$$

the roots of which are $\sqrt{p} = \frac{3}{2}$, $\sqrt{q} = 2$ or $\frac{4}{2}$, $\sqrt{r} = \frac{5}{2}$. Hence, as the value of $\frac{1}{8}b$ is negative, the four roots are

1st. $x = \frac{3}{2} + \frac{4}{2} - \frac{5}{2} = 1$,
2d. $x = \frac{3}{2} - \frac{4}{2} + \frac{5}{2} = 2$,
3d. $x = -\frac{3}{2} + \frac{4}{2} + \frac{5}{2} = 3$,
4th. $x = -\frac{3}{2} - \frac{4}{2} - \frac{5}{2} = -6$.

4. *Simpson's Rule for Biquadratic Equations.*

Mr. Simpson gave also a general rule for the solution of biquadratic equations, in the 2d edit. of his Algebra, pa. 150, in which the given equation is also resolved by means of a cubic equation, as well as the two former ways; and it is investigated on the principle, that the given equation is equal to the difference between two squares; being indeed a kind of generalization of Ferrari's method.

Thus, he supposes the given equation, viz,

$x^4 + px^3 + qx^2 + rx + s = \overline{x^2 + \frac{1}{2}px + A}|^2 - \overline{Bx + C}|^2$;

then from a comparison of the like terms, the values of the assumed letters are found, and the final equation becomes

$$A^3 - \tfrac{1}{2}qA^2 + kA - \tfrac{1}{2}l = 0,$$

where $k = \frac{1}{4}pr - s$, and $l = \frac{1}{4}r^2 + s \cdot \overline{\frac{1}{4}p^2 - q}$.

The value of A being found in this cubic equation, from it will be had the values of B and C, which have these general values, viz, $B = \sqrt{2A + \frac{1}{4}p^2 - q}$ and $C = \frac{pA - r}{2B}$. Hence, finally, the root x will be obtained from the assumed equation $\overline{x^2 + \frac{1}{2}px + A}|^2 - \overline{Bx + C}|^2 = 0$, or $x^2 + \frac{1}{2}px + A = \pm Bx \pm C$, in four several values.

Ex. Given the equ. $x^4 - 6x^3 - 58x^2 - 114x - 11 = 0$. Here $p = -6$, $q = -58$, $r = -114$, and $s = -11$, whence

k or $\frac{1}{4}pr - s = 182$, l or $\frac{1}{4}r^2 + s \cdot \overline{\frac{1}{4}p^2 - q} = 2512$; and therefore the cubic equation becomes

$$A^3 + 29A^2 + 182A - 1256 = 0,$$

the root of which is $A = 4$.

Hence then B or $\sqrt{2A + \frac{1}{4}p^2 - q} = \sqrt{75}$, and C or $\frac{pA - r}{2B} = \sqrt{27}$:

and the quadratic equation becomes

$x^2 - 3x + 4 = \pm x\sqrt{75} \pm \sqrt{27}$, the four roots of which are $x = 1\frac{1}{2} \pm 2\frac{1}{2}\sqrt{3} + \sqrt{17 \pm 11\frac{1}{2}\sqrt{3}}$,

and $x = 1\frac{1}{2} \pm 2\frac{1}{2}\sqrt{3} - \sqrt{17 \pm 11\frac{1}{2}\sqrt{3}}$.

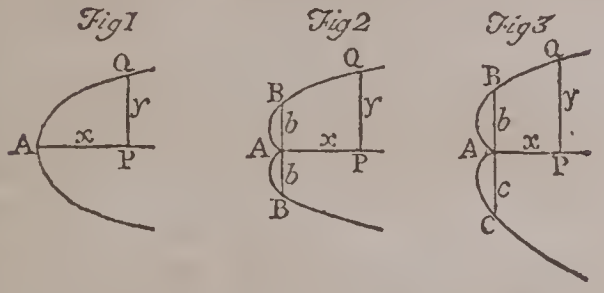
Mr. Simpson here subjoins an observation which it has since been found is erroneous, viz, that "The value of A, in this equation, will be *commensurate* and *rational* (and therefore the easier to be discovered), not only when all the roots of the given equation are *commensurate*, but when they are *irrational* and even *impossible*; as will appear from the examples subjoined." This is a strange reason for Simpson to give for the proof of a proposition; and it is wonderful that he fell upon no examples that disprove it, as the instances in which it holds true, are very few indeed, in comparison with the number of those in which it fails.

Note. In any biquadratic equation having all its terms, if $\frac{3}{8}$ of the square of the coefficient of the 2d term be greater than the product of the coefficients of the 1st and 3d terms, or $\frac{3}{8}$ of the square of the coefficient of the 4th term be greater than the product of the coefficients of the 3d and 5th terms, or $\frac{3}{8}$ of the square of the coefficient of the 3d term greater than the product of the coefficients of the 2d and 4th terms; then all the roots of that equation will be real and unequal; but if either of the said parts of those squares be less than either of those products, the equation will have imaginary roots.

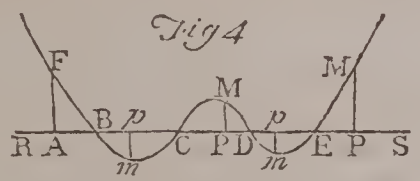
For the construction of biquadratic equations, see *Construction*. See also *Des Cartes's Geometry*, with the *Commentaries of Schooten* and others; *Baker's Geometrical Key*; *Slusius's Mesolabium*; *l'Hospital's Conic Sections*; *Wolfius's Elementa Matheseos*, &c.

Biquadratic *Parabola*, a curve of the 3d order, having two infinite legs, and expressed by one of these three equations, viz,

$a^3.x = y^4$, as in fig. 1,
$a^3x = y^4 - a^2y^2$, as in fig. 2,
$a^3x = y^4 - \overline{a + b}.y^3 - aby^2$, as in fig. 3;
where x = AP the abſciſs, y = PQ the ordinate, b = AB, c = AC, and a = a certain given quantity.

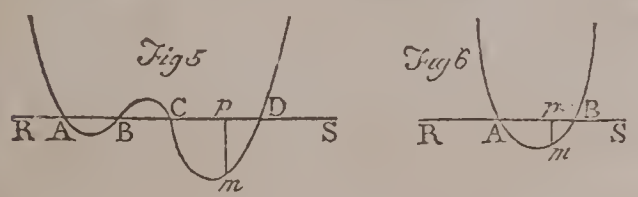


But the moſt general equation of this curve is the following, which belongs to fig. 4. viz,



$ay = x^4 + bx^3 + cx^2 + dx + e$;
where x = Ap or AP the abſciſs, and $-y$ or $+y$ is the ordinate pm or PM, alſo a, b, c, d, e, are conſtant quantities; the beginning of the abſciſs being at any point A in the indefinite line AP.

But if the beginning of the abſciſs A be where this line interſects the curve, as in fig. 5, then the nature of the curve will be defined by this equation $a \times pm$ = Ap × Bp × Cp × Dp, wherever the point p is taken in the infinite line RS.



When the curve has no ſerpentine part, as fig. 6, the equation is more ſimple, being in this caſe barely $a \times pm$ = Ap^2 × pB^2.

BIQUALAR, in the cuſtoms of the Algerines, a cook of the divan. The janizaries, whom the Algerines call *oldachis*, after ſerving a certain term as common ſoldiers, are preferred to be biqualars, or cooks of the divan, which is the firſt ſtep towards arriving at higher preferment. Biqualars have the care of furniſhing the officers and commanders of the Algerine ſoldiery with meat and drink in the camp, in garriſon, &c. From biqualars they are made odobachis; that is, corporals of companies, or commanders of ſquadrons.

BIQUINTILE, an aſpect of the planets, when they are 144 degrees diſtant from each other. It is thus called, becauſe they are diſtant from one another by twice the fifth part of 360 degrees.

BIR, or Berr, a town of the province of Diarbeck in Turkey in Aſia, with a caſtle where the governor reſides, ſeated on the eaſtern bank of the river Euphrates, near a high mountain in a very pleaſant and fertile country. E. long. 38. 6. N. lat. 36. 10.

BIRAGUE (Clement), a Milaneſe engraver, and the inventor of the art of cutting diamonds. He is ſaid to have flouriſhed about the year 1580.

BIRCH-tree, in botany. See Betula.

Birch-*Bark*, being bituminous, and of a fragrant ſmell, is uſed in fumigations to correct the air when foul or infected. The inner ſilken bark was anciently uſed for writing-tables before the invention of paper; though Ray rather aſſigns the office of paper to its cuticle, or outer ſkin, which peels off yearly. And with the outward, thicker, and coarſer part, are houſes in Ruſſia, Poland, and other northern countries, covered inſtead of ſlates or tiles. The Indians make pinnaces with white cedar, which they cover with large flakes of birch-bark; ſewing them with thread of ſpruce-roots, and pitching them, as the ancient Britons did with the willow. Pliny ſpeaks of a bitumen actually procured from the birch-tree.

Fungus of Birch, an excreſcence growing on its trunk. It is aſtringent, and for that reaſon good againſt hemorrhages. When boiled, beaten, and dried in an oven, it makes excellent touchwood.

Birch-*Leaves* are of uſe in the dropſy, itch, &c. either internally or externally applied.

Birch-*Twigs* ſerve to make rods and brooms: ſmeared with bird-lime, they are uſed by fowlers. Of theſe alſo were compoſed the ancient faſces carried by lictors.

Birch-*Wine* is made by fermenting the vernal juice as we would ferment the juice of any kind of fruit of which we deſigned to make wine. Formerly it was in great repute in all nephritic diſorders, but it is left out of modern practice. The preparation of birch-wine is amply deſcribed in a book intitled *Vinetum Britannicum*.

BIRCH (Dr. Thomas), an eminent hiſtorical and biographical writer, was born in London in 1705. His parents were both of them quakers; and his father, Joſeph Birch, was a coffee-mill maker by trade. Thomas being put to ſchool, was indefatigable in his application, and ſtole many hours from ſleep to increaſe his ſtock of knowledge. By this unremitting diligence, though he had not the happineſs of an univerſity education, he ſoon became qualified to take holy orders in the church of England, to the ſurpriſe of his acquaintance. In 1728 he married the daughter of the Rev. Mr. Cox, to whom he was curate: but his felicity was of ſhort duration, Mrs. Birch dying of a puerperal fever in leſs than 12 months after their marriage; an event which he deplores in a very elegant and pathetic poem, preſerved in Nichols's Collection. In 1732 he was recommended to the friendſhip and favour of the late lord high chancellor Hardwicke, then attorney-general; to which noble peer, and to the preſent Earl of Hardwicke, he was indebted for all his preferments. The firſt proof he experienced of his patron's regard was the living of Ulting in the county of Eſſex, in the gift of the crown, to which he was preſented 1732. In 1734 he was appointed one of the domeſtic chaplains to the unfortunate Earl of Kilmarnock, who was beheaded 1746. Mr. Birch was choſen a member of the Royal Society, Feb. 20, 1734-5; and of the Society of Antiquaries, Dec. 11, 1735, of which he afterwards became director till his death. Before this, the Mariſchal college of Aberdeen had conferred on him, by diploma, the degree of Maſter of Arts. In 1743, by the intereſt of Lord Hardwicke, he was preſented by the crown to the ſinecure rectory of Landewy Welfrey in the county of Pembroke; and in 1743-4 was preferred, in the ſame manner, to the rectory of Sidington St. Peter's, in the county and dioceſe of Glouceſter. We find no traces of his having taken poſſeſſion

of this living; and indeed it is probable that he quitted it immediately for one more ſuitable to his inclinations and to his literary engagements, which required his almoſt conſtant reſidence in town; for on the 24th of February 1743-4, he was inſtituted to the united rectories of St. Michael Woodſtreet and St. Mary Staining; and in 1745-6, to the united rectories of St. Margaret Pattens and St. Gabriel, Fenchurch-ſtreet (by lord chancellor Hardwicke, in whoſe turn the preſentation then was). In January 1752, he was elected one of the ſecretaries of the Royal Society, in the room of Dr. Cromwell Mortimer, deceaſed. In January 1753, the Mariſchal college of Aberdeen created him Doctor of Divinity; and in that year the ſame degree was conferred on him by Archbiſhop Herring. He was one of the truſtees of the Britiſh Muſeum; for which honour he was probably indebted to the preſent Earl of Hardwicke, as he was for his laſt preferment, the rectory of Depden in Eſſex, to which he was inducted Feb. 26, 1761. In the latter part of his life he was chaplain to the Princeſs Amelia. In 1765 he reſigned his office of ſecretary to the Royal Society, and was ſucceeded by Dr. Morton. His health declining about this time, he was ordered to ride for the recovery of it; but being a bad horſeman, and going out Jan. 9, 1766, he was unfortunately thrown from his horſe, on the road betwixt London and Hampſtead, and died on the ſpot, in the 61ſt year of his age, to the great regret of the Doctor's numerous literary friends; and was buried in St. Margaret Pattens. Dr. Birch had in his lifetime been very generous to his relations; and none that were nearly allied to him being living at his deceaſe, he bequeathed his library of books and manuſcripts, with his pictures painted in 1735, and all his other pictures and prints not otherwiſe diſpoſed of by his will, to the Britiſh Muſeum. He likewiſe left the remainder of his fortune, which amounted to not much more than 500l. to be laid out in government-ſecurities, for the purpoſe of applying the intereſt to increaſe the ſtipend of the three aſſiſtant librarians: thus manifeſting at his death, as he had done during his whole life, his reſpect for literature, and his deſire to promote uſeful knowledge. To the Royal Society he bequeathed his picture painted by Wills in 1737, being the original of the mezzotinto print done by Fauber in 1741. His principal publications were, 1. "The General Dictionary, Hiſtorical and Critical;" including a new tranſlation of Mr. Bayle, and interſperſed with ſeveral thouſand new lives. Dr. Birch's aſſociates in this undertaking were, the Rev. John Peter Bernard, Mr. John Lockman, and Mr. George Sale. The whole deſign was completed in 10 volumes folio. 2. Dr. Cudworth's "Intellectual Syſtem (improved from the Latin edition of Moſheim), his Diſcourſe on the true Notion of the Lord's Supper, and two Sermons, with an Account of his Life and Writings," 2 vols 4to, 1743. 3. "The Life of the Hon. Robert Boyle," 1744; prefixed to an edition of that excellent philoſopher's works, reviſed by Dr. Birch. 4. "The Lives of Illuſtrious Perſons of Great Britain," annexed to the engravings of Houbraken and Vertue, 1747—1752. 5. "An Inquiry into the Share which King Charles I. had in the Tranſactions of the Earl of Glamorgan," 1747, 8vo. 6. An edition of "Spenſer's Fairy Queen, 1751," 3 vols quarto, with prints from deſigns by Kent. 7. "The Miſcellaneous Works of Sir Walter Raleigh;" to which was prefixed the Life of that great, unfortunate, and injured man; 1751, 2 vols 8vo. 8. "The Theological, Moral, Dramatic, and Poetical Works of Mrs. Catharine Cockburn; with an Account of the Life of that very ingenious Lady," 1751, 2 vols 8vo. 9. "The Life of the Moſt Reverend Dr. John Tillotſon, Lord Archbiſhop of Canterbury. Compiled chiefly from his original Papers and Letters," 1752, 8vo. 10. "Milton's Proſe Works," 1753, 2 vols 4to; with a new Life of that great poet and writer. 11. "Memoirs of the Reign of Queen Elizabeth, from the year 1581 till her death; in which the ſecret intrigues of her court, and the conduct of her favourite Robert Earl of Eſſex, both at home and abroad, are particularly illuſtrated. From the original papers of his intimate friend Anthony Bacon, Eſq; and other manuſcripts never before publiſhed," 1754, 2 vols 4to. 12. "The Hiſtory of the Royal Society of London for improving natural knowledge, from its firſt riſe. In which the moſt conſiderable of thoſe papers communicated to the Society, which have hitherto not been publiſhed, are inſerted in their proper order, as a ſupplement to the Philoſophical Tranſactions," 1756 and 1757, 4 vols 4to. 13. "The Life of Henry Prince of Wales, eldeſt Son of King James I. compiled chiefly from his own papers and other manuſcripts never before publiſhed," 1760, 8vo. His numerous communications to the Royal Society may be ſeen in the Philoſophical Tranſactions; and his poetical talents are evident from the verſes of which we have already made mention.

BIRD (William), an eminent muſician and compoſer, was one of the children of the chapel in the reign of Edward VI. and, as it is aſſerted by Wood in the Aſhmolean MS. was bred up under Tallis. It appears, that in 1575 Tallis and Bird were both gentlemen and alſo organiſts of the royal chapel; but the time of their appointment to this latter office cannot now be aſcertained with any exactneſs. The compoſitions of Bird are many and various; thoſe of his younger years were moſtly for the ſervice of the church. He compoſed a work intitled *Sacrarum Cantionum, quinque vocum*, printed in 1589; among which is that noble compoſition *Civitas ſancti tui*, which for many years paſt has been ſung in the church as an anthem to the words "Bow thine ear, O Lord! He was alſo the author of a work intitled *Grudualia, ac Cantiones ſacræ, quinis, quaternis, triniſque vocibus concinnatæ, lib. primus*. Of this there are two editions, the later publiſhed in 1610. Although it appears by theſe his works that Bird was in the ſtricteſt ſenſe a church muſician, he occaſionally gave to the world compoſitions of a ſecular kind: and he ſeems to be the firſt among Engliſh muſicians that ever made an eſſay in the compoſition of that elegant ſpecies of vocal harmony, the madrigal; the *La Verginella* of Arioſto, which he ſet in that form for five voices, being the moſt ancient muſical compoſition of the kind to be met with in the works of Engliſh authors. Of his compoſitions for private entertainment, there are extant, 'Songs of fundry natures, ſome of gravitie, and others of myrth, fit for all companies and voyces, printed in 1589;' and two other collections of the ſame kind, the laſt of them printed in 1611. But the moſt permanent memorials of Bird's excellencies are his motets and anthems; to which may be added, a fine ſervice in the key of D with the minor third, the firſt compoſition in Dr. Boyce's Cathedral Muſic, vol. iii. and that well-known canon of his, *Non nobis, Domine*. Beſides his ſalaries and other emoluments of his profeſſion, it is to be ſuppoſed that Bird derived ſome advantages from the patent granted by queen Elizabeth to Tallis and him, for the ſole printing of muſic and muſic-paper; Dr. Ward ſpeaks of a book which he had ſeen with the letters T. E. for Thomas Eaſt, Eſt, or Eſte, who printed muſic under that patent. Tallis dying in 1585, the patent by the terms of it ſurvived to Bird, who, no doubt for a valuable conſideration, permitted Eaſt to exerciſe the right of printing under the protection of it; and he in the title-page of moſt of his publications ſtyles himſelf the *aſſignee of William Bird*. Bird died in 1623.

BIRD, in zoology. See Zoology; Comparative-*Anatomy*; and Ornithology.

Beam-Bird, or *Petty-chaps*.	See	Motacilla.
Black-Bird.	See	Turdus.
Blue-Bird.	See	Motacilla.
Call-Bird.	See	Bird-*Catching*.
Canary-Bird.	See	Fringilla.
Dung-Bird.	See	Upupa.
Humming-Bird.	See	Trochillus.
Mocking-Bird.	See	Turdus.
Bird *of Paradise*.	See	Paradisea.

Bird *Call*, a little ſtick cleft at one end, in which is put a leaf of ſome plant, wherewith to counterfeit the cryer's call of ſeveral birds, and bring them to the net, or ſnare, or lime-twig, to be taken. A laurel-leaf fitted on the bird-call, counterfeits the voice of lapwings; a leek that of nightingales, &c.

Bird-*Catching*, the art of taking birds or wild-fowl, whether for food, for the pleaſure of their ſong, or for their deſtruction as pernicious to the huſbandman, &c. The methods are by bird-lime, nets, decoys, &c. See the articles Bird-*Lime* and Decoy.

In the ſuburbs of London, there are many perſons, who, for want of better employment during the months of October and March, get their livelihood by a method of *bird-catching*, which is totally unknown in other parts of Great Britain. This method of bird-catching muſt have been long practiſed, as it is brought to a moſt ſyſtematical perfection, and is attended with a very conſiderable expence. The nets are a moſt ingenious piece of mechaniſm; generally twelve yards and a half long, and two yards and a half wide; and no one, on bare inſpection, would imagine that a bird (who is ſo very quick in all its motions) could be caught by the nets flapping over each other; till he becomes an eye-witneſs of the puller's ſucceſs.

The wild birds *fly*, as the bird-catchers term it, chiefly during the month of October, and part of September and November; as the flight in March is much leſs conſiderable than that of Michaelmas. It is to be noted alſo, that the ſeveral ſpecies of birds of *flight* do not make their appearance preciſely at the ſame time, during the months of September, October, and November. The pippet, which is a ſmall ſpecies of lark, for example, begins to fly about Michaelmas; and then the woodlark, linnet, goldfinch, chaffinch, greenfinch, and other birds of flight ſucceed; none of which are eaſily to be caught in any great number at any other time; but more particularly the pippet and the woodlark.

Theſe birds, during the Michaelmas and March flights, are chiefly on the wing from day-break to noon, though there is afterwards a ſmall flight from two till night: this however is ſo inconſiderable, that the bird-catchers always take up their nets at noon. It well deſerves the attention of the naturaliſt to enquire whence theſe periodical flights of certain birds can ariſe. As the ground, however, is ploughed during the months of October and March for ſowing the winter and lent corn, it ſhould ſeem that they are thus ſupplied with a great profuſion both of ſeeds and inſects, which they cannot ſo eaſily procure at any other ſeaſon.

As theſe birds fly always againſt the wind, there is great contention amongſt the bird catchers who ſhall gain that point; if, for example, it be weſterly, the bird catcher, who lays his nets moſt to the eaſt, is ſure almoſt of catching every thing, provided his call-birds are good. On theſe occaſions, a gentle wind to the ſouth-weſt generally produces the beſt ſport.

The bird-catcher, who is a ſubſtantial man, and has a proper apparatus for this purpoſe, generally carries with him five or ſix linnets (of which more are caught than any other kind of ſinging bird), two gold-finches, two green finches, one wood-lark, one red-poll, a yellow-hammer, tit-lark, and aberdavine, and perhaps a bull-finch; theſe are placed at ſmall diſtances from the nets in little cages. He has, beſides, what are called *flur birds*, which are placed within the nets, are raiſed upon the flur *, and gently let down at the time the wild bird approaches them. Theſe generally conſiſt of the linnet, the gold-finch, and the green-finch, which are ſecured to the flur by what is called a *brace* †; a contrivance that ſecures the birds without doing any injury to their plumage.

As it is known there is a ſuperiority between one bird and another, from the one being more in ſong than the other; the bird-catchers contrive that their call-birds ſhall moult before the uſual time. They therefore, in June or July, put them into a cloſe box under two or three folds of blankets, and leave their dung in the cage to raiſe a greater heat; in which ſtate they continue, being perhaps examined but once a-week to have freſh water. As for food, the air is ſo putrid, that they eat little during the whole ſtate of confinement, which laſts about a month. The birds frequently die under this operation; and hence the value of a ſtopped bird riſes greatly. When the bird has thus prematurely moulted, he is in ſong whilſt the wild birds are out of ſong, and his note is louder and more piercing than that of a wild one; but it is not only in his note he receives an alteration, the plumage is equally improved. The black and yellow in the wings of the gold-finch, for example, become deeper and more vivid, together with a moſt beautiful gloſs, which is not to be ſeen in the wild bird. The bill, which in the latter is likewiſe black at the end, in the ſtopped-bird becomes white and more taper, as do its legs: in ſhort, there is as much difference between a wild and a ſtopped bird, as there is between a horſe which is kept in body-clothes and one at graſs.

When the bird-catcher has laid his nets, he diſpoſes of his call-birds at proper intervals. It muſt be owned, their ſight and hearing infinitely excel thoſe of the bird-catcher. The inſtant that the ‡ wild birds are perceived, notice is given by one to the reſt of the call-birds, as it is by the firſt hound that hits on the ſcent to the reſt of the pack; after which, follows the ſame ſort of tumultuous ecſtacy and joy. The call-birds, while the bird is at a diſtance, do not ſing as a bird does in a chamber; they invite the wild ones by what the bird catchers call *ſhort jerks*, which, when the birds are good, may be heard at a great diſtance. The aſcendency by this call or invitation is ſo great, that the wild bird is ſtopped in its courſe of flight; and, if not already acquainted with the nets §, lights boldly within 20 yards of perhaps three or four bird-catchers, on a ſpot which otherwiſe it would not have taken the leaſt notice of. Nay, it frequently happens, that if half a flock only are caught, the remaining half will immediately afterwards light in the nets, and ſhare the ſame fate; and ſhould only one bird

* A moveable perch to which the bird is tied, and which the bird-catcher can raiſe at pleaſure by means of a long ſtring faſtened to it.

† A ſort of bandage, formed of a ſlender ſilken ſtring that is faſtened round the bird's body, and under the wings, in ſo artful a manner as to hinder the bird from being hurt, let it flutter ever ſo much in the raiſing.

‡ It may alſo be obſerved, that the moment they ſee a hawk, they communicate the alarm to each other by a plaintive note; nor will they then jerk or call though the wild birds are near.

§ A bird, acquainted with the nets, is by the bird-catchers termed a *ſharper*; which they endeavour to drive away, as they can have no ſport whilſt it continues near them.

eſcape, that bird will ſuffer itſelf to be pulled at till it is caught; ſo faſcinating a power have the call-birds.

The nightingale is not a bird of flight, in the ſenſe the bird-catchers uſe this term. Like the robin, wren, and many other ſinging birds, it only moves from hedge to hedge, and does not take the periodical flights in October and March. The perſons who catch theſe birds, make uſe of ſmall trap-nets, without call-birds; and are conſidered as inferior in dignity to other bird-catchers who will not rank with them. The arrival of the nightingale is expected by the trappers in the neighbourhood of London, the firſt week in April: at the beginning, none but cocks are taken; but in a few days the hens make their appearance, generally by themſelves, though ſometimes a few males come along with them. The latter are diſtinguiſhed from the females not only by their ſuperior ſize, but by a great ſwelling of their vent, which commences on the firſt arrival of the hens. They are caught in a net-trap, the bottom of which is ſurrounded with an iron ring; the net itſelf is rather larger than a cabbage net. When the trappers hear or ſee them, they ſtrew ſome freſh mould under the place, and bait the trap with a meal-worm from the baker's ſhop. Ten or a dozen nightingales have been thus caught in the courſe of a day.

The common way of taking larks, of which ſo many are uſed at our tables, is in the night, with thoſe nets which are called *trammels*. Theſe are uſually made of 36 yards in length, and about ſix yards over, with ſix ribs of pack-thread, which at the ends are put upon two poles of about 16 feet long, and made leſs at each end. Theſe are to be drawn over the ground by two men, and every five or ſix ſteps the net is made to touch the ground, otherwiſe it will paſs over the birds without touching them, and they will eſcape. When they are felt to fly up againſt the net, it is clapped down, and then all are ſafe that are under it. The darkeſt nights are propereſt for this ſport; and the net will not only take larks, but all other birds that rooſt on the ground; among which are woodcocks, ſnipes, partridges, quails, field-fares, and ſeveral others. In the depth of winter people ſometimes take great numbers of larks by nooſes of horſe-hair. The method is this: Take 100 or 200 yards of packthread; faſten at every ſix inches a nooſe made of double horſe-hair; at every 20 yards the line is to be pegged down to the ground, and ſo left ready to take them. The time to uſe this is when the ground is covered with ſnow, and the larks are to be allured to it by ſome white oats ſcattered all the way among the nooſes. They muſt be taken away as ſoon as three or four are hung, otherwiſe the reſt will be frighted; but though the others are ſcared away juſt where the ſportſman comes, they will be feeding at the other end of the line, and the ſport may be thus continued for a long time.—Thoſe caught in the day are taken in clap-nets of fifteen yards long, and two and a half in breadth; and are enticed within their reach by means of bits of looking-glaſs, fixed in a piece of wood, and placed in the middle of the nets, which are put in a quick whirling motion by a ſtring the larker commands; he alſo makes uſe of a decoy-lark. Theſe nets are uſed only till the 14th November: for the larks will not *dare*, or frolic in the air, except in fine ſunny weather; and of courſe cannot be inveigled into the ſnare. When the weather grows gloomy, the larker changes his engine, and makes uſe of a trammel net, twenty ſeven or twenty-eight feet long, and five broad; which is put on two poles, eighteen feet long, and carried by men under each arm, who paſs over the fields and quarter the ground as a ſetting dog: when they hear or feel a lark hit the net, they drop it down, and by that means the birds are ſecured.

The inhabitants of each cluſter of the Orkney Iſles ſeed principally during the ſeaſon on the eggs of the birds of the cliffs. The method of taking them is ſo very hazardous, as to demonſtrate the extremities to which the poor are occaſionally driven for want of food. Copinſha, Hunda, Hoy, Foula, and Noſs-head, are the moſt celebrated rocks; and the neighbouring natives the moſt expert climbers and adventurers after the game of the precipice. The height of ſome is above fifty fathoms; their faces roughened with ſhelves or ledges ſufficient only for the birds to reſt and lay their eggs on. To theſe the dauntleſs fowlers will aſcend, paſs intrepidly from the one to the other, collect the eggs and birds, and deſcend with the ſame indifference. In moſt places the attempt is made from above: they are lowered from the ſlope contiguous to the brink, by a rope, ſometimes made of ſtraw, ſometimes of the briſtles of the hog: they prefer the laſt even to ropes of hemp, as it is not liable to be cut by the ſharpneſs of the rocks; the former is apt to untwiſt. They truſt themſelves to a ſingle aſſiſtant, who lets his companion down, and holds the rope, depending on his ſtrength alone; which often fails, and the adventurer is ſure to be daſhed to pieces, or drowned in the ſubjacent ſea. The rope is often ſhifted from place to place, with the impending weight of the fowler and his booty. The perſon above receives ſignals for the purpoſe, his aſſociate being far out of ſight; who, during the operation, by help of a ſtaff, ſprings from the face of the rocks, to avoid injury from the projecting parts. See Plate 48.

But the moſt ſingular ſpecies of bird-catching is on the holm of Noſs, a vaſt rock ſevered from the iſle of Noſs by ſome unknown convulſion, and only about ſixteen fathoms diſtant. It is of the ſame ſtupendous height as the oppoſite precipice, with a raging ſea between; ſo that the intervening chaſm is of matchleſs horror. Some adventurous climber has reached the rock in a boat, gained the height, and faſtened ſeveral ſtakes on the ſmall portion of earth which is to be found on the top; correſpondent ſtakes are placed on the edge of the correſpondent cliffs. A rope is fixed to the ſtakes on both ſides, along which a machine, called a cradle, is contrived to ſlide; and, by the help of a ſmall parallel cord faſtened in like manner, the adventurer waſts himſelf over, and returns with his booty.

The manner by which bird-catching in the Feroe iſlands is performed is ſo very ſtrange and hazardous, that we ſhould by no means omit to deſcribe it. Neceſſity compels mankind to wonderful attempts. The cliffs which contain the objects of their ſearch are often two hundred fathoms in height, and are attempted from above and below. In the firſt caſe, the fowlers provide themſelves with a rope 80 or 100 fathoms in length. The fowler faſtens one end about his waiſt and between his legs, recommends himſelf to the protection of the Almighty, and is lowered down by ſix others, who place a piece of timber on the margin of the rock, to preſerve the rope from wearing againſt the ſharp edge. They have beſides a ſmall line faſtened to the body of the adventurer, by which he gives ſignals that they may lower or raiſe him, or ſhift him from place to place. The laſt operation is attended with great danger, by the looſening of the ſtones, which often fall on his head, and would infallibly deſtroy him, were it not protected by a ſtrong thick cap; but even that is found unequal to ſave him againſt the weight of the larger fragments of rock. The dexterity of theſe men is amazing; they will place their feet againſt the front of the precipice, and dart themſelves ſome fathoms from it, with a cool eye ſurvey the places where the birds neſtle, and again ſhoot into their haunts. In ſome places the birds lodge in deep receſſes. The fowler will alight there, diſengage himſelf from the rope, fix it to a ſtone, and at his leiſure collect the booty, faſten it to his girdle, and reſume his pendulous ſeat. At times he will again ſpring from the rock, and in that attitude, with a fowling-net placed at the

end of a ſtaff, catch the old birds which are flying to and from their retreats. When he has finiſhed his dreadful employ, he gives a ſignal to his friends above, who pull him up, and ſhare the hard-earned profit. The feathers are preſerved for exportation: the fleſh is partly eaten freſh, but the greater portion is dried for proviſion during the winter.

The method of fowling from below has alſo its ſhare of danger. The party goes on the expedition in a boat; and when it has attained the baſe of the precipice, one of the moſt daring, having faſtened a rope about his waiſt, and furniſhed himſelf with a long pole with an iron hook at one end, either climbs or is thruſt up by his companions, who place a pole under his breech, to the next footing ſpot he can reach. He, by means of the rope, brings up one of the boat's crew; the reſt are drawn up in the ſame manner, and each is furniſhed with his rope and fowling-ſtaff. They then continue their progreſs upwards in the ſame manner, till they arrive at the region of birds; and wander about the face of the cliff in ſearch of them. They then act in pairs; one faſtens himſelf to the end of his aſſociate's rope, and, in places where birds have neſtled beneath his footing, he permits himſelf to be lowered down, depending for his ſecurity on the ſtrength of his companion, who has to haul him up again; but it ſometimes happens that the perſon above is overpowered by the weight, and both inevitably periſh. They fling the fowl into the boat, which attends their motions, and receives the booty. They often paſs ſeven or eight days in this tremendous employ, and lodge in the crannies which they find in the face of the precipice.

In ſome remote parts of Ruſſia there is practiſed a ſingular invention for taking great quantities of gelinottes or grous. They chooſe the moſt open places in the birch woods; and there they plant long forks in the earth oppoſite the larger trees. On theſe forks is laid a horizontal ſtick, gallows-wiſe, to which are tied ſmall bundles of ears of corn. See the Plate. At a ſmall diſtance from this part of the contrivance, is a kind of large funnel or inverted cone, made with long birch twigs, thin and flexible, the lower extremities of which are ſtuck in the earth, very near to one another; but by ſpreading towards the top, forms there an opening of above a yard in diameter. In this opening is placed a wheel made of two circles that interſect each other, and are ſurrounded with ſtraw and ears of corn. This wheel turns on an axis faſtened to the ſides of the funnel in ſuch a manner, that there is room enough between the ſticks of the cone and the circles to admit of the wheel's turning freely about. The birds firſt perch upon the tranſverſe ſtick near the tree; and when they have a mind to fall upon the corn tied to the wheel, they muſt neceſſarily ſtand upon one of the projecting parts of the circles of which it is compoſed. At that inſtant the wheel turns, and the gelinotte falls, head foremoſt, to the bottom of the trap, which is there ſo contracted that he cannot get out. They ſometimes find the machine half full of gelinottes.

The following method of netting or catching of wild pigeons is eagerly purſued as a diverſion in different parts of Italy, particularly by the inhabitants of Cava in the Hither Principato, and is thus deſcribed by Mr. Swinburne. The people "aſſemble in parties; and if any ſtranger chances to ſtray to their rendezvous, give him a moſt cordial welcome. I am not in the leaſt ſurpriſed (ſays Mr. Swinburne) at their paſſionate fondneſs for this ſport, as I found it extremely bewitching, keeping the attention conſtantly alive, and the ſprings of the mind pleaſingly agitated by expectation; the ſituations where the toils are ſpread are incomparably beautiful, the air is pure and balſamic, and every thing around breathes health and ſatisfaction. When the periodical flights of ſtock-doves return from the northern and weſtern parts of Europe to gain warmer regions for their winter abode, the fowler repairs to the mountain and ſpreads his nets acroſs the intermediate hollows, the paſſes through which the birds direct their courſe, to avoid unneceſſary elevation in their flight. Theſe nets are hung upon a row of large trees planted for the purpoſe. The branches being very thick and cloſe at top, and the bole lofty and bare, a great opening is left below for the toils, which reach to the ground; and, by means of pulleys, fall in a heap with the leaſt effort. Sometimes they are extended upon poles that exceed the height of the trees. At a ſmall diſtance is a lofty circular turret, like a column with a little capital or cap, upon which a man is ſtationed to watch the approach of the game. As he commands a free view over all the country, and practice has made his ſight as acute as that of the lynx, he deſcries the birds at a wonderful diſtance. The doves advance with great velocity; but the alert watchman is prepared for them; and juſt as they approach his poſt, hurls a ſtone above them with a ſling: upon this the whole flock, whoſe fears have birds of prey for their great object, ſuppoſing the ſtone to be an enemy of that kind ready to pounce them, dart down like lightning to avoid the blow by paſſing under the trees; but there they ruſh into the jaws of death, by daſhing againſt the net, which inſtantly drops and ſo entangles them that not one of them can eſcape the active hands of the fowler. Theſe birds are ſometimes taken by dozens at one fall, and are accounted fine eating. The dexterity with which the ſlingers manage their weapon is very remarkable; they throw the ſtone to a great height without any violent effort, and without whirling the ſling round before they diſcharge the pellet. In the Pyrenean mountains, where the ſame diverſion is followed, the watchmen uſe a bow and arrow, trimmed with the feathers of a hawk."

We ſhall conclude this article with mentioning the following ſimple but ingenious method of catching aquatic birds as uſed in Mexico by the natives. The lakes of the Mexican vale, as well as others of the kingdom, are frequented by a prodigious multitude of ducks, geeſe, and other water-birds. The Mexicans leave ſome empty gourds to float upon the water, where thoſe birds reſort, that they may be accuſtomed to ſee and approach them without fear. The bird catcher goes into the water ſo deep as to hide his body, and covers his head with a gourd: the ducks come to peck at it; and then he pulls them by the feet under water, and in this manner ſecures as many as he can carry away.

Bird-*Lime*, a viſcid ſubſtance, uſed for catching birds and other animals by entangling their legs. It is prepared after different ways; but the moſt common birdlime among us is made from holly-bark, which is boiled ten or twelve hours, and when its green coat is ſeparated from the other, it is covered up for a fortnight in a moiſt place. It is then pounded into a tough paſte, ſo that no fibres of the wood are diſcernible, and waſhed in a running ſtream till no motes appear. Laſtly, it is put up to ferment four or five days, ſkimmed as often as any thing ariſes, and laid up for uſe. A third part of nut-oil, or thin greaſe, muſt be incorporated with it over the fire before it is fit for uſe.

It muſt be confeſſed the juice of holly-bark is a very peculiar ſubſtance; but, if trials were made, it ſeems probable that many other juices would be found to have the ſame clammy nature. The miſletoe affords a juice, even ſuperior to that of the holly; and if a young ſhoot of the common alder be cut through, there will a ſtringy juice draw out in threads, and follow the knife like bird-lime or the juice of the holly. It ſeems in this tree to be lodged, not in the bark, but in certain veins juſt within the circle of the wood. The roots of all the

hyacinths alſo afford a tough and ſtringy juice of the ſame kind; and ſo does the aſphodel, the narciſſus, and the black bryony root, in a ſurpriſing quantity.

When twigs are ſmeared with bird-lime, and deſigned to be put in places ſubject to wet, the common bird-lime is apt to have its force ſoon taken away. It is neceſſary, therefore, to have recourſe to a particular ſort, which from its property of bearing water unhurt, is called *water bird-lime*; and is prepared thus: Take a pound of ſtrong and good bird-lime; waſh it thoroughly in ſpring-water, till the hardneſs is all removed; and then beat it well, that the water may be quite ſeparated, ſo as not a drop remains; then dry it well, and put it into an earthen pot; add to it as much capon's greaſe as will make it run. Then add two ſpoonfuls of ſtrong vinegar, one ſpoonful of oil, and a ſmall quantity of Venice turpentine. Let the whole boil for ſome minutes over a moderate fire, ſtirring it all the time. Then take it off; and when there is occaſion to uſe it, warm it, and cover the ſticks well with it. This is the beſt ſort of bird-lime for ſnipes and other birds that frequent wet ſituations.

The moſt ſuitable method of uſing the common bird-lime is this: Cut down the main branch or bough of any buſhy tree, whoſe twigs are thick, ſtraight, long, and ſmooth, and have neither knots nor prickles. The willow and the birch-tree afford the beſt of this kind. Let all the ſuperfluous ſhoots be trimmed off, and the twigs all made neat and clean; they muſt all be well covered with the bird-lime within four inches of the bottom; but the main bough from which they grow, muſt not be touched with the lime. No part of the bark, where the lime ſhould come, muſt be left bare: but it is a nice matter to lay it on properly; for if it be too thick it will give the birds a diſtaſte, and they will not come near it; and if there be too little of it, it will not hold them when they are there. When the buſh is thus prepared, it muſt be ſet up in ſome dead hedge, or among ſome growing buſhes near the outſkirts of a town, a farmer's back-yard, or the like, if it be in the ſpring; for theſe places are the reſort of the ſmall birds at that time. If it be uſed in ſummer, the buſh muſt be placed in the midſt of a quick-ſet hedge, or in groves, buſhes, or white-thorn trees, near fields of corn, hemp, flax, and the like; and in the winter, the proper places are about ſtacks of corn, hovels, barns, and the like. When the lime-buſh is thus planted, the ſportſman muſt ſtand as near it as he can, without being diſcovered; and with his mouth, or otherwiſe, make ſuch ſort of notes as the birds do when they attack or call to one another. There are bird-calls to be bought for this uſe; but the moſt expert method is to learn the notes of call of the ſeveral birds, and imitate them by a ſort of whiſtling. When one bird is thus enticed to the buſh, and hung faſt, the buſineſs of the ſportſman is not to run up to take it, but to be patient; for it will hang itſelf more faſt, by its ſtruggling to get away; and its fluttering will bring more to the buſh, ſo that ſeveral may be taken together. The time of the day for this ſport is from ſun-riſe to ten o'clock, and from one to ſun-ſet.—Another very good method of bringing the birds together, is by a ſtale: a bat makes a very good ſtale; but it muſt be faſtened, ſo as to be in ſight at a diſtance. An owl is a ſtill better ſtale; for this bird never goes abroad but it is followed by all the ſmall birds in the neighbourhood. They will gather together in great numbers about it; and having no convenient place to ſit on but the lime-buſh, will be taken in great numbers. If a living owl or bat is not to be had, the ſkin ſtuffed will ſerve the purpoſe, and will laſt twenty years. Some have uſed the image of an owl carved in wood, and painted in the natural colours: and it has been found to anſwer the purpoſe very completely.

Divination by Birds. } Sec { Augury.
Migration of Birds. } Sec { Migration.
Nidification of Birds. } Sec { Ornithology.

Singing Birds are, the nightingale, blackbird, ſtarling, thruſh, linnet, lark, throſtle, Canary-bird, bulfinch, goldfinch, &c. See ſome very curious experiments and obſervations on the ſinging of birds, Phil. Tranſ. vol. lxiii. Their firſt ſound is called *chirp*, which is a ſingle ſound repeated at ſhort intervals; the next *call*, which is a repetition of one and the ſame note; and the third ſound is called *recording*, which a young bird continues to do for ten or eleven months, till he is able to execute every part of his ſong; and when he is perfect in his leſſon, he is ſaid to *ſing his ſong round*. Their notes are no more innate than language in man; they all ſing in the ſame key. The honourable author, Daines Barrington, has there attempted to reduce their comparative merits to a ſcale, and to explain how they firſt came to have partieular notes. See Song *of Birds*.

Preſervation of Birds. Thoſe who are curious in collecting birds have a method of preſerving them from putrefaction, ſo as to retain their natural form and poſition, as well as the beauty of their colours and plumage. A good antiſeptic for animal ſubſtances has been much inquired after; as for want of it many curious animals, and birds particularly, come to our hands in a very imperfect ſtate: ſome from foreign parts entirely miſcarry, and others of the fineſt plumage are devoured by inſects. Various methods of preſervation, therefore, have been deſcribed; but the following ſeems to be the leaſt troubleſome, and as effectual as any.

"After opening the bird by a longitudinal inciſion from the breaſt to the vent; diſſecting the fleſhy parts from the bones; and removing the entrails, eyes, brains, and tongue; the cavities and inſide of the ſkin are to be ſprinkled with the powders mentioned below: the eyes are then to be inſerted, and the head ſtuffed with cotton or towe: in the next place, a wire is to be paſſed down the throat through one of the noſtrils, and fixed into the breaſt bone: wires are alſo to be introduced through the feet, up the legs and thighs, and inſerted into the ſame bone; next, fill the body with cotton to its natural ſize, and ſew the ſkin over it: the attitude is laſtly to be attended to; and in whatever poſition the ſubject is placed to dry, that ſame poſition will be retained afterwards.

"The drying compound is as follows:

Corroſive ſublimate	¼ lb.
Pulverized nitre	½ lb.
Alum burnt	¼ lb.
Flowers of ſulphur	½ lb.
Camphor	¼ lb.
Black pepper	1 lb.
Tobacco ground coarſe	1 lb.

Mix the whole together, and keep it in a glaſs veſſel ſtopped cloſe.

"Small birds may be preſerved in brandy, rum, arrack, or firſt runnings; though in this manner the colour of the plumage is liable to be extracted by the ſpirit.

"Large ſea-fowl have thick ſtrong ſkins, and ſuch may be ſkinned; the tail, claws, head, and feet, are carefully to be preſerved, and the plumage ſtained as little as poſſible with blood. The inſide of the ſkin may be ſtuffed as recommended above.

"Kuckahn obſerves, Phil. Tranſ. vol. lx. p. 319, that 'baking is not only uſeful in freſh preſervations, but will alſo 'be of very great ſervice to old ones, deſtroying the eggs of 'inſects; and it ſhould be a conſtant practice once in two or 'three years to bake them over again, and to have the caſes 'freſh waſhed with camphorated ſpirit, or the ſublimate ſolution,

which would not only preſerve collections from decay much longer, but alſo keep them ſweet.'

"One of the beſt preſervatives, is to procure cloſe boxes, well glazed: with ſuch a precaution I have kept them in a dry room many years without the leaſt appearance of injury.—Baking is apt to crimp and injure the plumage, unleſs great care be uſed; and therefore the proper degree of heat ſhould be aſcertained by means of a feather before ſuch ſubjects are baked.

"When the ſubject is to be kept for ſome time in a hot climate, it ſhould be ſecured in a box filled with towe, oakum, or tobacco, well ſprinkled with the ſublimate ſolution."

In Guiana, the number and variety of beautiful birds is ſo great, that ſeveral perſons in the colony advantageouſly employ themſelves, with their ſlaves and dependants, in killing and preſerving theſe animals for the cabinets of naturaliſts in different parts of Europe. The method of doing this, as related by Mr. Bancroft in his Natural Hiſtory of Guiana, is, "to put the bird which is to be preſerved in a proper veſſel, and cover him with high wines, or the firſt running of the diſtillation of rum. In this ſpirit he is ſuffered to remain for 24 or 48 hours, or longer, according to his ſize, till it has penetrated through every part of his body. When this is done, the bird is taken out; and his feathers, which are no ways changed by this immerſion, are placed ſmooth and regular. It is then put into a machine, made for the purpoſe, among a number of others, and its head, feet, wings, tail, &c. are placed exactly agreeable to life. In this poſition they are all placed in an oven, very moderately heated, where they are ſlowly dried; and will ever after retain their natural poſition, without danger of putrefaction."

Pictures of Birds. Mr. Edwards, in his Natural Hiſtory of Birds, vol. ii. p. 119, deſcribes a method of making pictures of birds with their natural feathers. Firſt, take a thin board, or pannel of deal, or wainſcot well ſeaſoned, that it may not warp; then ſmoothly paſte on it white paper, and let it dry; and if the wood caſts its colour through, you may paſte on a ſecond paper, and it will be whiter: let the ſecond paper dry; then get ready any bird that you would repreſent, and draw it as exact as may be on the papered pannel, of its natural ſize (middle-ſized birds are beſt for this work); then paint what ground-work, or tree, or other thing, you deſign to ſet your bird on, together with the bill and legs of the bird in water colours, leaving the bird to be covered with its own natural feathers. You muſt firſt prepare the part to be feathered, by laying on pretty thick gum Arabic, diſſolved in water, with a large hair-pencil: then lay the pannel flat, and let it dry hard; and when dry, cover it with the gum-water a ſecond time, and let it dry; and then a third, in caſe you do not find it lie with a good body on the paper; the thickneſs of a ſhilling, when dried hard, is ſufficient. When your piece is thus prepared, take the feathers off from the bird as you uſe them; beginning always at the tail and points of the wing, and working upwards to the head; obſerving to cover that part of your drawing with the feather that you take from the ſame part in your bird, letting them fall one over another in their natural order. You muſt prepare your feathers by cutting off the downy part that is about their bottoms; and the larger feathers muſt have the inſides of their ſhafts ſhaved off with a knife to make them lie flat; the quills of the wings muſt have their inner webs clipped off, ſo that in laying them the gum may hold them by their ſhafts. When you begin to lay them, take a pair of ſteel pliers to hold the feathers in; and have ſome gum-water, not too thin, and a large pencil, ready to moiſten the gummed ground-work by little and little as you work it: then lay your feathers on the moiſtened parts; which muſt not be watery, but ſomething tacky or clammy to hold the feathers. You ſhould prepare a parcel of ſmall leaden weights, in the form of ſugar-loaves; which you may caſt in ſand, by firſt making holes in its ſurface with a pointed ſtick: theſe weights will be neceſſary to ſet on the feathers you have newly applied, to hold them to the gum till they are dry and fixed: but you muſt be cautious leſt the gum come through the feathers; for it not only ſmears them, but dries to the bottoms of the weights, and you will be apt to pull off the feathers with the weights, which will diſorder your work. When you have wholly covered your bird with feathers, you muſt with a little thick gum, ſtick on a piece of paper cut round, of the bigneſs and in the place of the eye, which you muſt colour like the eye of the bird. When the whole is dry, dreſs the feathers round the outline that may chance to ſtare a little, and rectify what may be mended in any other part: then lay a ſheet of clean paper on it: and on that a heavy book, or ſome ſuch thing, to preſs it: after which it may be preſerved in a frame covered with a glaſs, and ſecured from the duſt.

Birds, in heraldry, according to their ſeveral kinds, repreſent either the contemplative or active life. They are reckoned the emblems of liberty, expedition, readineſs, ſwiftneſs, and fear. They are more honourable bearings than fiſhes, becauſe they participate more of air and fire, the two nobleſt and higheſt elements, than of earth and water.—Birds muſt be borne in coat-armour, as is beſt fitting the propriety of their natural actions of going, ſitting, ſtanding, flying, &c. Birds that are either whole-footed, or have their feet divided, and yet have no talons, are ſaid to be *membered;* but the cock, and all birds of prey with ſharp and hooked beaks and talons for encounter or defence, are termed *armed.* In the blazoning of birds, if their wings be not diſplayed, they are ſaid to be borne cloſe; as, *he beareth an eagle*, &c. cloſe.

Birds-*Neſts*, in cookery, the neſt of a ſmall Indian ſwallow, very delicately taſted, and frequently mixed among ſoups. On the ſea-coaſts of China, at certain ſeaſons of the year, there are ſeen vaſt numbers of theſe birds. They leave the inland country at their breeding time, and come to build in the rocks, and faſhion their neſts out of a matter which they find on the ſhore, waſhed thither by the waves. The nature of this ſubſtance is ſcarcely yet aſcertained. According to Kempfer, it is molluſcæ or ſea-worms; according to M. le Poivre, fiſh-ſpawn; according to Dalrymple, ſea-weeds; and according to Linnæus, it is the animal ſubſtance frequently found on the beach, which fiſhermen call *blubbers* or *jellies*. The neſts are of a hemiſpheric figure, and of the ſize of a gooſe's egg, and in ſubſtance much reſemble the ichthyocolla or *iſinglaſs*. The Chineſe gather theſe neſts, and ſell them to all parts of the world; they diſſolve in broths, &c. and make a kind of jelly of a very exquiſite flavour.

We are told that theſe neſts are found in great abundance in the iſland of Sumatra, particularly about Croe, near the ſouth end of the iſland. Four miles up the river of that name is a large cave, where the birds build in vaſt numbers. The neſts are diſtinguiſhed into white and black, of which the firſt are by far the more ſcarce and valuable, being found in the proportion of one only to twenty-five. "The white ſort (ſays Mr. Marſden) ſells in China at the rate of 1000 to 1500 Spaniſh dollars the peeul; the black is uſually diſpoſed of at Batavia for about 20 dollars the ſame weight, where it is chiefly converted into glue, of which it makes a very ſuperior kind. The difference between the two has by ſome been ſuppoſed to be owing to the mixture of the feathers of the birds with the viſcous ſubſtance of which the neſts are formed: and this they deduce from the experiment of keeping the black neſts for a ſhort time in hot water, when they are ſaid to become in a great degree white. Among the natives I have heard ſome aſſert, that they are the work of a different ſpecies of bird.

It was ſuggeſted to me, that the white might probably be the recent neſts in which they were taken; and the black, ſuch as had been uſed for a number of years ſucceſſively. This opinion appearing plauſible, I was particular in my inquiries as to that point, and learned what ſeemed much to corroborate it. When the natives prepare to take the neſts, they enter the caves with torches, and forming ladders according to the uſual mode, of a ſingle bamboo notched, they aſcend and pull down the neſts, which adhere in numbers together, from the ſide and top of the rock. They informed me, that the more frequently and regularly the cave is ſtripped, the greater proportion of white neſts they are ſure to find, and that on this experience they often make a practice of beating down and deſtroying the old neſts in larger quantities than they trouble themſelves to carry away, in order that they may find white neſts the next ſeaſon in their room. The birds, during the building time, are ſeen in large flocks on the beach, collecting in their bills the foam which is thrown up by the ſurf, of which there is little doubt but they conſtruct their neſts, after it has undergone, perhaps, a preparation, from a commixture with their ſaliva, or other ſecretion, with which nature has provided them for that purpoſe."

BIREMIS, in Roman antiquity, a veſſel with two rows of oars; concerning the diſpoſition of which authors are not agreed.

BIRETUM, or BIRRETUM, a ſort of black bonnet, or covering of the head, in form of a pyramid, much uſed in Italy and France, about 500 or 600 years ago, as a badge of victory, honour, or facerdotal preferment.

BIRKENHEAD, or BERKENHEAD (Sir John), a famous political author, born about the year 1615. Being recommended to Dr. William Laud, archbiſhop of Canterbury, he became his ſecretary; in which office he ſhewed ſuch capacity and diligence, that the archbiſhop, by his diploma, created him maſter of arts in 1639; and in the year following, by letter commendatory from the ſame prelate, he was choſen probationer fellow of All-Souls' College. This obliged him to reſide conſtantly at Oxford; and on King Charles I.'s making that city his head-quarters during the civil war, our author was made choice of to write a kind of journal in defence of the royal cauſe, by which he gained great reputation. By his majeſty's recommendation he was choſen reader in moral philoſophy; which employment he enjoyed till 1648, when he was expelled by the parliament viſitors. He retired afterwards to London, where he wrote ſeveral poetical pieces; and having adhered ſteadily to his principles, he acquired the title of the *loyal poet*, and ſuffered ſeveral impriſonments. He publiſhed, while he thus lived in obſcurity, ſome very ſatirical compoſitions, moſtly levelled againſt the republican grandees, and written with great poignancy. Upon the reſtoration of king Charles II. our author was rewarded for his loyalty. He was created, April 6, 1661, on the king's letters ſent for that purpoſe, doctor of the civil law by the univerſity of Oxford; and in that quality, as an eminent civilian, was conſulted by the convocation on the queſtion, Whether biſhops ought to be preſent in capital caſes? He was about the ſame time elected to ſerve in parliament for Wilton in the county of Wilts. He was knighted November 14, 1662; and upon Sir Richard Fanſhaw's going in a public character to the court of Madrid, he was appointed to ſucceed him as maſter of requeſts. He lived afterwards in credit and eſteem, and received various favours from the court, which, however, drew upon him ſome very ſevere attacks from thoſe who oppoſed the court. Mr. Wood has treated him with great ſeverity; but his memory has been tranſmitted with honour to poſterity by others, particularly by Dryden, Langbaine, and Winſtanly. He died in Weſtminſter Dec. 4, 1679; and was interred in St. Martin's in the Fields.

BIRKENFIELD, a town of Germany, capital of a county of the ſame name in the circle of the Upper Rhine. It is ſeated near the river Nave, in E. long. 7. 9. N. lat. 49. 35.

BIRMINGHAM, a very large town of Warwickſhire in England, ſituated in W. long. 1. 35. N. lat. 52. 30. It has no corporation, being only governed by two conſtables and two bailiffs; and it is therefore free for any perſon to come and ſettle there; which has contributed greatly not only to the increaſe of the buildings, but alſo of the trade, which is the moſt flouriſhing of any in England for all ſorts of iron work, beſides many other curious manufactures. The town ſtands on the ſide of a hill, nearly in the form of a half-moon. The lower part is filled with the work-ſhops and warehouſes of the manufacturers, and conſiſts chiefly of old buildings. The upper part of the town contains a number of new and regular ſtreets, and a handſome ſquare elegantly built. It has ſeveral churches; particularly one in the lower part of the town, which is an ancient building with a very tall ſpire; and another, which is a very grand modern ſtructure, having a ſquare ſtone tower with a cupola and turret above it. The houſes in this town amount to between 7000 and 8000, and their number is increaſing every day.

BIRON (Armand de Gontault, Lord of), Marſhal of France, and a celebrated general in the 16th century, ſignalized himſelf by his valour and conduct in ſeveral ſieges and battles. He was made grand maſter of the artillery in 1569, and nobody dared to aſſault him at the maſſacre of St. Bartholomew. He was the firſt who declared for Henry IV. He brought a part of Normandy under his ſubjection, and diſſuaded him from retiring to England or Rochelle. But he was killed by a cannon-ball, at the ſiege of Epernay, on the 26th of July 1592. He was a very univerſal ſcholar: and uſed to carry a pocket-book, in which he wrote down every thing that appeared remarkable; which gave riſe to the proverb very much uſed at court: When a perſon happened to ſay any thing uncommon, they told him, *You have found that in Biron's pocket-book.*

BIROTA, or BIROTUM, in Roman antiquity, a kind of vehicle, ſo denominated from its moving upon two wheels. It carried about 200 pound weight, and was drawn by three mules.

BIRRUS, in Roman antiquity, a cloak made of woollen cloth, worn by the ſoldiers. Alſo a robe anciently worn by the prieſts or biſhops.

BIRTH, in midwifery, ſignifies the ſame with delivery. See MIDWIFERY.

BIRTH alſo ſignifies a perſon's deſcent; and is ſaid to be high or low according to the circumſtances of his anceſtry. There is ſcarcely any truth (Mr. Knox obſerves in his Eſſays) of which the world has been more frequently reminded by moraliſts, than the unreaſonableneſs of that veneration which is paid to birth. They have been told, that virtue alone is true nobility; but though they have acknowledged the aſſertion to be founded in reaſon, they have continued, with uniform perſeverance, in the ſame error. The luminous glory of an illuſtrious anceſtor ſeems to have diffuſed a brilliance over a long line of deſcendants, too opaque of themſelves to emit any original irradiations.

"Gratitude (continues that elegant author), which firſt raiſes a benefactor to a diſtinguiſhed rank in civil honours, is willing to continue its kindneſs to his immediate offspring. The diſtinction is rendered hereditary. This predilection for an anceſtor ſoon leads to the accumulation of honours and poſſeſſions in his ſucceſſors; and the incenſe originally offered, becauſe it was deſerved, is at laſt laviſhed at the ſhrine of opulence, independently of merit.

" Subordination is, indeed, eſſential to ſociety. The order of nobles, as hereditary guardians of the laws, is found an uſeful political eſtabliſhment; and none ſeem ſo well adapted to ſupply it, as they who have been raiſed to eminence by their anceſtors, and who poſſeſs a territorial patrimony in the land which they are to protect. All that is contended for is, that the recommendation of birth may not ſet aſide or depreciate real merit, the praiſe of learning, and the intrinſic value of virtuous exertions.

" It is a remarkable circumſtance in the hiſtory of mankind, that ſome of the beſt books have been written, and ſome of the greateſt achievements performed, by thoſe whoſe origin was truly plebeian. The politeſt and genteeleſt books, whether the ſentiments or the ſtyle be conſidered, have been produced by ſlaves, or the deſcendants of ſlaves. Horace, Phædrus, and Terence, wrote in a ſtyle which muſt have been the ſtandard of a court, to an intercourſe with which they were by no means entitled by their extraction. The founders of the moſt diſtinguiſhed families emerged from the middle and the lower claſſes, by the ſuperior vigour of their natural abilities, or by extraordinary efforts, aſſiſted by fortune; and unleſs the adventitious circumſtances of wealth and civil honours can effect a change in the conſtituent principles of the mind and body, there is certainly no real ſuperiority to be derived in a boaſted pedigree of Tudors and Plantagenets. And yet there have appeared flatterers who have indirectly ſuggeſted, that the minds of the nobility ſeem to be caſt in a finer mould, and to have an elegance inherent in their original conſtitution. According to this hypotheſis, we muſt go on to ſuppoſe, that the mind of a commoner exalted to the higher order of ſenators, catches this elegance by the contagion of inviſible effluvia. On his creation he undergoes a kind of new birth, and puts off the exuviæ which encumbered and degraded him in the lower regions. Thus are all the occult perfections of noble blood to be infuſed by the mandate of a monarch. ' But no,' ſaid Maximilian to a man who aſked to be ennobled by him, ' though I can give you riches and a title, I cannot make you noble.'

" In truth, there is many a nobleman, according to the genuine idea of nobility, even at the loom, at the plough, and in the ſhop; and many more in the middle ranks of mixed ſociety. This genuine idea contains in it generoſity, courage, ſpirit, and benevolence, the qualities of a warm and open heart, totally unconnected with the accidental advantages of riches and honour; and many an Engliſh ſailor has poſſeſſed more of the real hero than a lord of the admiralty.

" If, indeed, there is any ſubſtantial difference in the quality of their blood, the advantage is probably on the ſide of the inferior claſſes. Their indigence and their manual employments require temperance and exerciſe, the beſt puriſiers of the animal juices. But the indolence which wealth excites, and the pleaſures which faſhionable life admits without reſtraint, have a natural tendency to vitiate and enfeeble the body as well as the mind: and among the many privileges inherited by him who boaſts nobility in his veins, he commonly receives the ſeeds of the moſt painful and the impureſt diſeaſes. He diſplays indeed a coronet on his coat of arms, and he has a long pedigree to peruſe with ſecret ſatisfaction; but he has often a gout or a ſcrophula, which make him wiſh to exchange every drop derived from his Norman anceſtors, for the pure tide that warms a peaſant's boſom.

" The ſpirit of freedom, moral, mental, and political, which prevails in Britain, precludes that unreaſonable attachment to birth, which, in the countries of deſpotiſm, tends to elevate the noble to a rank ſuperior to humanity. In our neighbour's land, the region of external elegance united with real meanneſs, the implicit veneration paid to birth adds to the weight of legal oppreſſion. A Frenchman of the plebeian order attends to a Count or a Marquis with all the ſilent ſubmiſſion of idolatry: on the contrary, there is no doubt but that an Engliſh gondolier would box with the beſt lord in the land, if he were affronted by him, without the leaſt regard for his ſtar and ribbon. It would indeed be an additional pleaſure to the natural delight of conqueſt, to have bruiſed a puny lord. Even the more refined and poliſhed do not idoliſe illuſtrious birth. In truth, wealth appears to be the object of more univerſal veneration. Noble blood and noble titles, without an eſtate to ſupport them, meet with great compaſſion indeed, but with little reſpect; nor is the man who has raiſed himſelf to eminence, and who behaves well in it, neglected and deſpiſed becauſe he derives no luſtre from his forefathers. In a commercial country, where gain is the general object, they who have been moſt ſucceſsful in its purſuit will be revered by many, whatever was their origin. In France, where honour is purſued from the monarch to the cleanſer of a jakes, the diſtinction of birth, even with extreme poverty, is enviable. The brother of a Marquis would rather ſtarve on a beggarly penſion, than pollute himſelf with a trade by which he might acquire the revenues of a German kingdom. In our land of good ſenſe this folly is loſing ground; and the younger brothers of noble houſes often think it no diſgrace to rival the heir in a princely fortune acquired by honourable merchandiſe.

" As the world becomes more enlightened, the exorbitant value which has been placed on things not really valuable will decreaſe. Of all the effects of man's capricious admiration, there are few leſs rational than the preference of illuſtrious deſcent to perſonal merit, of diſeaſed and degenerate nobility to health, to courage, to learning, and to virtue. Of all the objects of purſuit which are not in our own power, the want of diſtinguiſhed birth may moſt eaſily be diſpenſed with, by thoſe who poſſeſs a ſolid judgment of that which makes and keeps us happy. There may be ſome reaſon to repine at the want of wealth and fame; but he who has derived from his parent health, vigour, and all the powers of perception, need not lament that he is unnoticed at the herald's office.

" It has been obſerved, that virtue appears more amiable when accompanied with beauty; it may be added, that it is more uſeful when recommended to the notice of mankind by the diſtinction of an honourable anceſtry. It is then greatly to be wiſhed, that the nobly born would endeavour to deſerve the reſpect which the world pays them with alacrity, by employing their influence to benevolent purpoſes; to thoſe purpoſes which can at all times be accompliſhed, even when the patriotic exertions of the field and cabinet are precluded."

Birth, or *Berth*, the ſtation in which a ſhip rides at anchor either alone or in a fleet, or the diſtance between the ſhip and any adjacent object, comprehending the extent of the ſpace in which ſhe ranges at the length of her cables: as, *ſhe lies in a good birth*, i. e. in a convenient ſituation, or at a proper diſtance from the ſhore and other veſſels; and where there is good anchoring ground, and ſhelter from the violence of the wind and ſea.

Birth alſo ſignifies the room or apartment where any particular number of the officers and ſhip's company uſually meſs and reſide. In a ſhip of war there is commonly one of theſe between every two guns.

Birth-*Day*, the anniverſary return of the day whereon a perſon was born. The ancients placed a good deal of religion in the celebration of birth-days, and took omens from thence of the felicity of the coming year. The manner of celebrating birth-days was by a ſplendid dreſs: wearing a ſort of rings peculiar to that day: offering ſacrifices; the men to their genius, of wine, frankincenſe; the women to Juno: giving ſuppers, and treating their friends and clients; who in return

made them preſents, wrote and ſung their panegyrics, and offered vows and good wiſhes for the frequent happy returns of the ſame day. The birth-days of emperors were alſo celebrated with public ſports, feaſts, vows, and medals ſtruck on the occaſion. But the ancients, it is to be obſerved, had other ſorts of birth-days beſides the days on which they were born. The day of their adoption was always reputed as a birth-day, and celebrated accordingly. The emperor Adrian, we are told, obſerved three birth-days; *viz.* the day of his nativity, of his adoption, and of his inauguration. In thoſe times it was held, that men were not born only on thoſe days when they firſt came into the world, but on thoſe alſo when they arrived at the chief honours and commands in the commonwealth, *e. gr.* the conſulate. Hence Cicero declares in his oration *ad Quirites*, after his return from exile: *A parentibus, id quod neceſſe erat, parvus ſum procreatus; a vobis natus ſum conſularis.*

Birthwort, in botany. See Aristolochia.

BIRVIESCA, a town of Old Caſtile in Spain, and capital of a ſmall territory called *Bureva*. W. long. 2. 15. N. lat. 56. 35.

BIRZA, a town of Poland in the province of Samogitia. E. long. 25. 5. N. lat. 56. 35.

BISA, or Biza, a coin of Pegu, which is current there for half a ducat. It is alſo a weight uſed in that kingdom.

BISACCIA, a ſmall handſome town of Italy, in the Ulterior Principato, and in the kingdom of Naples, with a biſhop's ſee. E. long. 15. 35. N. lat. 41. 3.

BISACUTA, in middle-age writers, an axe with two edges, or which cuts either way; or a miſſive weapon pointed at both ends. Walſingham repreſents the *ſecuris biſacuta* as peculiar to the Scottiſh nation. See Battle-*Axe*.

BISBÆA, a feaſt celebrated by the Meſſapii after the pruning of their vines, to obtain of the gods that they might grow again the better. The word is formed from βισσὸς, uſed by ſome to ſignify a vine.

BISCARA, a town of Africa in the kingdom of Algiers, ſeated in the eaſtern or Levantine government, in E. long. 5. 50. N. lat. 35. 10. This city belonged to the province of Zeb in Numidia, which lies ſouth of the kingdom of Labez; but the Algerines, in their annual inroads to carry off ſlaves, made themſelves maſters of Biſcara, in order to facilitate their entrance into the ſouthern provinces. It retains ſtill ſome remains of the ancient city that gave name to this territory; and has a garriſon to keep the inhabitants in awe, and who uſually bring lions, tigers, and other wild beaſts for ſale to ſtrangers. The city of Algiers is never without a great number of Biſcarans, who are employed in the hardeſt and loweſt offices, as cleanſing of ſtreets, emptying of vaults, ſweeping chimneys, &c. and when they have got about 10 or 12 crowns by this drudgery, they return to their country, where they are reſpected as worthy men on account of their money, the inhabitants of this province being almoſt entirely deſtitute of coin, and reckoned the moſt miſerable of all the Arabian tribes.

BISCAY, a province of Spain, bounded on the north by the ſea called the *Bay of Biſcay*, on the ſouth by Old Caſtile, on the weſt by Aſturias of Santilana, and on the eaſt by the territories of Alava and Guipuſcoa. It is in length about ſeventy-four miles; but the breadth is much leſs, and very unequal. This country in general is mountainous and barren; but in ſome places it produces corn, and every where a great quantity of apples, oranges, and citrons. They make cyder with the apples, which is their common drink. Beſides this, they have wine called *chacolino*, which is pleaſant, but will not keep long, and therefore is uſed inſtead of ſmall beer. Their valleys produce a little flax, and their hills a great deal of timber for ſhips. The ſea affords them excellent fiſh of all ſorts. The wool that is exported here comes from Old Caſtile; but their greateſt riches are produced by their mines of iron; which metal is extremely good, and is tranſported to all parts. They have likewiſe artificers that work in iron; and are, in particular, famous for working ſwords and knives. Biſcay is the country of the ancient Cantabri, ſo imperfectly ſubdued by Auguſtus, and ſo ſlightly annexed to the Roman empire. Their mountains have in all ages afforded them temptations and opportunities of withdrawing themſelves from every yoke that has been attempted to be impoſed upon them. Their language is accounted aboriginal, and unmixed with either Latin, French, or Spaniſh. It is ſo totally different from the Caſtilian, that we ſeldom meet with any of the peaſants that underſtand one word of Spaniſh. The Biſcayners are ſtout, brave, and choleric to a proverb. The beſt ſailors in Spain belong to the ports of Biſcay, and its mountains produce a very valuable race of ſoldiers. Their privileges are very extenſive, and they watch over them with a jealous eye. They have no biſhops in the province, and ſtyle the king only *Lord of Biſcay*. The men are well-built and active, like all mountaineers. The moſt ſingular thing in their dreſs is the covering of their legs: they wrap a piece of coarſe grey or black woollen cloth round them, and faſten it on with many turns of tape. The women are beautiful, tall, light, and merry; their garb is neat and paſtoral; their hair falls in long plaits down their backs; and a veil or handkerchief, twiſted round in a coquettiſh manner, ſerves them for a very becoming head-dreſs. On Sundays they generally wear white, tied with roſe-coloured knots. The chief towns in it are Bilboa, Ordunna, Durango, Fontarabia, St. Sebaſtian, Toloſa, and Victoria.

Biscay (New), a province of North America, in the audience of Guadalajara. It has New Mexico on the north, Culiacan on the weſt, Zacatecas on the ſouth, and Panuco with Florida on the eaſt. It is about 300 miles from eaſt to weſt, and 360 from north to ſouth. In general it is well watered, fruitful, moderately temperate, and abounds in all ſorts of proviſions, except the mountains of Topia, which are barren. The original inhabitants are not all brought under ſubjection, they having four large towns in the moraſſes, that are of difficult acceſs; for this reaſon the Spaniards have built three ſmall fortified towns, which are well inhabited, for the defence of their ſilver mines. The latitude is from 25 to 28 degrees.

BISCHOFISHEIM, a town of Germany, in the archbiſhopric of Mentz, and circle of the Lower Rhine, ſeated on the river Tauber, near the frontiers of Franconia. E. long. 9. 37. N. lat. 49. 40.

BISCHOFF-zell, a town of Switzerland, belonging to the biſhop of Conſtance. There is a caſtle wherein the biſhop's bailiff reſides, who receives half the fines; but he has nothing to do with the town, nor is there any appeal from the council of the town. It is ſeated on the Thur, at the place where the Sitter falls into this river almoſt half way between Conſtance and St. Gall. E. long. 9. 23. N. lat. 47. 33.

BISCHOP, or Biskop, (John de), an excellent artiſt, born at the Hague in 1646. He is ſpoken of with great commendation as a painter, and his drawings from the great maſters are held in the higheſt eſtimation by the curious. In theſe he has ſucceeded ſo happily, as to preſerve with the greateſt exactneſs the ſtyle of the painter whoſe pictures he copied. But as an engraver he is moſt generally known; and his works are numerous. They are chiefly etchings, harmonized with the graver; and though ſlight, are yet free, ſpirited, and pleaſing. He gives a richneſs to the colour, and a roundneſs to the figures, far beyond what is uſually done with the point, ſo little aſſiſted by the graver. His figures in general are well drawn; but in a mannered, rather than a correct, ſtyle. The extremities indeed are not always well marked, or his heads

equally expreſſive or beautiful. It is ſaid of him, that he owed his reputation to his own genius alone, having never ſtudied under any maſter by whoſe inſtruction he might have been benefited. He worked chiefly at Amſterdam, where he died in the year 1686, at 40 years of age.

Bischop (Cornelius), a portrait and hiſtory painter, was born at Antwerp in 1630, and was the diſciple of Ferdinand Bol. His pencil, his tint of colouring, his ſtyle and manner, had a ſtrong reſemblance of his maſter; and by many competent judges he is eſteemed not inferior to him in hiſtorical ſubjects as well as in portrait, having been always aſſiduous to ſtudy after nature. A painting by this maſter, conſiſting of a few figures by candle light, was ſo much admired by Louis XIV. that he purchaſed it at an high price, and placed it in the royal collection; and the King of Denmark admitted his works among thoſe of the beſt maſters. However, notwithſtanding the encomiums beſtowed on this maſter by the Flemiſh writers, an impartial judge would perhaps think his compoſitions but heavy and without expreſſion, and his works in general not worthy of all that commendation which is laviſhed upon them. He died in the year 1674.

Bischop (Abraham), ſon of Cornelius Biſchop, was inſtructed by his father to deſign hiſtorical ſubjects and portraits; but preferred the painting of fowls, particularly thoſe of the domeſtic kind, to any other ſubjects which were recommended to him. He deſigned every object after nature, and uſually painted in a large ſize, ſuch as ornamental furniture for grand halls; and every ſpecies of fowl was ſo exactly like nature in its attitude, character, and plumage, that his works were beheld with very general admiration.

BISCHWELLER, a fortreſs of Alſace, ſeated in E. long. 7. 0. N. lat. 48. 40.

BISCHROMA, in muſic, the ſame as our triple quaver. See Chroma.

BISCUTELLA, buckler-mustard, or *baſtard Mithridate-muſtard*; a genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ*. The ſilicula is flat-compreſſed, rounded, above and below two-lobed, and the leaves of the calyx are gibbous at the baſe. Of this there are three ſpecies: the auriculata, with ſmall pods joined to the ſtyle; the didyma, with a double orbicular pod diverging from the ſtyle; and the apula, with flowers growing in ſpikes, and a ſhorter ſtyle. They are natives of France, Italy, and Germany.

BISEGLIA, a populous town of Italy in the kingdom of Naples and Terra de Bari, with a Biſhop's ſee, ſeated near the Gulph of Venice, in E. long. 16. 49. N. lat. 41. 18.

BISERRULA, in botany; a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*: the legumen is bilocular and flat; and the partition contrary. Of this genus there is only one ſpecies known; *viz.* the pelecinus, an annual plant with purple flowers, growing in Italy, Sicily, Spain, and the ſouth of France.

BISERTA, a town of the kingdom of Tunis in Africa, ſeated on a gulf of the ſame name, in E. long. 10. 40. N. lat. 37. 20. The gulf is a very large one, and the *Sinus Hipponenſis* of the ancients. It is formed by the Capes Blanco and Ziebeb; and has a beautiful ſandy inlet near four leagues wide, which once admitted the largeſt veſſels, but through the negligence of the Turks can now admit only thoſe of the ſmalleſt ſize, and is in danger in a ſhort time of being totally choaked up. Some remains of the great pier of Hippo are ſtill extant; by which it appears to have run out into the ſea ſo as to break the north-eaſt wind, and make this one of the ſafeſt and moſt beautiful havens in theſe parts. On the ſouth, this gulf has a communication with a lake of the ſame name, ſo as to form a kind of canal between it and the Mediterranean ſea. Through this canal a conſtant ſtream is obſerved alternately diſcharging itſelf from the ſea to the lake, and from the lake to the ſea, in the ſame manner as the Atlantic Ocean is obſerved to do in the Mediterranean, and back again; ſo that what the lake loſes by exhalations is ſoon recruited by the ſea, which in hot ſeaſons runs into it with a very briſk current to keep up the equilibrium. The millets of this lake are the beſt in Barbary; great quantities of their roes dried and made into Botargo, are ſent from hence into the Levant, where they are accounted a great dainty. The town was formerly very conſiderable; and, though not above a mile in circuit, is ſaid to have contained 6000 houſes; whereas both it and the villages under it now ſcarcely contain that number of inhabitants. It has ſtill, however, ſome ſtrong caſtles and batteries to defend it, eſpecially towards the ſea. There are alſo two very capacious priſons for ſlaves, a large magazine or warehouſe for merchandize, and two towers with ſome other outworks to defend the entrance of the haven. The city, though ſo near the ſea, is well ſupplied with freſh water from ſprings that ſurround it on every ſide towards the land. It is likewiſe well furniſhed with variety of fiſh from the adjacent lake. Moſt of the inhabitants of Biſerta, as well as of the adjacent country on both ſides of the canal, are employed in the fiſhing trade, which begins about the end of October, and ends in the beginning of May; for the rains then ſweetening the waters, make the fiſh come into it in vaſt quantities during that ſeaſon; but afterwards they either diſappear, or grow lean, dry, and unfit to eat. The people here are extremely poor; yet very proud, ill-natured, and faithleſs; inſomuch that Muley Haſun Bey, one of their ſovereigns, uſed to ſay, that none of his ſubjects deſerved his reſentment ſo much as they, ſince neither fear nor love could keep them faithful. Biſerta has about eight villages under its government; a large plain called *Matter* or *Mater*; and the territory of Choros, the *Clypea* or *Corobis* of the ancients. This is a tract of great extent, and would be very fertile were it not for the frequent incurſions of the Arabs. The people are very poor, live meanly, and go worſe clad. Their choiceſt dainty is their couſcou, a kind of cake made of flour, eggs, and ſalt, which they dry and keep all the year round. Their dreſs is nothing elſe than a piece of coarſe cloth wrapped round their bodies, and another round their heads by way of a turban; and moſt of them go bare-footed and bare-legged. The poorer ſort have nothing but a few ſkins laid on the floor to ſleep upon; but the rich have narrow couches fixed againſt the wall, about five or ſix feet high, to which they mount by a ladder. They are very expert horſemen, as moſt in theſe countries are, and ride without ſaddle or bridle; nor do they ever ſhoe their horſes. They are ſtill more miſerable from the neighbourhood of the Arabs, who living altogether by plunder, robbery, and murder, oppreſs the poor inhabitants with their frequent inroads and cruel exactions. The Biſertines, both of the city and country, are the moſt ſuperſtitious people in Barbary, ſcarce going any where without hanging a quantity of amulets about their own, or, if they ride, their horſes' neck alſo. Theſe amulets are only ſcraps of parchment or paper, with ſome ſtrange characters written upon them, which they ſew up in a piece of leather, ſilk, &c. and imagine when worn about them that it will be a preſervative againſt all diſaſters.

BISET (Charles Emanuel), a painter of conſiderable eminence, was born at Mechlin in 1633; and even in his early productions ſhowed a lively and ready invention. He was remarkable for introducing a multitude of figures into his deſigns, with an extraordinary variety of drapery peculiar to every nation. His general ſubjects were converſations, balls,

concerts, and aſſemblies of gay and genteel perſons, which were correctly deſigned and well coloured; though their actions and attitudes were ſometimes very indelicate. His pictures had a ſtrong effect at a diſtance; and even when more nearly inſpected, they ſhowed a neatneſs of pencil, a ſpirited touch, and a good expreſſion.

BISHOP, a prelate or perſon conſecrated for the ſpiritual government and direction of a dioceſe. The word comes from the Saxon *biſchop*, and that from the Greek ἐπίσκοπος, an *overſeer* or *inſpector*: which was a title the Athenians gave to thoſe whom they ſent into the provinces ſubject to them, to ſee whether all things were kept in order; and the Romans gave the ſame title to thoſe who were inſpectors and viſitors of the bread and proviſions. It appears from a letter of Cicero, that he himſelf had a biſhopric; being *epiſcopus Oræ & Campaniæ*.

A biſhop differs from an archbiſhop in the following particulars: that an archbiſhop with biſhops conſecrate a biſhop, as a biſhop with prieſts ordain a prieſt; that the archbiſhop viſits a province as the biſhop a dioceſe; that the archbiſhop convocates a provincial ſynod as the biſhop a diocеſan one; and that the archbiſhop has canonical authority over all the biſhops of his province as the biſhop over the prieſts in his dioceſe. It is a long time ſince biſhops have been diſtinguiſhed from mere prieſts or preſbyters; but whether that diſtinction be of divine or human right, whether it was ſettled in the apoſtolical age or introduced ſince, is much controverted. But whether the apoſtles ſettled any thing of this kind themſelves, or whether they left the ſpiritual œconomy in the hands of the preſbyters, or of thoſe together with the people, it appears that in a little time the functions of the prieſthood were divided, and the prieſts diſtinguiſhed into degrees; the political part of religion being, according to ſome, aſſigned principally to biſhops, and the evangelical to the prieſts, &c. Or, according to others, the functions of teaching and preaching were reſerved to the biſhop, and that of ordination ſuperadded; which was their principal diſtinction, and the mark of their ſovereignty in their dioceſe.

According to the ancient eccleſiaſtical diſcipline, biſhops were to be married once, and not to put away their wives on pretence of religion; but a ſecond marriage was a diſqualification for this order. If they lived chaſte, they were ranked as confeſſors. Some biſhops, in the middle age, on account of their *regalia* or temporalities, were obliged to a military ſervice called *hoſtis*, by which they were to lead their vaſſals into the field, and attend the king in his military expeditions. This Charlemagne excuſed, and even forbid: but the prohibition was little regarded; ſince we find the thing often practiſed afterwards.

In ancient times, the election of biſhops was veſted in the clergy, and the people of the pariſh, province, or dioceſe; but afterwards, princes and magiſtrates, patriarchs and popes, uſurped that privilege. The election was to be within three months after the vacancy of the ſee; and the perſon to be choſen out of the clergy of that church. Formerly the biſhop claimed a ſhare in the election of an archbiſhop; but this was ſet aſide by the popes. In England, during the Saxon times, all eccleſiaſtical dignities were conferred by the king in parliament. At length, however, after ſeveral conteſts, eſpecially between archbiſhop Anſelm and Henry I. in conſequence of a grant of king John, recognized in Magna Charta, and eſtabliſhed by ſtat. 25 Edw. III. ſtat. 6. § 3. biſhops were elected by the chapters of monks or canons, ſome ſhadow of which ſtill remains in the preſent method of diſpoſing of biſhoprics; but by ſtat. 25 Hen. VIII. cap. 20. the right of nomination was reſtored to the king.

Ordinarily at leaſt three biſhops are required in the ceremony of conſecrating a biſhop; but in ſome caſes a ſingle one ſuffices. Thus indeed it is with the Engliſh ſucceſſion of Proteſtant biſhops. The king being certified of the death of a biſhop by the dean and chapter, and his leave requeſted to elect another, the *congé d'elire* is ſent to them, with a letter miſſive, nominating the perſon whom he would have choſen. The election is to be within twelve days after the receipt of it, otherwiſe the king by letters patent appoints whom he pleaſes; and the chapter, in caſe of refuſing the perſon named by the king, incurs a *præmunire*. After election, and its being accepted of by the biſhop, the king grants a mandate under the great ſeal for confirmation; which the biſhop conſigns to his vicar-general; conſiſting moſtly in a ſolemn citation of ſuch as have any objections to the biſhop elect, a declaration of their contumacy in not appearing, and an adminiſtration of the oaths of allegiance and ſupremacy, of ſimony, and canonical obedience. Sentence being read by the vicar-general, the biſhop is inſtalled in the province of Canterbury by the arch-deacon; the fact is recorded by a public notary; and the biſhop is inveſted with full powers to exerciſe all ſpiritual juriſdictions, though he cannot ſue for his temporalities till after conſecration. Then follows the conſecration by the archbiſhop or ſome other biſhop appointed by lawful commiſſions, and two aſſiſtant biſhops: the ceremony of which is much the ſame as in the Romiſh church, ſave that having put on the epiſcopal robes, the archbiſhop and biſhops lay their hands on the new prelate's head, and conſecrate him with a certain form of words. The proceſs of the tranſlation of a biſhop to another biſhopric only differs in this, that there is no conſecration. The age of a biſhop is to be at leaſt thirty years; and by the ancient diſcipline, none were to be choſen but thoſe who had paſſed through all the inferior orders; but in ſome caſes of neceſſity this was diſpenſed with, and deacons, nay laymen, were raiſed *per ſaltum* to the dignity of the mitre.

The forms of conſecrating biſhops differ in different churches. In the Greek church, the biſhop elect, being by the aſſiſtant biſhops preſented for conſecration, and the inſtrument of election put in his hand; after ſeveral prayers (the firſt called *diaconicum*) demanding conſecration, makes profeſſion of his faith; after which he receives a benediction. He is then interrogated as to the belief of the Trinity; to which he anſwers by a *long profeſſion of faith*, and receives a ſecond benediction. Laſtly, he is aſked what he thinks of the *incarnation?* to which he anſwers in a *third profeſſion of faith;* which is followed by a third benediction: after which the conſecrator gives him the paſtoral ſtaff: then he is led up to the altar; where, after certain prayers, and three croſſes on his head, he receives the *pallium*, if he be an archbiſhop or patriarch; he then receives the kiſs of peace of his conſecrator and two aſſiſtants; and ſitting down, reads, prays, and gives the communion to his conſecrator and others who are preſent.

In the Romiſh church, the biſhop elect being preſented by the elder aſſiſtant to the conſecrator, takes the oath. He is then examined as to his faith; and after ſeveral prayers, the New Teſtament is drawn over his head, and he receives the chriſm or unction on his head. The paſtoral ſtaff, ring, and goſpel, are then given him; and after communion, the mitre is put on his head: each ceremony being accompanied with proper prayers, &c. the conſecration ends with Te Deum. Theſe laſt-mentioned ceremonies are laid aſide in the conſecration of Engliſh biſhops. Nevertheleſs, the book of conſecration ſet forth in the time of Edward VI. and confirmed by act of parliament, in which ſome of them are enjoined, is declared to be the ſtandard for this purpoſe by the thirty-ſixth article.

The function of a biſhop in England may be conſidered as two-fold; *viz.* what belongs to his order, and what belongs to his juriſdiction. To the epiſcopal order belong the ceremonies of dedication, confirmation, and ordination; to the epiſcopal juriſdiction, by the ſtatute law, belong the licenſing of phyſi-

cians, ſurgeons, and ſchoolmaſters, the uniting ſmall pariſhes (though this laſt privilege is now peculiar to the biſhop of Norwich), aſſiſting the civil magiſtrate in the execution of ſtatutes relating to eccleſiaſtical matters, and compelling the payment of tenths and ſubſidies due from the clergy. By the common law, the biſhop is to certify the judges, touching legitimate and illegitimate births and marriages; and by that and the eccleſiaſtical law, he is to take care of the probate of wills and granting adminiſtrations; to collate to benefices, grant inſtitutions on the preſentation of other patrons, command induction, order the collecting and preſerving the profits of vacant benefices for the uſe of the ſucceſſors, defend the liberties of the church, and viſit his dioceſe once in three years. To the biſhop alſo belong ſuſpenſion, deprivation, depoſition, degradation, and excommunication.

All the Engliſh biſhops are peers of the realm, except the biſhop of Sodor and Man; and, as ſuch, ſit and vote in the Houſe of Lords. They are barons in a threefold manner, viz. feudal, in regard to the temporalities annexed to their biſhoprics; by writ, as being ſummoned by writ to parliament; and laſtly, by patent and creation. Accordingly they have the precedence of all other barons, and vote as barons and biſhops; and claim all the privileges enjoyed by the temporal lords, excepting that they cannot be tried by their peers, becauſe, in caſes of blood, they themſelves cannot paſs upon the trial, for they are prohibited by the canons of the church (as already obſerved) to be judges of life and death. They have the title of *Lords and Right Reverend Fathers in God*. Beſides two archbiſhops, there are 24 biſhops in England; excluſive of the biſhop of Sodor and Man, who has no ſeat in the Houſe of Peers: The biſhops of London, Durham, and Wincheſter, take place of the other biſhops, who are to rank after them according to their ſeniority of conſecration. There is now alſo a biſhop in our ſettlement of Nova Scotia. In Scotland, before the Preſbyterian eſtabliſhment, there were two archbiſhoprics and 12 biſhoprics.

Bishop's *Court*, an eccleſiaſtical court, held in the cathedral of each dioceſe, the judge whereof is the biſhop's chancellor, who judges by the civil and canon law; and if the dioceſe be large, he has his commiſſaries in remote parts, who hold what they call *conſiſtory courts*, for matters limited to them by their commiſſion.

Bishop *and his Clerks*, ſome little iſlands and rocks on the coaſt of Pembrokeſhire near St. David's in Wales, which are very dangerous to mariners.

Bishop's-*Aukland*. See Aukland.

Bishop's *Caſtle*, a town of Shropſhire in England, ſeated near the river Clun. It is a corporation, ſends two members to parliament, and its market is much frequented by the Welch. W. long. 2. 55.. N. lat. 52. 30.

Bishop's-*Stortford*, a town of Hertfordſhire in England, ſeated on the ſide of a hill, in E. long. 0. 25. N. lat. 51. 50. It has ſeveral good inns, but the ſtreets are not paved. It has a large church, one Preſbyterian, and one Quaker meeting. Here was formerly a caſtle called *Weymore caſtle*, wherein a garriſon was kept, but no remains of it are now left.

BISHOPING, a term among horſe-dealers, to denote the ſophiſtications uſed to make an old horſe appear young, a bad one good, &c.

BISHOPRIC, the diſtrict over which a biſhop's juriſdiction extends, otherwiſe called a dioceſe. In England there are 24 biſhoprics, beſides that of Sodor and Man; in Scotland, none at all; in Ireland 18.

BISI (Bonaventura), a celebrated miniature painter, was born at Bologna, and was a diſciple of Lucio Maſſari. But his ſole delight was in miniature painting, and in that way he arrived at great excellence. Inſtead of working from his own invention, or original deſign, he employed himſelf to imitate, in ſmall ſize, the pictures of Guido, Correggio, Titian, and other great maſters, and thoſe he finiſhed with aſtoniſhing grace, neatneſs, and beauty. A great number of the works of this maſter are in the Duke's gallery at Modena, and are highly valued. He died in the year 1662, but at what age is unknown.

BISIGNANO, a town of Italy, in the kingdom of Naples, and in the Hither Calabria. It has a ſtrong fort, a biſhop's ſee, and the title of a principality. It is ſeated on a mountain near the river Boccona, in E. long. 16. 40. N. lat. 39. 37.

BISK, or Bisque, in cookery, a rich ſort of broth or ſoup, made of pigeons, chickens, force-meat, mutton-gravy, and other ingredients. The word is French, formed, as ſome think, from *biſcocta*; becauſe the biſque, conſiſting of a diverſity of ingredients, needs ſeveral repeated coctions to bring it to perfection. There is alſo a *demi-biſque*, made at a low expence, in which only half the ingredients are uſed; and a biſque of fiſh, made of carps, minced with their roes and lobſters.

BISKET, a kind of bread prepared by the confectioners, of fine flour, eggs, and ſugar, and roſe or orange water; or of flour, eggs, and ſugar, with aniſeeds and citron-peel, baked again and again in the oven, in tin or paper moulds. There are divers ſorts of biſkets; as ſeed-biſket, fruit-biſket, long-biſket, round-biſket, Naples-biſket, ſponge-biſket, &c.

Sea-Bisket, is a ſort of bread much dried by paſſing the oven twice, to make it keep for ſea-ſervice. For long voyages they bake it four times, and prepare it ſix months before the embarkation. It will keep good a whole year, if properly dried. To preſerve ſea-biſket from inſects, Mr. Hales adviſes to make the fumes of burning brimſtone paſs through the caſks full of bread. Biſket may be likewiſe preſerved a long time, by keeping it in caſks well calked, and lined with tin. The ancients had their biſket prepared after the like manner, and for the like uſe, as the moderns. The Greeks called it *αρτον δισπορον*, *q. d.* bread put twice to the fire. The Romans gave it the name of *panis nauticus*, or *capta*. Pliny denominates it *vetus aut nauticus panis tuſus atque iterum coctus*. By which it appears, that, after the firſt baking, they ground or pounded it down again for a ſecond. In ſome middle-age writers, it is called *paximas*, *paximus*, and *panis paximatus*. Among the Romans, we alſo meet with a kind of land-biſket for the camp-ſervice, called *buccellatum*, ſometimes *expeditionalis annona*, which was baked much, both to make it lighter for carriage, and leſs liable to corrupt, the coction being continued till the bread was reduced one-fourth of its former weight.

BISKOP. See Bischop.

BISMILLAH, a ſolemn form uſed by the Mahometans at the beginning of all their books and other writings, ſignifying, *In the name of the moſt merciful God.*

Bismillah is alſo uſed among the Arabs as a word of invitation to eat. Thus an Arab prince will frequently ſit down to eat in the ſtreet before his own door, and call to all that paſs, even beggars, in this word, who do not fail to come and ſit down to eat with him; for the Arabs are hoſpitable, and have no difficulty in treating their inferiors as if they really were on a footing with them.

BISMUTH, or Tin-glass, one of the ſemi-metals, of a reddiſh or yellowiſh-white colour and a lamellated texture, and moderately hard and brittle, ſo that it not only breaks into pieces under the ſtrokes of the hammer, but may even be beaten to powder. It is the heavieſt of all the ſemimetals, weighing from 9.600 to 9.700, and is ſtill more fuſible than lead. It is found,

1. *Native*. Biſmuth is found more commonly in a native

ſtate than any other metallic ſubſtance. It is uſually cryſtallized in cubes or octagons, or in the form of dendrites or thin laminæ inveſting the ores of other metals, particularly cobalt.

2. *Native Calx of Biſmuth*, in which the metal is mineralized by aërial acid, is either in form of a powder or indurated like mortar. It is frequently of a greeniſh-yellow colour, being mixed with the ores of other metals. The red and yellow part is moſt commonly cobalt ore; though it has often been miſtaken for biſmuth. It is frequently found in glittering particles interſperſed through ſtones of various kinds. Silver, iron, and other metals, are alſo found in it.

3. *Mineralized by the Vitriolic Acid.* This is ſaid to be of a yellowiſh, reddiſh, or variegated colour, and to be found mixed with the calx of biſmuth incruſting other ores.

4. *By Sulphur.* This is found chiefly in Sweden, is of a blueiſh-grey colour, a lamellated texture and teſſelar form like galena, but much heavier; ſometimes preſenting parallel ſtriæ like antimony. It is ſaid to contain cobalt and arſenic as well as biſmuth. It is very fuſible, and the ſulphur it contains may be moſtly ſeparated by ſcoriſication.

5. *By Sulphur and Iron.* This ore is ſaid to be of a lamellar cuneiform texture, and to be found in Norway. This kind of ore yields a fine radiated regulus; for which reaſon it has been ranked among the antimonial ores by thoſe who have not taken proper care to melt from it a pure regulus, or one deſtitute of ſulphur. In Schneeberg they have what is called *columbine* biſmuth and *plumoſe* biſmuth; the former taking its name from the colour, the latter from its texture. The latter is ſaid to contain a great quantity of cobalt.

6. *With Sulphur and Arſenic.* This ore is generally of a whitiſh-yellow or aſh colour, has a ſhining appearance, and is compoſed of ſmall ſcales or plates intermixed with ſmall yellow flakes. Its texture is hard and ſolid; ſometimes it ſtrikes fire with ſteel. It has a diſagreeable ſmell when rubbed; does not effervеſce with acids, but is partially diſſolved by the nitrous acid. The ſolution, diluted with water, becomes a kind of ſympathetic ink; the words written with it on white paper being inviſible when dry, but aſſuming a yellowiſh colour when heated before the fire. There is alſo a grey biſmuth ore of the arſenicated kind, with a ſtriated form, found at Helſingland in Sweden and at Annaberg in Germany. Another of the ſame kind, with variegated colours of red, blue, and yellowiſh-grey, is likewiſe found at Schneeberg in Saxony. At Miſnia in Germany, and at Gillebeck in Norway, it is alſo found ſtriated with green fibres like an amianthus. At Georgenſtadt in Germany, and at Annaberg in Saxony, it is intermixed with reddiſh-yellow ſhining particles, called by the French *Mines de Biſmuth Tigreas*. The *minera biſmuthi arenacea* mentioned by Wallerius and Bomare belongs alſo to the ſame kind of arſenicated ores.

This ſemimetal is ſcarcely altered by expoſure to the light. In cloſe veſſels it ſublimes without any alteration; and if permitted to cool ſlowly, it cryſtallizes in Greek volutes. It cryſtallizes alſo more eaſily than any other metallic ſubſtance. Heated with acceſs of air, its ſurface, when melted, ſoon becomes covered with a greeniſh-grey or brown calx. If the metal be heated at once to ignition, it burns with a ſmall blue flame ſcarcely ſenſible, and the calx evaporates in a yellowiſh ſmoke, which condenſes into flowers of the ſame colour. Mr. Geoffroy obſerved, that the flowers which riſe laſt are of a beautiful yellow colour like orpiment. By expoſure to the heat of a porcelain furnace, a part of the ſemimetal flowed out through a crack in the veſſel, and the portion which remained in the veſſel formed a glaſs of a dirty violet colour, while the biſmuth melted in contact with the external air was yellowiſh. By expoſure to the atmoſphere the ſurface of this metal becomes ſomewhat tarniſhed, and its ſurface covered with a whitiſh ruſt. It is not attacked by water, nor does it combine with earths; but its calces give a greeniſh-yellow tinge to glaſſes. It is employed by pewterers to communicate hardneſs to tin; and may be uſed inſtead of lead in the cupellation of metals. It reſembles lead in many reſpects, and is thought to be equally deleterious if taken internally.

Moſt metallic ſubſtances unite with biſmuth, and are thereby rendered more fuſible than before; hence it is uſed in the making of ſolder, printers types, &c. as well as pewter. When native, it is of a yellowiſh-white colour, and ſo fuſible that it melts at the flame of a candle. By calcination it gains about half an ounce in the pound. This calx is ſaid to promote the vitrification of earths, and of the refractory metallic calces more powerfully than lead, and likewiſe to act as a more violent corroſive on crucibles than the glaſs of lead itſelf. Hence it is preferable to lead for the purification of gold and ſilver, deſtroying more effectually the baſer metals with which they have been adulterated. In all operations of this kind, where ſulphur makes one of the heterogeneous matters to be deſtroyed, biſmuth is of the greateſt ſervice, on account of its forming with ſulphur an extremely fuſible compound, while that of lead and ſulphur proves very refractory.

Biſmuth readily amalgamates with mercury, and the compound formed by this means will adhere to iron. On expoſing the iron, thus coated with amalgam, to a conſiderable heat, the mercury flies off, and the greateſt part of the biſmuth adheres to the iron, which thus looks as if it had been ſilvered. If mixtures of biſmuth with ſome other metals, particularly lead, be amalgamated, the lead becomes ſo thin as to paſs through leather along with the mercury; but on ſtanding, the biſmuth is thrown up to the ſurface in form of a dark-coloured powder, the quickſilver and lead remaining united. From this property it is too often uſed for the purpoſe of adulterating quickſilver; as rendering a very conſiderable portion of lead intimately combined with it. One part of this metal with another of biſmuth, may be united with three of quickſilver, without affecting its fluidity. The quickſilver thus adulterated is not only unfit for medicinal uſes, but even for the common mechanical purpoſes of gilding and ſilvering; as the workmen find, in this caſe, that it leaves a leaden hue upon the gold or ſilver, which ſpoils the fine appearance of the work. If the abuſe happens to be diſcovered, the mercury may be purified by diſtillation to a certain degree, though, according to Boerhaave, it is impoſſible ever to free it totally from a mixture of any of the imperfect metals.

Biſmuth readily unites by cementation with ſulphur, and melts with a more gentle heat than when alone; but on continuing the fire, a ſeparation takes place, the biſmuth falling to the bottom, and a ſulphureous ſcoria ſwimming on the ſurface. Sulphur is likewiſe very readily abſorbed by the calx of biſmuth. A curious needle-formed maſs is the product of their union, in appearance exactly reſembling antimony, but contracting a reddiſh tinge on the outſide by expoſure to the air. The calx cannot take up quite half its weight of ſulphur.

With the compound of calx of biſmuth and ſulphur in a very gentle heat, ſilver melts into a brittle regulus. With a ſtronger fire gold alſo unites with it, forming a brittle compound, whoſe particles ſomewhat reſemble an ore, with ſome ſtriæ and ſhining ones among them. Copper melts with it in a gentle heat, and the compound retains a remarkable degree of fuſibility: on the addition of lead a new combination takes place; the copper and ſulphur riſe to the top in ſcoria reſembling an ore, whilſt the biſmuth and lead unite into a regulus at the bottom. Zinc and biſmuth will not unite; the former melting and burning on the ſurface as it does by itſelf. Equal parts of lead, tin, and biſmuth, form a blackiſh ſparkling compound reſembling the ſmall dried ores of lead.

The ſpecific gravity of a mixture of biſmuth and copper is exactly the mean betwixt that of the two ingredients unmixed. With iron the compounds are ſpecifically lighter than each of the ingredients; but with gold, ſilver, tin, lead, and regulus of antimony, they turn out heavier than either of the ingredients.

Biſmuth reduced to powder, and applied with the white of an egg to turned wood, makes it look as if it had been ſilvered, after being properly dried and rubbed over with an hard poliſher. Some pretend that the calx of biſmuth, by long reverberation, becomes red like that of lead; but this is found to be a miſtake. In this caſe it ſcarcely even retains the form of a calx; for a part of the biſmuth is ſoon revived into its metallic ſtate by the contact of the flame. None of the deſtructible metallic ſubſtances are capable of being revived ſo eaſily as biſmuth. The calx heated ſtrongly in a cloſe veſſel melts into glaſs.

This ſemimetal is moſt commonly lodged in cobalt-ores; which, when of a high red, or peach-bloom colour, are called *biſmuth bloom* or *flowers of biſmuth*. It has been ſuppoſed, that biſmuth communicates to glaſs the ſame blue colour with cobalt, becauſe the droſs which remains after the biſmuth has been melted out, and called by the ſmelters *biſmuth-grain*, ſometimes produces that effect. But as no ſuch grains or colouring-matter remains from pure biſmuth, it is plain, that this property muſt depend on ſomething mixed with the ſemimetal, and which was undoubtedly nothing but ſome cobalt-ore united with the biſmuth. To the ſame mixture we muſt aſcribe the property which biſmuth-ore has of making ſympathetic ink of the ſame kind with that formed directly by ſolution of regulus of cobalt. For this purpoſe a tincture is to be drawn from the ore with nitrous acid, and this afterwards mixed with a ſaturated ſolution of ſea-ſalt, and inſpiſſated, yields a reddiſh ſalt: its watery ſolution is the curious liquor called *Green* SYMPATHETIC *Ink;* though there is an impropriety in calling it *green*, when in fact it is red. If any words are written with this ink on white paper, the characters diſappear as ſoon as dry; but on holding the paper to the fire, they become *green* and legible; on cooling they diſappear again, and this repeatedly any number of times. Bomare informs us, that words written with this ſympathetic ink may alſo be rendered legible, by wetting them with a ſponge or pencil dipped in an aqueous ſolution of *hepar ſulphuris*. The experiment ſucceeds beſt when the tincture drawn from the calcined ore is mixed with a ſolution of one-fourth its weight of ſea-ſalt: this mixture is then evaporated nearly to dryneſs, and the reſiduum diſſolved in water, which forms the ſympathetic ink. If the tincture be mixed with nitre or borax inſtead of ſea ſalt, the characters will become roſe-coloured when warmed; and, by paſſing ſea-ſalt over them, they afterwards become blue; but if mixed with as much alkali as is ſufficient to ſaturate the acid, they change by heat to a purple and red colour. See CHEMISTRY.

BISNAGAR, formerly a very large and powerful kingdom of Aſia, comprehending the kingdoms of Kanara, Meſſowr, Travankor, Madura, Marava, and Tanjour. It was called *Biſnagar* from its capital city, and took the name of *Narſinga* from one of its rajahs or kings. We know nothing certain concerning this kingdom before the year 1520, when Khriſna Rajah, king of Biſnagar, made war with Adel Khan king of Viſiapur, from whom he reſolved to take the city of Rachol, ſituated in the iſland of Salſette near Goa, which he ſaid had belonged to his anceſtors. The king of Biſnagar's army conſiſted of 733,000 foot, 35,000 horſe, 586 elephants with towers on their backs, each of which had four men in it; beſides theſe were 12,000 water-carriers, and the army was followed by 20,000 common women. The city, however, reſiſted this formidable army for three months; at the end of which, Adel Khan came to its relief with an army of 120,000 foot, 18,000 horſe, 150 elephants, and many heavy cannon. In the engagement the king of Biſnagar proved victorious, and almoſt entirely deſtroyed the army of Adel Khan, taking from him 4000 horſes, 100 elephants, 400 cannon, &c. Soon after he took the city by aſſault; but agreed to reſtore the booty taken in the former battle, provided Adel Khan conſented to come and kiſs his foot as the ſovereign lord of Kanara. This baſe condition was accepted, but accidentally prevented from being put in execution. From this time we hear of nothing remarkable till the year 1558, when a Portugueſe of the city of *Meliapur* or *St. Thomas*, on the coaſt of Coromandel, perſuaded Rama Rajah, then king of Biſnagar, to march againſt that place, telling him the plunder would be worth 2,000,000, and that the deſtruction of Meliapur would be of great ſervice to the images in the pagods, which were thrown down by the Chriſtians. The king ſet out accordingly with an army of 500,000 men; but the inhabitants, inſtead of preparing for their defence, ſent him a preſent of 4000 ducats. This ſomewhat appeaſed him: however, he would not enter the city, but ordered the inhabitants of both ſexes, with all their valuable effects, to be brought into his preſence; which being done, he found that the value of their whole ſubſtance did not exceed 80,000 ducats. On this he ordered the informer to be thrown to the elephants, who tore him in pieces; after which he diſmiſſed the citizens, and reſtored all their goods ſo punctually, that only a ſilver ſpoon happening to be miſſing, it was ſought for, and returned to the owner. In 1565 the happy ſtate of this kingdom excited the envy of the kings of Dekan; who, having raiſed an army of 500,000 foot and 50,000 horſe, defeated and killed the king of Biſnagar, though at the head of an army almoſt twice as numerous, and took the royal city itſelf. They are ſaid to have ſpent five months in plundering it, although the inhabitants had before carried off 1550 elephants loaded with money and jewels to the amount of upwards of 100,000,000 of gold; beſides the royal chair for ſtate days, whoſe price could not be eſtimated. The victors, however, found a diamond of the ſize of an ordinary egg, beſides another of a ſize ſomewhat inferior, and ſeveral other jewels of immenſe value. But they were afterwards forced to abandon the kingdom, as being too large for them to keep in their hands. From this time the kingdom of Biſnagar remained pretty much unmoleſted till about the year 1627, when it was ſubdued by Aurengzebe, ſecond ſon to Shah Jehan, and hath ever ſince remained ſubject to the Great Mogul. In ſome places of this kingdom it is ſaid the roads have great foreſts of bamboos on each ſide, which are ſo thick that it is impoſſible for a man to paſs. Theſe foreſts are full of monkeys; and what is ſingular, thoſe on the one ſide ſeem to be enemies to thoſe on the other; for if a baſket of rice is ſet down on the road with a parcel of ſmall ſticks about it, the monkeys on each ſide will come out, and fall a-fighting with the ſticks till one of the parties retreats. This, it is ſaid, is often done by travellers for diverſion. They catch the wild elephants here in pitfalls, and then tame them by means of others already tamed: the latter ſeldom fail of beating the wild ones into good behaviour. The town of Biſnagar is ſituated in E. long. 78. 0. N. lat. 13. 20.

BISNOW, or BISCHNOU, a ſect of the Banians in the Eaſt Indies; they call their god Ram-ram, and give him a wife: they adorn his image with golden chains, necklaces of pearls, and all ſorts of precious ſtones. They ſing hymns in honour of their god, mixing their devotion with dances and the ſound of drums, flageletts, brazen baſons, and other inſtruments. This ſect lives wholly upon herbs and pulſe, butter and milk. In this ſect, the wives do not burn themſelves after their huſbands death, as is practiſed by thoſe of the *ſa-*

marath ſect; but content themſelves with a perpetual widowhood.

BISOMUM, or Disomum, in Roman antiquity, a tomb for two dead bodies, or the aſhes of two. The ancients frequently buried two, three, or four bodies in the ſame ſepulchre, diſpoſed aſide of each other; for it was held an impiety to lay one a-top of another. Hence the ſepulchres of the primitive Chriſtians had the words *biſomi*, *triſomi*, *quadriſomi*, &c. inſcribed on them to indicate the number of bodies depoſited in them.

BISON, in zoology, the trivial name of a ſpecies of bos. See Bos.

BISQUET, or Biskет. See Biskет.

BISSAGOS, a cluſter of iſlands on the coaſt of Negroland in Africa, ſituated between the mouth of the river Gambia and Rio Grande. Their names are, *Bulam*, *Ceſſuabac*, *La Gallinci*, *Cazegut*, *Calacha*, and *Oranguana*, with ſome other ſmall iſlands; but the only one which merits attention is that of Bulam. See Bulam. Each of theſe iſlands is governed by a king of its own; and as all thoſe petty monarchs are quite independent, they frequently make war with each other, yet they always unite againſt the inhabitants of Biafara, who are their common enemies. They have canoes that carry from 25 to 40 men with their proviſions and arms, which are ſabres, and bows and arrows. The inhabitants are negroes; who are tall, ſtrong and healthy, though they live only on fiſh, nuts, and palm-oil; chooſing rather to ſell the rice, millet, and other grain produced in their country, to the Europeans, than not to gratify their paſſion for trinkets and ornaments. In general, they are idolaters; cruel and ſavage in their diſpoſition, not only to ſtrangers but to one another, when they happen to quarrel, as they frequently do about trifles; and if they happen to be diſappointed of their revenge, they frequently deſtroy themſelves.

BISSAO, an iſland on the coaſt of Africa, a few leagues to the ſouth-eaſt of the river Gambia, and ſeparated from the continent only by the channel of the river Geves. In this iſland the French have a factory, and there is alſo a fort belonging to the Portugueſe, at both of which a great trade is carried on. The iſland is about 35 or 40 miles in circumference, having an agreeable proſpect to the ſea, from which it riſes by a gentle aſcent, on every ſide, to an eminence in the centre of the iſland. There are however a great many hills inferior in height to that in the middle, and ſeparated by beautiful and fertile valleys divided by little rivulets, which at the ſame time augment the richneſs and elegance of the ſcene. So rich is the ſoil of Biſſao, that wheat and maize ſpring up to the ſize of Indian corn, or rather reſemble a field covered over with reeds or bamboos. The cattle alſo are of an extraordinary ſize, and ſeem to keep pace with the extravagant growth of the corn. Milk and wine are in the greateſt abundance; but the iſland affords neither hogs nor horſes. The former are forbid by the natives to be imported; and ſomething in the ſoil or climate renders it unfit for the increaſe of the latter, which never thrive here. The dreſs of the men of all ranks in Biſſao is only a ſkin fixed to the girdle before and behind. The dreſs of the married women conſiſts of a cotton petticoat; but virgins go entirely naked, wearing only bracelets of different kinds on their arms and legs. If they are of high quality, their bodies are marked or painted with a variety of hideous forms of ſnakes and other figures, which, as their colour is jet-black, gives their ſkins ſomewhat the appearance of flowered ſattin. Even the princeſs royal herſelf, the eldeſt daughter of the emperor, is only diſtinguiſhed from other women by the elegance of thoſe paintings and the richneſs of her bracelets. One very extraordinary ornament uſed in this country is a large iron ring with a flat round ſurface on the outſide inſtead of a ſtone, upon which the ring changes with a bit of iron in ſuch a manner as to converſe with the greateſt facility by means of the different ſounds produced; but this kind of language is uſed only among the polite and the great. All the Biſſaons are idolaters, nor has commerce introduced the ſmalleſt change in their manners, but their ideas of religion are exceedingly confuſed. Their chief idol is a little image called *China*, of which the worſhippers give very abſurd accounts; but, beſides this, every man invents a god for himſelf: trees are held ſacred; and if not adored as gods, are worſhipped as the reſidence of ſome divinity. The government is deſpotic, the will of the emperor being a law to his people. Of this we have an inſtance in Biſſao, not to be matched in any other country whatever. This is no other than a preſent which one ſubject may make of the houſe and eſtate of his neighbour to the emperor: and as it is moſt commonly his majeſty's pleaſure to accept of ſuch preſents, the proprietor dares not reſiſt, but immediately ſets about building another houſe, though even this he cannot do without the prince's leave; and if this ſhould not be readily granted, he muſt live with his family in the open air till this difficulty is removed.

BISSART (Peter), profeſſor of canon law in the univerſity of Bononia in Italy, was deſcended from the earls of Fife in Scotland, and born in that county in the reign of James V. He was educated at St. Andrew's: from thence he removed to Paris; and, having ſpent ſome time in that univerſity, proceeded to Bononia, where he commenced doctor of laws, and was afterwards appointed profeſſor of canon law. He continued in that honourable employment ſeveral years with great reputation, and died in the year 1568. He is ſaid to have been not only a learned civilian, but an excellent poet, orator, and philoſopher. *Petri Biſſarti opera omnia*, *viz. poemata*, *orationes*, *lectiones feriales*, *&c. Lib. de irregularitate*, *&c.* were publiſhed at Venice in 1565, 4to.

BISSENPOUR, a ſmall diſtrict of the kingdom of Bengal, in the Eaſt Indies, which has all along preſerved its independence. It has been governed time immemorial by a Bramin family of the tribe of Rajah-puts. Here the purity and equity of the ancient political ſyſtem of the Indians is found unadulterated. This ſingular government, the fineſt and moſt ſtriking monument in the world, has till now been beheld with too much indifference. We have no remains of ancient nations but braſs and marble, which ſpeak only to imagination and conjecture, thoſe uncertain interpreters of manners and cuſtoms that no longer exiſt. Were a philoſopher tranſported to Biſſenpour, he would immediately be a witneſs of the life led by the firſt inhabitants of India many thouſand years ago; he would converſe with them; he would trace the progreſs of this nation, celebrated as it were from its very infancy; he would ſee the riſe of a government which, being founded in happy prejudices, in a ſimplicity and purity of manners, in the mild temper of the people, and the integrity of the chieftains, has ſurvived thoſe innumerable ſyſtems of legiſlation which have made only a tranſitory appearance on the ſtage of the world with the generations they were deſigned to torment. More ſolid and durable than thoſe political ſtructures, which, raiſed by impoſture and enthuſiaſm, are the ſcourges of human kind, and are doomed to periſh with the fooliſh opinions that gave them birth, the government of Biſſenpour, the offſpring of a juſt attention to order and the laws of nature, has been eſtabliſhed and maintained upon unchangeable principles, and has undergone no more alteration than thoſe principles themſelves. The ſingular ſituation of this country has preſerved to the inhabitants their primitive happineſs and the gentleneſs of their character, by ſecuring them from the danger of being conquered, or of imbruing their hands in the blood of their fellow-creatures. Nature has ſurrounded them with water;

and they need only open the ſluices of their rivers to overflow the whole country. The armies ſent to ſubdue them have ſo frequently been drowned, that the plan of enſlaving them has been laid aſide; and the projectors of it have thought proper to content themſelves with a mere ſhow of acquieſcence.

Liberty and property are ſacred in Biſſenpour. Robbery, either public or private, is never heard of. As ſoon as any ſtranger enters the territory, he comes under the protection of the laws, which provide for his ſecurity. He is furniſhed with guides at free coſt, who conduct him from place to place, and are anſwerable for his perſon and effects. When he changes his conductors, the new ones deliver to thoſe they relieve an atteſtation of their conduct, which is regiſtered and afterwards ſent to the Raja. All the time he remains in the country, he is maintained and conveyed with his merchandiſe at the expence of the ſtate, unleſs he deſires leave to ſtay longer than three days in the ſame place. In that caſe, he is obliged to defray his own expences; unleſs he is detained by any diſorder, or other unavoidable accident. This beneficence to ſtrangers is the conſequence of the warmth with which the citizens enter into each others intereſts. They are ſo far from being guilty of an injury to each other, that whoever finds a purſe, or other thing of value, hangs it upon the firſt tree he meets with, and informs the neareſt guard, who give notice of it to the public by beat of drum. Theſe maxims of probity are ſo generally received, that they direct even the operations of government. Out of about 350,000l. on an average it annually receives, without injury to agriculture or trade, what is not wanted to ſupply the unavoidable expences of the ſtate, is laid out in improvements. The Raja is enabled to engage in theſe humane employments, as he pays the Moguls only what tribute and at what times he chooſes.

BISSEXTILE, in chronology, a year conſiſting of 366 days, being the ſame with our leap-year. See CHRONOLOGY.

BISTI, in commerce, a ſmall coin of Perſia. Some ſay that it is among the current ſilver coins of Perſia, and worth only a little above three farthings of our money; others ſpeak of it again as a money of account.

BISTORT, or KNOTGRASS, in botany, the trivial name of a ſpecies of polygonum. See POLYGONUM.

BISTOURY, in ſurgery, an inſtrument for making inciſions; of which there are different kinds, ſome being of the form of a lancet, others ſtraight and fixed in the handle like a knife, and others crooked with the ſharp edge on the inſide.

BISTRE, among painters, ſignifies the burnt oil extracted from the ſoot of wood. It is of a brown tranſparent colour, having much the ſame effect in water-painting, where alone it is uſed, as brown pink has in oil. Though this colour is extremely ſerviceable in water-colours, and much valued by thoſe who know and can procure it; yet it is not in general uſe here, perhaps on account of its not being eaſily procured of a perfect kind; hardly any of it being good, except that imported from France. Perhaps the principal reaſon for this is, that dry beech-wood affords the beſt ſoot for making it: and it is not eaſy to procure ſuch here without mixture of the ſoot of green wood, or other combuſtibles that deprave it for this purpoſe: or it is poſſible that they who have pretended to prepare it, have been ignorant of the proper means; there not being any directions in books that treat of theſe matters, from whence they could learn the proper proceſs. Biſtre may, however, be prepared with great eaſe in the following manner. Take any quantity of the ſoot of dry wood, but let it be of beech wherever that can be procured. Put it into water in the proportion of two pounds to a gallon; and boil them half an hour: then after the fluid has ſtood ſome little time to ſettle, but while yet hot, pour off the clearer part from the earthy ſediment at the bottom; and if on ſtanding longer it forms another earthy ſediment, repeat the ſame proceſs, but this ſhould be done only while the fluid remains hot: evaporate then the fluid to dryneſs; and what remains will be good biſtre, if the ſoot was of a proper kind.—The goodneſs of biſtre may be perceived by its warm deep brown colour, and tranſparency when moiſtened with water.

BISTRICZ, a handſome ſtrong town of Tranſilvania, ſeated on a river of the ſame name, in E. long. 25. 3. N. lat. 47. 33.

BIT, or BITT, an eſſential part of a bridle. Bits are of different kinds. 1. The muſrol, ſnaffle, or watering-bit. 2. The cannon-mouth, jointed in the middle. 3. The cannon with a faſt mouth, all of a piece, only knee'd in the middle, to form a liberty or ſpace for the tongue; fit for horſes too ſenſible, or tickliſh, and liable to be continually bearing on the hand. 4. The cannon-mouth, with the liberty in form of a pigeon's neck; proper where a horſe has too large a tongue. 5. The cannon with a port mouth, and an upſet or mounting liberty; where a horſe has a good mouth, but large tongue. 6. The ſcatch-mouth, with an upſet; ruder but more ſecure than a cannon-mouth. 7. The cannon-mouth with a liberty; proper for a horſe with a large tongue, and round bars. 8. The maſticadour or ſlavering bit, &c. The ſeveral parts of a ſnaffle, or curb-bit, are the mouth-piece, the cheeks and eyes, guard of the cheek, head of the cheeks, the port, the welts, the campanel or curb and hook, the boſſes, the bolſters and rabbets, the water-chains, the ſide-bolts, and rings, kirbles of the bit or curb, trench, top-rol, flap and j eve. The importation of bits for bridles is now prohibited by an act of parliament.

BIT, or *Bitts*, in ſhip-building, the name of two great timbers, uſually placed abaft the manger, in the ſhip's loof, through which the croſs-piece goes: the uſe of it is to belay the cable on, while the ſhip is at anchor.

BIT is alſo uſed in commerce for a piece of coin current in Jamaica, and valued at 7½d.

BITBURGH, a town of the Netherlands, in the duchy of Luxemburg. E. long. 6. 43. N. lat. 50. 0.

BITCH, the female of the dog kind. See CANIS.

BITCHE, a town of Lorraine, capital of a territory of the ſame name, and ſeated at the foot of the mountains near the river Swolbe. E. long. 7. 44. N. lat. 49. 5.

BITETO, a town of Italy, in the kingdom of Naples, and in the Terra di Bari. E. long. 16. 56. N. lat. 41. 8.

BITHYNIA, an ancient kingdom of Aſia, formerly known by the names of *Myſia*, *Mygdonia*, *Babrycia*, *Mariandynia*, and *Bithynia*. It was bounded on the weſt by the Boſphorus Thracius and part of the Propontis, on the ſouth by the river Rhyndacus and mount Olympus, on the north by the Euxine ſea, and on the eaſt by the river Parthenius. The chief cities were *Myrlea*, *Nicomedia*, *Chalcedon*, *Heraclea*, and *Pruſa*.—As to its hiſtory we find nothing of moment recorded; except the famous conduct of Pruſſias, one of its kings, in delivering up to the Romans, Hannibal, the great Carthaginian general, who fled to him for protection. His great grandſon Nicomedes IV. bequeathed the kingdom to the Romans. From them it was taken by the Turks, to whom it ſtill remains ſubject, but has no modern name.

BITONTO, an epiſcopal town of Italy, in the kingdom of Naples and Terra di Bari. It is ſeated in a plain eight miles ſouth of the gulph of Venice, in E. long. 16. 52. N. lat. 41. 13.

BITTACLE. See BINNACLE and Plate 60.

BITTER, an epithet given to all bodies of an oppoſite

taſte to ſweetneſs. For the medical virtues of bitters, ſee MATERIA MEDICA.

BITTER, a ſea-term, ſignifying any turn of the cable about the bits, ſo as that the cable may be let out by little and little. And when a ſhip is ſtopped by a cable, ſhe is ſaid *to be brought up by a bitter*. Alſo that end of the cable which is wound about the bits is called *the bitter end of the cable*.

BITTER-*Apple*, in botany. See COLOCYNTHIS.

BITTER-*Salt*. See EPSOM-*Salt*.

BITTER-*Sweet*, in botany. See SOLANUM.

BITTERN, in ornithology. See ARDEA.

BITTERN, in the ſalt-works, the brine remaining after the ſalt is concreted. This they ladle off, ſo that the ſalt may be taken out of the pan, and afterwards put in again; when, being farther boiled, it yields more ſalt. See SALT.

BITUMENS, in natural hiſtory, are oily matters, of a ſtrong ſmell, and of different conſiſtencies, which are found in many places within the earth. See CHEMISTRY.

BITUMEN JUDAICUM. See ASPHALTUM.

BITUREX, BITURIGES, or *Biturices*, afterwards corrupted to *Bourges*; the name of *Avaricum*, from the cuſtom of the lower age of calling towns from the names of the people.

BIVALVES, a term ſometimes uſed for ſuch ſhells as conſiſt of two pieces, as the muſcle.—It is alſo an appellation given by botaniſts to ſuch pods or capſules as conſiſt of two valves incloſing the ſeeds.

BIVENTER, in anatomy, called alſo *digaſtric*, or *two-bellied*, a muſcle of the lower jaw. See ANATOMY, *Table of the Muſcles*.

BIUMBRES, in geography, an appellation given to the inhabitants of the torrid zone, by reaſon, at two different ſeaſons of the year, their ſhadows are projected two different ways. The biumbres are the ſame with thoſe otherwiſe denominated *amphiſcii*.

BIXA, the ROUCOU or *Arnotto-Tree*; a genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The corolla is ten-petalled; the calyx quinquedented; the capſule hiſpid and bivalved. Of this genus there is but one ſpecies known, *viz.* the *orellana*, a native of the warm parts of America. This riſes with an upright ſtem to the height of eight or ten feet, ſending out many branches at the top forming a regular head, garniſhed with heart-ſhaped leaves ending in a point, and having long footſtalks. The flowers are produced in looſe panicles at the end of the branches: theſe are of a pale peach colour, having large petals, and a great number of briſtly ſtamina of the ſame colour in the centre. After the flower is paſt, the germen becomes a heart-ſhaped, or rather a mitre-ſhaped, veſſel, covered on the outſide with briſtles opening with two valves, and filled with angular ſeeds. Theſe ſeeds are covered with a red waxen pulp or pellicle, from which the colour called ANOTTA is prepared, according to the proceſs deſcribed under that article. Theſe plants, in the countries where they grow, thrive beſt in a cool rich ſoil, and ſhoot moſt luxuriantly near ſprings and rivulets. With us, they may be propagated by ſeeds procured from America. Theſe are to be ſown in pots in the ſpring, and plunged in a bed of tanners' bark: the plants muſt afterwards be removed into ſeparate pots, and always kept in the ſtove.

BIZARRE, denoting *capricious*, &c. a term uſed among floriſts for a particular kind of carnation, which has its flowers ſtriped or variegated with three or four colours.

BIZARRO, in the Italian muſic, denotes a fanciful kind of compoſition, ſometimes faſt, ſlow, ſoft, ſtrong, &c. according to the fancy of the compoſer.

BIZOCHI, or BISOCHI, in church-hiſtory, certain heretical monks, ſaid to have aſſumed the religious habit contrary to the canons, rejected the ſacraments, and maintained other errors.

BLACK, a well known colour, ſuppoſed to be owing to the abſence of light, moſt of the rays falling upon black ſubſtances being not reflected but abſorbed by them. Concerning the peculiar ſtructure of ſuch bodies as fits them for appearing of this or that particular colour, ſee the article COLOUR. On black colours in general, we have the following remarks in Dr. Lewis's Philoſophical Commerce of the Arts, p. 317.

"1. Of black, as of other colours, there are many ſhades or varieties; different bodies, truly and ſimply black, or which have no ſenſible admixture of any of the reſt of the colours, as black velvet, fine black cloth, the feathers of the raven, &c. appearing, when placed together, of tints very ſenſibly different.

"2. One and the ſame body alſo aſſumes different degrees of blackneſs, according to the diſpoſition of the ſenſible part of its ſurface; and in this reſpect, there is not, perhaps, any other colour which is ſo much affected by an apparent mechaniſm. Thus black velvet, when the pile is raiſed, appears intenſely black, much more ſo than the ſilk it was made from; but on preſſing the pile ſmooth, it looks pale, and in certain poſitions ſhows ſomewhat even of a whitiſh caſt.

"3. This obſervation is agreeable to the phyſical theory, which aſcribes the blackneſs of bodies to the luminous rays, that fall upon them, being in great part abſorbed or ſtifled in their pores. When the ſurface is compoſed of a multitude of looſe filaments, or ſmall points, with the extremities turned towards the eye, much of the light is ſtifled in the interſtices between them, and the body appears dark: when the filaments are preſſed cloſe, or the ſurface ſmoothed and poliſhed, more of the light is reflected from it, and the intenſity of the blackneſs is diminiſhed; though the beauty may be improved by the gloſſineſs which reſults from the ſmoothing.

"4. There is one caſe, however, in which a high poliſh may, on the ſame principle, produce blackneſs in bodies otherwiſe even white. We find that ſpecula of white metal, or of quickſilvered glaſs, which reflect the rays of light to one point or in one direction, look always dark, unleſs when the eye is directly oppoſed to the reflected rays.

"5. As the abſorption of the luminous rays, except in the caſe juſt mentioned, makes the phyſical cauſe of blackneſs; it is concluded that black bodies receive heat more freely than others. Black marble or tiles, expoſed to the ſun, become ſenſibly hotter than white ones. Black paper is kindled by a burning glaſs much ſooner than white, and the difference is ſtrongly marked: a burning-glaſs, too weak to have any viſible effect at all upon white paper, ſhall readily kindle the ſame paper rubbed over with ink. Hence, black clothes, when wetted, are ſaid to dry faſter; black habits, and rooms hung with black, to be warmer; black mould to be a hotter ſoil for vegetables; and garden walls, painted black, to anſwer better for the ripening of wall-fruit than thoſe of a lighter colour.

"6. It is not however to be affirmed, that the like differences obtain in the impreſſions made by common fire. Black paper, held to the fire, does not ſeem to be affected ſooner, or in a greater degree, than ſuch as is white. It may be proper to obſerve alſo, that the combuſtibility of the paper may be increaſed, by impregnating it with ſubſtances of themſelves not combuſtible, and which give no colour to it. This is the foundation of one of the *ſympathetic* inks, as they are called,

made of a ſtrong ſolution of ſal ammoniac in water, which, though colourleſs when written with on paper, becomes very legible on expoſing the paper to the fire; that is, it occaſions the parts moiſtened with it to ſcorch or burn, before the reſt of the paper is hurt, to a brown or black. All the ſalts I have tried produced this effect in a greater or leſs degree; nitre, alum, tartar, very weakly; ſea-ſalt more ſtrongly; fixed alkaline ſalts ſtill more ſo; ſal ammoniac the moſt ſtrongly of all. Metallic ſolutions, made in acids, and diluted ſo as not to corrode the paper, acted in the ſame manner.

"7. Beſides the ſimple blacks, there are a multitude of compound ones, inclining more or leſs to other colours. Thus the painters have blue-blacks, brown-blacks, &c. which may be made by mixing pigments of the reſpective colours with ſimple black ones, in greater or leſs quantity, according to the ſhade required. The dyers alſo have different blacks, and often darken other colours by ſlightly paſſing them through the black dyeing liquor; but the term *brown black* is in this buſineſs unknown, brown and black being here looked upon as oppoſite to one another. In effect, the colour called *brown-black* is no other than that which ill-dyed black clothes change to in wearing: no wonder then that it is excluded from the catalogue of the dyers colours.

"8. The true or ſimple blacks, mixed with white, form different ſhades of grey, lighter or darker according as the white or black ingredients prevail in the mixture. The black pigments, ſpread thin upon a white ground, have a like effect.

"9. Hence the painter, with one true black pigment, can produce on white paper, or on other white bodies, all the ſhades of grey and black, from the ſlighteſt diſcoloration of the paper up to a full black: and the dyer produces the ſame effect on white wool, ſilk, or cloth, by continuing the ſubjects for a ſhorter or longer time in the black bath, or making the bath itſelf weaker or ſtronger.

"10. Hence alſo the dilution of black pigments with white, or the ſpreading of them thin upon a white ground, affords a ready method of judging of the quality or ſpecies of the colour; which, if it be a true black, will in this diluted ſtate look of a pure or ſimple grey; but if it has a tendency to any other colour, that colour will now betray itſelf.

"11. All the colours in a very deep or concentrated ſtate approach to blackneſs. Thus the red liquor prepared by boiling or infuſing madder-root in water, and the yellow decoction or infuſion of liquorice-root, evaporated in a gentle heat till they become thick, look of a dark black colour, or of a colour approaching to blackneſs; and theſe thick maſſes, drawn out into ſlender ſtrings, or diluted with water, or rubbed on paper, exhibit again the red and yellow colours which the liquors had at firſt. Nature affords many black objects, whoſe blackneſs depends upon the ſame principle, being truly a concentration of ſome of the other colours. Thus in blackberries, currants, elderberries, &c. what ſeems to be black is no other than an opaque deep red: their juice appears black when its ſurface is looked down upon in an opaque veſſel, but red when diluted or ſpread thin. The black flint, as it is called, of the iſland of Aſcenſion, held in thin pieces between the eye and the light, appears greeniſh; and one of the deep black ſtones called *black agate*, viewed in the ſame manner, diſcovers its true colour to be a deep red."

The moſt remarkable black colour of a vegetable kind, of which we have any knowledge, is the juice of the anacardium orientale, which poſſibly may be the tree that produces the excellent black varniſh of China and Japan. The juices of moſt aſtringent vegetables however produce a black with iron; and for this purpoſe ſome of them are uſed in dyeing and calico-printing, for the particulars of which, ſee the article DYEING. There are alſo a number of black colours artificially prepared for the uſe of painters, ſuch as lamp-black, ivory-black, German black, &c. for an account of the preparation and qualities of which, ſee the article COLOUR-*Making*.

BLACK-*Act*; the ſtatute of 9 Geo. I. c. 22. is commonly called the *Waltham black act*, becauſe it was occaſioned by the devaſtations committed near Waltham in Eſſex, by perſons in diſguiſe, or with their faces blacked. By this ſtatute it is enacted, that perſons hunting armed and diſguiſed, and killing or ſtealing deer, or robbing warrens, or ſtealing fiſh out of any river, &c. or any perſons unlawfully hunting in his majeſty's foreſts, &c. or breaking down the head of any fiſh-pond, or killing, &c. of cattle, or cutting down trees, or ſetting fire to houſe, barn, or wood, or ſhooting at any perſon, or ſending letters either anonymous or ſigned with a fictitious name demanding money, &c. or reſcuing ſuch offenders, are guilty of felony, without benefit of clergy. This act is made perpetual by 31 Geo. II. c. 42.

BLACK-*Bird*, in ornithology. See TURDUS.

BLACK-*Book of the Exchequer*. See BARONS *of the Exchequer*.

BLACK-*Books*, a name given to thoſe which treat of necromancy. The black-book of the Engliſh monaſteries was a detail of the ſcandalous enormities practiſed in religious houſes, compiled by order of the viſitors under King Henry VIII. to blacken, and thus haſten their diſſolution.

BLACK-*Cap*, in ornithology. See MOTACILLA.

BLACK *Cock*. See TETRAO.

BLACK-*Eagle*. See FALCO.

BLACK *Eunuchs*, in the cuſtoms of eaſtern nations, are Ethiopians caſtrated, to whom their princes commit the care of their women. See EUNUCH.

BLACK-*Foreſt*, a foreſt of Germany, in Suabia, running from north to ſouth between Ortnau, Briſgaw, part of the duchy of Wirtemberg, the principality of Fuſtemburg towards the ſource of the Danube, as far as the Rhine above Baſil. It is part of the ancient Hyrcanian foreſt.

BLACK-*Friars*, a name given to the dominican order; called alſo *predicants* and *preaching friars*; in France, *jacobins*.

BLACK-*Jack*, or *Blend*, is a mineral called alſo *falſe galena*, *blinde*, &c. See BLINDE.

BLACK-*Land*, in agriculture, a term by which the huſbandmen denote a particular ſort of clay ſoil, which, however, they know more by its other properties than by its colour, which is rarely any thing like a true black, and often but a pale grey. This, however pale when dry, always blackens by means of rain; and when ploughed up at theſe ſeaſons it ſticks to the ploughſhares, and the more it is wrought the muddier and duſkier coloured it appears. This ſort of ſoil always contains a large quantity of ſand, and uſually a great number of ſmall white ſtones.

BLACK-*Lead* (*Plumbago*). See *Black*-LEAD.

BLACK-*Leather*, is that which has paſſed the curriers hands, where, from the ruſſet as it was left by the tanners, it is become black, by having been ſcored and rubbed three times on the grain-ſide with a ſolution of vitriolated iron, or as it is vulgarly called, *copperas*. See LEATHER.

BLACK-*Legs*, a name given in Leiceſterſhire to a diſeaſe frequent among calves and ſheep. It is a kind of jelly which ſettles in their legs, and often in the neck, between the ſkin and the fleſh. *Black-legs* is alſo a cant term applied in ridicule to ſharpers and jockies who take in unwary perſons at horſe-races, cock fights, &c. Their appearing always in boots is probably the reaſon of their being called *black-legs*.

BLACK-*Mail*, a certain rate of money, corn, cattle, or other matter, anciently paid by the inhabitants of towns in Weſt-

moreland, Cumberland, Northumberland, and Durham, to perſons inhabiting on or near the borders, being men of name, and allied with others in thoſe parts, known to be great robbers and ſpoil-takers; in order to be by them freed and protected from any pillage. Prohibited by 43 El. c. 13. The origin of this word is much conteſted, yet there is ground to hold the word *black* to be here a corruption of blank or white, and conſequently to ſignify a rent paid in a ſmall copper coin called *blanks*. This may receive ſome light from a phraſe ſtill uſed in Picardy, where ſpeaking of a perſon who has not a ſingle halfpenny, they ſay, *il n'a pas une blanque maille*.

Black-*Monks*, a denomination given to the Benedictines, called in Latin *nigri monachi*, or *nigro monachi*; ſometimes *ordo nigrorum*, "the order of blacks."

Black-*Oats*. See Oats.

Black-*Proceſſion*, in eccleſiaſtical writers, that which is made in black habits, and with black enſigns and ornaments. See Procession. Anciently at Malta there was a black-proceſſion every Friday, where the whole clergy walked with their faces covered with a black veil.

Black-*Rents*, the ſame with black-mail, ſuppoſed to be rents formerly paid in proviſions and fleſh, not in ſpecie.

Black-*Rod*. See Rod.

Black-*Row Grains*, a ſpecies of iron ſtone or ore found in the mines about Dudley in the county of Stafford.

Black-*Sea*. See Euxine-*Sea*.

Black-*Sheep*, in the Oriental hiſtory, the enſign or ſtandard of a race of Turkmans ſettled in Armenia and Meſopotamia; hence called the *dinaſty of the black ſheep*.

Black-*Stones* and *Gems*, according to Dr. Woodward, owe their colour to a mixture of tin in their compoſition.

Black-*Strakes*, a range of planks immediately above the wales in a ſhip's ſide. They are always covered with a mixture of tar and lamp-black.

Black-*Tin*, in mineralogy, a denomination given to the tin-ore when dreſſed, ſtamped, and waſhed ready for the blowing houſe, or to be melted into metal. It is prepared into this ſtate by means of beating and waſhing; and when it has paſſed through ſeveral buddles or waſhing troughs, it is taken up in form of a black powder, like fine ſand, called *black-tin*.

Black-*Wadd*, in mineralogy, a kind of ore of manganeſe, remarkable for its property of taking fire when mixed with linſeed oil in a certain proportion. It is found in Derbyſhire, and is uſed as a drying ingredient in paints; for when ground with a large quantity of oily matter, it loſes the property above-mentioned. See Manganese.

Black-*Water*, the name of two rivers in Ireland; one of which runs through the counties of Cork and Waterford, and falls in Youghal Bay; and the other, after watering the county of Armagh, falls into Lough-Neah.

Black-*Whytlof*, in our old writers, bread of a middle fineneſs betwixt white and brown, called in ſome parts *ravel-bread*. In religious houſes, it was the bread made for ordinary gueſts, and diſtinguiſhed from their houſehold loaf, or *panis conventualis*, which was pure manchet, or white bread.

Black-*Work*, iron wrought by the blackſmith; thus called by way of oppoſition to that wrought by whiteſmiths.

BLACKALL (Dr. Offspring), biſhop of Exeter in the beginning of the 18th century, was born at London 1654, and educated at Catherine-hall, Cambridge. For two years he refuſed to take the oath of allegiance to King William and Queen Mary, but at laſt ſubmitted to the government, though he ſeemed to condemn the Revolution, and all that had been done purſuant to it. He was a man of great piety, had much primitive ſimplicity and integrity, and a conſtant evenneſs of mind. In a ſermon before the houſe of commons, January 30th, 1699, he animadverted on Toland's aſſertion in his Life of Milton, that Charles I. was not the writer of the *Icon Baſilike*, and on ſome inſinuations againſt the authenticity of the Holy Scriptures; which produced a controverſy between him and that author. In 1700 he preached a courſe of ſermons in St. Paul's at Boyle's lecture, which were afterwards publiſhed; and was conſecrated biſhop of Exeter in 1707. He died at Exeter in 1716, and was interred in the cathedral there.

BLACKBANK, a town of Ireland, in the county of Armagh and province of Ulſter, ſeated in W. long. 6. 55. N. lat. 54. 12.

BLACKBERRY, in botany. See Rubus.

BLACKBURN, a town of Lancaſhire in England, ſeated near the river Derwent. It takes its name from the brook Blackwater which runs through it. W. long. 2. 15. N. lat. 53. 40.

BLACKING is a term ſometimes uſed to ſignify a factitious black; as ſhoe-black, &c. A mixture of ivory or lamp-black with linſeed-oil makes the common oil blacking. For a ſhining watery blacking, ſmall-beer is uſed in the proportion of about a pint to two ounces of ivory-black, with the addition of half an ounce of brown ſugar, and a quarter of an ounce of gum arabic. The white of an egg ſubſtituted for the gum makes the black more ſhining; but is ſuppoſed to hurt the leather, and make it apt to crack.

BLACKMORE (Sir Richard), a phyſician, and voluminous writer of theological, poetical, and phyſical works. Having declared himſelf early in favour of the Revolution, King William, in 1697, choſe him one of his phyſicians in ordinary, and conferred the honour of knighthood on him. On Queen Anne's acceſſion, Sir Richard was alſo appointed one of her phyſicians, and continued ſo for ſome time. Dryden and Pope treated the poetical performances of Blackmore with great contempt; and in a note to the mention made of him in the Dunciad, we are informed that his "indefatigable muſe produced no leſs than ſix epic poems: *Prince and King Arthur*, 20 books; *Eliza*, 10; *Alfred*, 12; *The Redeemer*, ſix; beſide *Job*, in folio; the whole book of *Pſalms*; *The Creation*, ſeven books; *Nature of Man*, three books; and many more." But notwithſtanding Blackmore was much ridiculed by the wits, he is not without merit; and Addiſon has, in the Spectator, beſtowed ſome liberal commendations on his poem on the Creation. It muſt be mentioned too in honour of Sir Richard, that he was a chaſte writer, and a warm advocate for virtue, at a time when an almoſt univerſal degeneracy prevailed. He had been very free in his cenſures on the libertine writers of his age; and it was owing to ſome liberty he had taken of this kind, that he drew upon him the reſentment of Mr. Dryden. He had likewiſe given offence to Mr. Pope; for, having been informed by Mr. Curl that he was the author of a traveſtie on the firſt Pſalm, he took occaſion to reprehend him for it in his Eſſay on Polite Learning. Beſides what are above mentioned, Sir Richard wrote ſome theological tracts, and ſeveral treatiſes on the plague, ſmall-pox, conſumptions, the ſpleen, gout, dropſy, &c. and many other poetical pieces. He died October 9, 1729.

BLACKNESS, the quality of a black body; or a colour ariſing from ſuch a texture and ſituation of the ſuperficial parts of a body as does as it were deaden, or rather abſorb, the light falling on it, without reflecting any, or very little of it, to the eye. In that ſenſe, *blackneſs* ſtands directly oppoſed to *whiteneſs*; which conſiſts in ſuch a texture of parts as indifferently reflects all the rays thrown upon it, of what colour ſoever they be.—Deſcartes, ſays Dr. Prieſtley, though miſtaken with reſpect to the nature of light and colours, yet diſtinguiſhes juſtly between black and white; obſerving, that black ſuffocates and extinguiſhes the light that falls upon it, but that white reflects them. See Black.

BLACKS, in phyſiology. See NEGROES.

BLACKS is alſo a name given to an aſſociation of diſorderly and ill-deſigning perſons, who formerly herded chiefly about Waltham in Eſſex, and deſtroyed deer, robbed fiſh-ponds, ruined timber, &c. See BLACK-*Act*.

BLACKSTONE (Sir William), an eminent Engliſh lawyer, was born at London in July 1723. His father, Mr. Charles Blackſtone, a ſilk-man, citizen, and bowyer of London, died ſome months before the birth of our author, who was the youngeſt of four children; and their mother died before he was 12 years old. Even from his birth, the care both of his education and fortune was kindly undertaken by his maternal uncle Mr. Thomas Bigg, an eminent ſurgeon in London, and afterwards on the death of his elder brothers, owner of the Chilton eſtate, which is ſtill enjoyed by that family In 1730, being about ſeven years old, he was put to ſchool at the Charter-houſe; and in 1735 was, by the nomination of Sir Robert Walpole, on the recommendation of Charles Wither, of Hall in Hampſhire, Eſq his couſin by the mother's ſide, admitted upon the foundation there. In this excellent ſeminary he applied himſelf to every branch of youthful education, with the ſame aſſiduity which accompanied his ſtudies through life. His talents and induſtry rendered him the favourite of his maſters, who encouraged and aſſiſted him with the utmoſt attention: ſo that at the age of 15 he was at the head of the ſchool, and, although ſo young, was thought well qualified to be removed to the univerſity. He was accordingly entered a commoner at Pembroke college in Oxford, on the 30th of November 1738, and was the next day matriculated. At this time he was elected to one of the Charter-houſe exhibitions by the governors of that foundation, to commence from the Michaelmas preceding; but was permitted to continue a ſcholar there till after the 12th of December, being the anniverſary commemoration of the founder, to give him an opportunity of ſpeaking the cuſtomary oration which he had prepared, and which did him much credit. About this time alſo he obtained Mr. Benſon's gold prize-medal of Milton, for verſes on that poet. In the February following, the ſociety of Pembroke college unanimouſly elected him to one of Lady Holford's exhibitions for Charter-houſe ſcholars in that houſe. Here he proſecuted his ſtudies with unremitting ardour; and although the claſſics, and particularly the Greek and Roman poets, were his favourites, they did not entirely engroſs his attention: logic, mathematics, and the other ſciences, were not neglected. At the early age of 20, he compiled a treatiſe entitled *Elements of Architecture*, intended for his own uſe only, and not for publication; but it is nevertheleſs eſteemed by thoſe judges who have peruſed it.

Having determined to make choice of the law for his future purſuits, he was entered in the Middle Temple on the 20th of November 1741. He now found it neceſſary to quit the more amuſing purſuits of his youth, for the ſeverer ſtudies to which he had dedicated himſelf; and betook himſelf ſeriouſly to reading law. He expreſſed his diſagreeable ſenſations on this occaſion in a copy of verſes, ſince publiſhed by Dodſley in vol. 4th of his miſcellanies, intitled *The Lawyer's Farewell to his Muſe*; in which the ſtruggle of his mind is expreſſed ſo ſtrongly, ſo naturally, with ſuch elegance of ſenſe and language, and harmony of verſification, as muſt convince every reader that his paſſion for the muſes was too deeply rooted to be laid aſide without much reluctance; and that, if he had purſued that flowery path, he would perhaps have proved inferior to few of our Engliſh poets. Several little fugitive pieces beſides this, have at times been communicated by him to his friends; and he left (but not with a view of publication) a ſmall collection of juvenile pieces, both originals and tranſlations, inſcribed with this line from Horace, *Nec luſiſſe pudet, ſed non incidere ludum*. Some notes on Shakeſpeare, which juſt before his death he communicated to Mr. Steevens, and which were inſerted by him in his laſt edition of that author, ſhow how well he underſtood the meaning, as well as the beauties, of that his favourite among the Engliſh poets.

In November 1743 he was elected into the ſociety of All-Souls' college: and in the November following he ſpoke the anniverſary ſpeech in commemoration of archbiſhop Chicheley the founder, and the other benefactors to that houſe of learning, and was admitted actual fellow. From this period he divided his time between the univerſity and the Temple, where he took chambers, in order to attend the courts: in the former he purſued his academical ſtudies, and on the 12th of June 1745 commenced bachelor of civil law; in the latter he applied himſelf cloſely to his profeſſion, both in the hall and in his private ſtudies, and on the 28th of November 1746 was called to the bar. Though he was little known or diſtinguiſhed in Weſtminſter-hall, he was actively employed, during his occaſional reſidence at the univerſity, in attending to its intereſts, and mingling with and improving its interior concerns. In May 1749, as a ſmall reward for his ſervices, and to give him further opportunities of advancing the intereſts of the college, Mr. Blackſtone was appointed ſteward of their manors. And in the ſame year, on the reſignation of his uncle Seymour Richmond, Eſq. he was elected recorder of the borough of Wallingford in Berkſhire, and received the king's approbation on the 30th of May. The 26th of April 1750, he commenced doctor of civil law, and thereby became a member of the convocation, which enabled him to extend his views beyond the narrow circle of his own ſociety, to the general benefit of the univerſity at large. In the ſummer 1753 he took the reſolution of wholly retiring to his fellowſhip and an academical life, ſtill continuing the practice of his profeſſion as a provincial counſel.

His Lectures on the Laws of England appear to have been an early and favourite idea; for in the Michaelmas term, immediately after he quitted Weſtminſter-hall, he entered on the province of reading them at Oxford; and we are told by the author of his life, that even at their commencement, ſuch were the expectations formed from the acknowledged abilities of the lecturer, they were attended by a very crowded claſs of young men of the firſt families, characters, and hopes; but it was not till the year 1758 that the lectures in the form they now bear were read at the univerſity. Mr. Viner having by his will left not only the copy-right of his Abridgement, but other property to a conſiderable amount, to the univerſity of Oxford, to found a profeſſorſhip, fellowſhips, and ſcholarſhips of common law, he was on the 2?th of October 1758 unanimouſly elected Vinerian profeſſor; and on the 25th of the ſame month read his firſt introductory lecture, which he publiſhed at the requeſt of the vice-chancellor and heads of houſes, and afterwards prefixed to the firſt volume of his Commentaries. His lectures had now gained ſuch univerſal applauſe, that he was requeſted by a noble perſonage who ſuperintended the education of our preſent ſovereign, then prince of Wales, to read them to his royal highneſs; but as he was at that time engaged to a numerous claſs of pupils in the univerſity, he thought he could not, conſiſtently with that engagement, comply with this requeſt, and therefore declined it. But he tranſmitted copies of many of them for the peruſal of his royal highneſs; who, far from being offended at an excuſe grounded on ſo honourable a motive, was pleaſed to order a handſome gratuity to be preſented to him. It is doubtful whether the Commentaries were originally intended for the preſs; but many imperfect and incorrect copies having got abroad, and a pirated edition of them being either publiſhed,

or preparing for publication in Ireland, the learned lecturer thought proper to print a correct edition himself; and in November 1765 published the first volume, under the title of *Commentaries on the Laws of England;* and in the course of the four succeeding years, the remaining parts of this admirable work. It ought to be remarked, that before this period the reputation his lectures deservedly acquired him had induced him to resume his practice in Westminster-hall; and in a course somewhat inverted from the general progress of his profession, he who had quitted the bar for an academic life, was sent back from the college to the bar, with a considerable increase of business. He was likewise elected into parliament, first for Hindon, and afterwards for Westbury in Wilts; but in neither of these departments did he equal the expectations his writings had raised. The part he took in the Middlesex election drew upon him the attack of some persons of ability in the senate, and likewise a severe animadversion of *Junius*, one of the keenest polemical writers in the paper-war of that day. This circumstance probably strengthened the aversion he professed to parliamentary attendance; "where (he said), amidst the rage of contending parties, a man of moderation must expect to meet with no quarter from any side;" and when, on the resignation of Mr. Dunning in 1770, he was offered the place of solicitor-general, he refused that office; but shortly afterwards, on the promotion of Sir Joseph Yeates to a seat in the court of common-pleas, accepted a seat on the bench, and, by the death of Sir Joseph, succeeded him there also. As a judge he was not inactive; but, when not occupied in the duties of his station, was generally engaged in some scheme of public utility. The act for detached houses for hard labour for convicts, as a substitute for transportation, owed its origin in a great measure to his suggestions.

It should also be observed here, that the last augmentation of the judges salaries, calculated to make up the deficiencies occasioned by the heavy taxes they are subject to, and thereby render them more independent, was obtained in a great measure by his industry and attention. This respectable and valuable man died on the 14th of February 1780, in the 50th year of his age.

BLACKWALL (Anthony, A. M.), a learned author, after completing his academical education at Emanuel college, Cambridge, was appointed head master of the free-school at Derby, and lecturer of Allhallows there, where he first distinguished himself in the literary world by an edition of Theognis, printed at London in 1706, and was afterwards head master of the free school at Market-Bosworth in Leicestershire. The Grammar whereby he initiated the youth under his care into Latin, was of his own composing, and so happily fitted for the purpose, that he was prevailed on to make it public, though his modesty would not permit him to fix his name to it, because he would not be thought to prescribe to other instructors of youth. It is intitled, "A New Latin Grammar; being a short, clear, and easy Introduction of young Scholars to the Knowledge of the Latin Tongue; containing an exact Account of the two first Parts of Grammar." In his "Introduction to the Classics," first published in 1718, 12mo, he displayed the beauties of those admirable writers of antiquity, to the understanding and imitation even of common capacities; and that in so concise and clear a manner, as seemed peculiar to himself. But his greatest and most celebrated work was, "The Sacred Classics defended and illustrated; or, An Essay humbly offered towards preserving the Purity, Propriety, and True Eloquence of the Writers of the New Testament," in 2 vols. Mr. Blackwall had the felicity to bring up many excellent scholars in his seminaries at Derby and Bosworth; among others, the celebrated Richard Dawes, author of the *Miscellanea Critica*. A gentleman who had been his scholar, being patron of the church of Clapham in Surrey, presented him to that living as a mark of his gratitude and esteem. This happening late in life, and Blackwall having occasion to wait upon the bishop of the diocese, he was somewhat pertly questioned by a young chaplain as to the extent of his learning. "Boy (replied the indignant veteran), I have forgot more than ever you knew!" He died at Market-Bosworth, April 8, 1730.

BLACKWELL (Thomas), an eminent Scottish writer, was son of a minister at Aberdeen, and born there 1701. He had his grammatical learning at a school in Aberdeen, studied Greek and Philosophy in the Marischal college there, and took the degree of M. A. in 1718. Being greatly distinguished by uncommon parts, and an early proficiency in letters, he was, in December 1723, made Greek professor in the college where he had been educated; and continued to teach that language with applause even to his death. In 1737 was published at London, but without his name, "An Enquiry into the Life and Writings of Homer," 8vo; a second edition of which appeared in 1739; and not long after, "Proofs of the Enquiry into Homer's Life and Writings," which was a translation of the Greek, Latin, Spanish, Italian, and French notes, subjoined to the original work. In 1748 he published "Letters concerning Mythology," 8vo; without his name also. The same year he was made principal of the Marischal college in Aberdeen, and is the only layman who hath been appointed principal of that college since the patronage came to the Crown by the forfeiture of the Marischal family in 1716; all the other principals having been ministers of the church of Scotland. March 1752 he took the degree of doctor of laws: and the year following came out the first volume of his Memoirs of the Court of Augustus, in 4to. The second volume appeared in 1755; and the third, which was posthumous, and left incomplete by the author, was published in 1764. At the same time was published a third edition of the two former volumes which is a proof of the good reception the work met with from the public; though it must be acknowledged that the parade with which it is written, and the peculiarity of its language, exposed it to some severity from the critics.

Soon after this he became principal of his college, and married a merchant's daughter of Aberdeen, by whom he had no children. Several years before his death, his health began to decline: his disorder was of the consumptive kind, and thought to be forwarded by an excess of abstemiousness which he imposed upon himself. His disease increasing, he was advised to travel, and accordingly set out in February 1757; however, he was not able to go farther than Edinburgh, in which city he died the 8th of March following, in his 56th year. He was a very ingenious and very learned man: he had an equable flow of temper, and a truly philosophic spirit, both which he seems to have preserved to the last; for on the day of his death he wrote to several of his friends.

BLACKWELL (Alexander), son of a hosier at Aberdeen, where he received a liberal education, studied physic under Boerhaave at Leyden, took the degree of M. D. and acquired a proficiency in the modern languages. On his return home, happening to stay some time at the Hague, he contracted an intimacy with a Swedish nobleman. Marrying a gentleman's daughter in the neighbourhood of Aberdeen, he proposed practising his profession in that part of the kingdom; but in two years finding his expectations disappointed, he came to London, where he met with still less encouragement as a physician, and commenced corrector of the press for Mr. Wilkins a printer. After some years spent in this employment, he set up as a printer himself; and carried on several large works till 1734, when he became bankrupt. In what manner he subsisted from this event till the above-mentioned application

we do not learn, unleſs it was by the ingenuity of his wife, who publiſhed "A curious Herbal containing 500 cuts of the moſt uſeful Plants which are now uſed in the Practice of Phyſic, engraved on folio copperplates, after drawings taken from the life, by Elizabeth Blackwell. To which is added a ſhort deſcription of the Plants, and their common uſes in Phyſic, 1739," 2 vols. folio. In or about the year 1740 he went to Sweden, and renewing his intimacy with the nobleman he knew at the Hague, again aſſumed the medical profeſſion, and was very well received in that capacity; till turning projector, he laid a ſcheme before his Swediſh majeſty for draining the fens and marſhes, which was well received, and many thouſands employed in proſecuting it under the doctor's direction, from which he had ſome ſmall allowance from the king. This ſcheme ſucceeded ſo well, he turned his thoughts to others of greater importance, which in the end proved fatal to him. He was ſuſpected of being concerned in a plot with Count Teſſin, and was tortured; which not producing a confeſſion, he was behcaded Auguſt 9th 1748; and ſoon after this event appeared "A genuine copy of a Letter from a Merchant in Stockholm, to his Correſpondent in London, containing an impartial Account of Doctor Alexander Blackwell, his plot, trial, character, and behaviour, both under examination and at the place of execution; together with a copy of a paper delivered to a friend upon the ſcaffold."—He poſſeſſed a good natural genius, but was ſomewhat flighty and a little conceited. His converſation, however, was facetious and agreeable; and he might be conſidered on the whole as a well-bred and accompliſhed man.

BLADDER, in anatomy, a thin expanded membranous body, found in ſeveral parts of an animal, ſerving as a receptacle of ſome juice, or of ſome liquid excrement; from whence it takes various denominations, as *urinary-bladder*, *gall-bladder*, &c.

Bladder, by way of eminence, is a large veſſel which ſerves as a receptacle of the urine of animals, after its ſecretion from the blood in the kidneys. This is ſometimes alſo called, by way of diſtinction, the *urinary bladder*, *veſica urinaria*. The bladder is ſituated in the pelvis of the abdomen; in men immediately on the rectum; in women on the vagina. See Anatomy. Though the urinary bladder be naturally ſingle, yet there have been inſtances of nature's varying from herſelf in this particular. The bladder of the famous Caſaubon, upon diſſecting his body after his death, was found to be double; and in the Philoſophical Tranſactions, we have an account of a triple bladder found in the body of a gentleman who had long been ill and no one could gueſs the cauſe. The urinary bladders of brutes are differently contrived from the human bladder, and from each other according to the ſtructure and œconomy of the animal. See *Comparative* Anatomy.

Bladders, when below a certain magnitude, are more uſually denominated by the diminutive term veſicles, *veſiculæ*. Of theſe we meet with many ſorts both in the animal and vegetable world; ſome natural, as in the lungs, eſpecially of frogs; others morbid or preternatural, as the *hydatids*, and alſo thoſe obſervable in the itch. Naturaliſts have likewiſe diſcovered bladders in the thorax and abdomen of birds, as well as others in the belly of fiſhes, called *air-bladders* and *ſwims*.

Vegetable bladders are found every where in the ſtructure of the bark, the fruit, pith, and *parenchyma* or pulp; beſides thoſe morbid veſications raiſed on the ſurface of leaves by the puncture of inſects.

Bladder-*Nut*. See Staphylæa.

Bladder-*Senna*. See Colutea.

BLADE, in commerce, a thin ſlender piece of metal either forged by the hammer, or run and caſt in moulds to be afterwards ſharpened to a point, edge, or the like. Sword-blades are made by the armourers, knife-blades by the cutlers, &c. The Engliſh and Damaſcus blades are moſt eſteemed: among the French, thoſe of Vienne in Dauphiny have the preference. The conditions of a good blade of a ſmall ſword are, that it be light and tough, apter to bend than break. When it will ſtand in the bend, it is called *a poor man's blade*, being badly tempered.

BLADEN, (Martin), a tranſlator and dramatic author, was formerly an officer in the army, bearing the commiſſion of a lieutenant-colonel in queen Anne's reign, under the great duke of Marlborough, to whom he dedicated a tranſlation of Cæſar's Commentaries, which he had completed, and which is to this day a book held in great eſtimation. In 1714, he was made one of the Lords Commiſſioners of Trade and Plantations; and, in 1717, was appointed envoy extraordinary to the court of Spain, in the room of Mr. Brett, but declined it, chooſing rather to keep the poſt he already had, which was worth 1000l. *per annum*, and which he never parted with till his death, which was in May 1746. He was alſo many years member of parliament for the town of Portſmouth. He wrote two dramatic pieces; both of which (for the one is only a maſque introduced in the third act of the other) were printed in the year 1705, without the author's conſent. Their names are, 1. Orpheus and Euridice, a Maſque. 2. Solon, a Tragic Comedy.

BLADUM, in middle-age writers, is taken for all ſorts of ſtanding corn in the blade and ear. The word is alſo written *blatum*, *blava*, and *blavium*. In our old charters, the word bladum included the whole product of the ground, fruit, corn, flax, graſs, &c. and whatever was oppoſed to living creatures. It was ſometimes alſo applied to all ſorts of grain or corn threſhed on the floor. But the word was more peculiarly appropriated to bread-corn, or wheat, called in French *blé*. Thus the Knights Templars are ſaid to have granted to Sir Wido de Meriton's wife *duas ſummas bladi*.

BLAEU (William), a famous printer of Amſterdam, a diſciple and friend of Tycho Brahe's: his Atlas, his Treatiſe of the Globes, Aſtronomical Inſtitutions, &c. and his fine impreſſions, have ſecured his memory. He died in the year 1638.

BLAFART, in commerce, a ſmall coin, current at Cologn, worth ſomething more than a farthing of Britiſh coin.

BLAGRAVE (John), the ſecond ſon of John Blagrave, of Bulmarſh-court near Sunning in Berkſhire, deſcended of an ancient family in that country. From a grammar-ſchool at Reading he was ſent to St. John's college in Oxford, where he applied himſelf chiefly to the ſtudy of mathematics, and without taking any degree, afterwards retired to his patrimonial ſeat of Southcole-lodge near Reading, where he ſpent the remainder of his life. In this manſion he died in the year 1611; and was buried in the church of St. Laurence, where a ſumptuous monument was erected to his memory. Having never married, he bequeathed to all the poſterity of his three brothers, the ſum of 50l. each payable at the age of 26; and he calculated his donation ſo well, that near fourſcore of his nephews and their deſcendants have reaped the benefit of it. He alſo ſettled certain lands at Swallowfield in the ſame county, as a proviſion for the poor for ever. Among other charities, he left ten pounds to be annually diſpoſed of in the following manner: On Good-Friday, the church-wardens of each of the three pariſhes of Reading ſend to the town-hall *one virtuous maid, who has lived five years with her maſter*: there, in the preſence of the magiſtrates, theſe three virtuous maids throw dice for the ten pounds. The two loſers are returned with a freſh one the year following, and again the third year, till each has had three chances. He is ſaid to have been not more remarkable for his mathematical knowledge than for his candour and generoſity to his acquaintance. His works are

1. *A Mathematical Jewel.* Lond. 1585, fol. 2. *Of the Making and Use of the Familiar Staff.* Lond. 1590, 4to. 3. *Astrolabium Uranicum Generale.* Lond. 1596, 4to. 4. *The Art of Dialing.* Lond. 1609, 4to.

BLAIN, among farriers, a distemper incident to beasts, being an encysted tumour growing on the root of the tongue, and pressing against the wind-pipe, so as to occasion suffocation in some instances. It is perceived by the beast's gaping and holding out his tongue, and foaming at the mouth. To cure it, cast the beast, draw forth his tongue, and then, slitting the bladder, wash it gently with vinegar and a little salt, after which nature will complete the cure.

BLAIR (John), a Scottish author, was contemporary with, and the companion, some say the chaplain, of Sir William Wallace, whom he attended in almost all his exploits; and, after the death of that great man, which left so great a stain on the character of Edward I. of England, he wrote his memoirs in Latin. It is to be regretted that the injuries of time have destroyed this work, which might have thrown great light on the history of a very busy and remarkable period. An inaccurate fragment of it only has descended to us, from which little can be learned, and which was published, with a commentary, by Sir Robert Sibbald.

Blair (James), an eminent divine, was born and bred in Scotland, where he had at length a benefice in the episcopal church; but meeting with some discouragements, he came to England, in the latter end of the reign of king Charles II. and was sent by Dr. Compton as a missionary to Virginia, and was afterwards, by the same bishop, made commissary for that colony, the highest office in the church there. He distinguished himself by his exemplary conduct and unwearied labours in the work of the ministry; and finding that the want of proper seminaries for the advancement of religion and learning was a great damp upon all attempts for the propagation of the Gospel, he formed a design of erecting and endowing a college at Williamsburgh, in Virginia, for professors and students in academical learning. He therefore not only set on foot a voluntary subscription; but, in 1693, came to England to solicit the affair at court: when queen Mary was so well pleased with the noble design, that she espoused it with particular zeal; and king William readily concurring with her majesty, a patent was passed for erecting and endowing a college by the name of the *William and Mary college*, of which Mr. Blair was appointed president, and enjoyed that office near 50 years. He was also rector of Williamsburgh, and president of the council in that colony. He wrote, Our Saviour's Divine Sermon on the Mount explained in several Sermons, 4 vols. octavo; and died in the year 1743.

Blair (John), an eminent chronologist, was educated at Edinburgh; and coming to London was for some time usher of a school in Hedge-Lane. In 1754 he gave to the world that valuable publication, intitled, "The Chronology and History of the World from the Creation to the Year of Christ 1753. It was illustrated in LVI Tables; of which four are introductory, and contain the centuries prior to the first Olympiad; and each of the remaining LII contain, in one expanded view, a period of half a century. This volume, which is dedicated to lord chancellor Hardwicke, was published by subscription, on account of the great expence of the plates, for which the author apologized in his preface, where he acknowledged great obligations to the earl of Bath, and announced some chronological dissertations, wherein he proposed to illustrate the disputed points, to explain the prevailing systems of chronology, and to establish the authorities upon which some of the particular æras depend. In January 1755, he was elected a fellow of the Royal Society; and, in 1761, of the Society of Antiquaries. In 1756, he published a second edition of his "Chronological Tables." In Sept. 1757, he was appointed chaplain to the Princess Dowager of Wales, and mathematical tutor to the Duke of York; and on Dr. Townshend's promotion to the deanery of Norwich, the services of Dr. Blair were rewarded, March 10, 1761, with a prebendal stall at Westminster. The vicarage of Hinckley happening to fall vacant six days after, by the death of Dr. Morres, Dr. Blair was presented to it by the dean and chapter of Westminster; and, in August that year, he obtained a dispensation to hold with it the rectory of Burton Coggles in Lincolnshire. In September 1763, he attended his royal pupil the duke of York in a tour to the continent; had the satisfaction of visiting Lisbon, Gibraltar, Minorca, most of the principal cities in Italy, and several parts of France; and returned with the duke in August 1764. In 1768, he published an improved edition of his "Chronological Tables," which he dedicated to the Princess of Wales, who had expressed her early approbation of the former edition. To the new edition were annexed, "Fourteen Maps of Ancient and Modern Geography, for illustrating the Tables of Chronology and History. To which is prefixed a Dissertation on the Progress of Geography." In March 1771, he was presented by the dean and chapter of Westminster to the vicarage of St. Bride's in the city of London; which made it necessary for him to resign Hinckley, where he had never resided for any length of time. On the death of Mr. Sims, in April 1776, he resigned St. Bride's, and was presented to the rectory of St. John the Evangelist in Westminster; and, in June that year, obtained a dispensation to hold the rectory of St. John with that of Horton, near Colebrooke Bucks. His brother captain Blair falling gloriously in the service of his country in the memorable sea-fight of April 12th, 1782, the shock accelerated the doctor's death. He had at the same time the influenza in a severe degree, which put a period to his life, June 24th 1782, since which his "Lectures on the Canons of the Old Testament" have been advertised for publication by his widow.

Blair *of Athol*, a castle belonging to the duke of Athol, seated in the county of Athol in Scotland, 28 miles north-west of Perth. W. long. 3. 30. N. lat. 56. 46. This castle was besieged by the Highland army in 1746; and bravely defended by Sir Andrew Agnew, who was reduced to eat horse's flesh, until he was relieved by the Hessians under the earl of Crawford.

BLAISE, a military order instituted by the kings of Armenia, in honour of St. Blaise, anciently bishop of Sebasta in that country, the patron saint of that nation. Justinian calls them knights of St. Blaise and St. Mary, and places them not only in Armenia, but in Palestine. They made a particular vow to defend the religion of the church of Rome, and followed the rule of St. Basil. The precise year of the institution of the knights of St. Blaise is not known; but they appear to have commenced about the same time with the Knights Templars and Hospitallers; to the former of which they bore a near affinity, the regulars being the same in both.

BLAISOIS, a late province of France, which now forms the department of Loir and Cher. It is bounded on the north by Beauce, on the east by the Orleanois, on the south by Berry, and on the west by Touraine. Blois is the capital town.

BLAKE (Robert), a famous English admiral, born August 1589 at Bridgwater in Somersetshire, where he was educated at the grammar-school. He went from thence to Oxford in 1615, where he was entered at St. Alban's Hall. From thence he removed to Wadham college; and on the 10th of February 1617, he took the degree of bachelor of arts. In 1623, he wrote a copy of verses on the death of Mr. Camden, and soon after left the university. He was tinctured

pretty early with republican principles, and diſliking that ſeverity with which Dr. Laud, then biſhop of Bath and Wells, preſſed uniformity in his dioceſe, he began to fall into the puritanical opinions. His natural bluntneſs cauſing his principles to be well known, the puritan party returned him member for Bridgwater in 1640; and he ſerved in the parliament army with great courage during the civil war: but when the king was brought to trial, he highly diſapproved the meaſure as illegal, and was frequently heard to ſay, *he would as freely venture his life to ſave the king, as ever he did to ſerve the parliament.* But this is thought to have been chiefly owing to the humanity of his temper, ſince after the death of the king he fell in wholly with the republican party, and, next to Cromwell, was the ableſt officer the parliament could boaſt.

In the year 1648-9, he was appointed, in conjunction with Colonel Dean and Colonel Popham, to command the fleet; and ſoon after blocked up Prince Maurice and Prince Rupert in Kinſale harbour. But theſe getting out, Blake followed them from port to port; and at laſt attacked them in that of Malaga, burnt and deſtroyed their whole fleet, two ſhips only excepted, the Reformation in which Prince Rupert himſelf was, and the Swallow commanded by his brother Prince Maurice. In 1652, he was conſtituted ſole admiral; when he defeated the Dutch fleet commanded by Van Trump, Ruyter, and De Wit, in three ſeveral engagements, in which the Dutch loſt 11 men of war, 30 merchant ſhips, and, according to their own accounts, had 15,000 men ſlain. Soon after, Blake and his colleagues, with a grand fleet of 100 ſail, ſtood over to the Dutch coaſt; and forced their fleet to fly for ſhelter into the Texel, where they were kept for ſome time by Monk and Dean, while Blake ſailed northward. At laſt, however, Trump got out, and drew together a fleet of 120 men of war; and, on the 3d of June, the generals Dean and Monk came to an engagement with the enemy off the north Foreland with indifferent ſucceſs: but the next day Blake coming to their aſſiſtance with 18 ſhips, gained a complete victory; ſo that if the Dutch had not ſaved themſelves on Calais ſands, their whole fleet muſt have been ſunk or taken.

In April 1653, the uſurper Cromwell turned out the parliament, and ſhortly after aſſumed the ſupreme power. The States hoped great advantages from this; but were diſappointed Blake ſaid on this occaſion to his officers, "It is not for us to mind ſtate affairs, but to keep foreigners from fooling us." In November 1654, Cromwell ſent him with a ſtrong fleet into the Mediterranean, with orders to ſupport the honour of the Engliſh flag, and to procure ſatisfaction for the injuries that might have been done to our merchants. In the beginning of December, Blake came into the road of Cadiz, where he was treated with all imaginable reſpect: a Dutch admiral would not hoiſt his flag while he was there; and his name was now grown ſo formidable, that a French ſquadron having ſtopped one of his tenders, which had been ſeparated from Blake in a ſtorm, the admiral, as ſoon as he knew to whom it belonged, ſent for the captain on board, and drank Blake's health before him with great ceremony, under a diſcharge of five guns, and then diſmiſſed him. The Algerines were ſo much afraid of him, that, ſtopping the Sallee rovers, they obliged them to deliver up what Engliſh priſoners they had on board, and then ſent them freely to Blake, in order to purchaſe his favour. This, however, did not prevent his coming on the 10th of March before Algiers, and ſending an officer on ſhore to the dey to demand ſatisfaction for the piracies committed on the Engliſh, and the releaſe of all the Engliſh captives. The dey, in his anſwer, alleged, that the ſhips and captives belonged to private men, and therefore he could not reſtore them without offending all his ſubjects, but that he might eaſily redeem them: and if he thought good, they would conclude a peace with him, and for the future offer no acts of hoſtility to the Engliſh: and having accompanied this anſwer with a large preſent of freſh proviſions, Blake left Algiers, and ſailed on the ſame errand to Tunis; the dey of which place not only refuſed to comply with his requeſt, but denied him the liberty of taking in freſh water. "Here (ſaid he), are our caſtles of Goletto and Porto Ferino; do your worſt." Blake, at hearing this, began, as his cuſtom was when highly provoked, to curl his whiſkers; and after a ſhort conſultation with his officers, bore into the bay of Porto Ferino with his great ſhips and their ſeconds; and coming within muſket ſhot of the caſtle and the line, fired on both ſo warmly, that in two hours time the caſtle was rendered defenceleſs, and the guns on the works along the ſhore were diſmounted, though 60 of them played at a time on the Engliſh. Blake found nine ſhips in the road, and ordered every captain to man his long boat with choice men, to enter the harbour and fire the Tuniſians; which they happily effected, with the loſs of 25 men killed and 48 wounded, while he and his men covered them from the caſtle by playing continually on them with their great guns. This daring action ſpread the terror of his name through Africa and Aſia. From Tunis he ſailed to Tripoli, cauſed the Engliſh ſlaves to be ſet at liberty, and concluded a peace with that government. Thence returning to Tunis, the Tuniſians implored his mercy, and begged him to grant them peace, which he did upon terms highly advantageous to England. He next ſailed to Malta, and obliged the knights to reſtore the effects taken by their privateers from the Engliſh; and by theſe great exploits ſo raiſed the glory of the Engliſh name, that moſt of the princes and ſtates in Italy thought fit to pay their compliments to the Protector, by ſending ſolemn embaſſies to him.

Our gallant admiral paſſed the next winter either in lying before Cadiz, or in cruiſing up and down the Straits; and was at his old ſtation, at the mouth of that harbour, when he received information that the Spaniſh plate fleet had put into the bay of Sancta Cruz, in the iſland of Teneriffe: upon this he weighed anchor, with 25 men of war, on the 13th of April 1657; and on the 20th rode with his ſhips off the bay of Sancta Cruz, where he ſaw 16 Spaniſh ſhips lying in the form of a half-moon. Near the mouth of the haven ſtood a caſtle furniſhed with great ordnance; beſides which there were ſeven forts round the bay, with ſix, four, and three guns on each, joined to each other by a line of communication manned with muſketeers. To make all ſafe, Don Diego Diagues, general of the Spaniſh fleet, cauſed all the ſmaller ſhips to be moored cloſe along the ſhore; and the ſix large galleons ſtood farther out at anchor, with their broadſides towards the ſea. Blake having prepared for the fight, a ſquadron of ſhips was drawn out to make the firſt onſet, commanded by Captain Stayner in the Speaker frigate; who no ſooner received orders, than he ſailed into the bay, and fell upon the Spaniſh fleet, without the leaſt regard to the forts, which ſpent their ſhot prodigally upon them. No ſooner were theſe entered into the bay, but Blake, following after, placed ſeveral ſhips to pour broadſides into the caſtle and forts; and theſe played their parts ſo well, that, after ſome time, the Spaniards found their forts too hot to be held. In the mean time, Blake ſtruck in with Stayner, and bravely fought the Spaniſh ſhips, out of which the enemy were beaten by two o'clock in the afternoon; when Blake, finding it impoſſible to carry them away, ordered his men to ſet them on fire; which was done ſo effectually, that they were all reduced to aſhes, except two, which ſunk downright, nothing remaining above the water but part of the maſts. The Engliſh having now obtained a complete victory, were reduced to another difficulty by the wind, which blew ſo ſtrong into the bay, that they deſpaired of getting out. They lay under the fire of the caſtles and of all the forts, which muſt in a

little time have torn them to pieces. But the wind ſuddenly ſhifting, carried them out of the bay; where they left the Spaniards in aſtoniſhment at the happy temerity of their audacious victors. This is allowed to have been one of the moſt remarkable actions that ever happened at ſea. "It was ſo miraculous (ſays the Earl of Clarendon), that all men who knew the place wondered that any ſober man, with what courage ſoever endowed, would ever have undertaken it; and they could hardly perſuade themſelves to believe what they had done; whilſt the Spaniards comforted themſelves with the belief, that they were devils and not men who had deſtroyed them in ſuch a manner." This was the laſt and greateſt action of the gallant Blake. He was conſumed with a dropſy and ſcurvy; and haſtened home, that he might yield up his laſt breath in his native country, which he had ſo much adorned by his valour. As he came within ſight of land, he expired. Never man, ſo zealous for a faction, was ſo much reſpected and eſteemed even by the oppoſite factions. Diſintereſted, generous, liberal; ambitious only of true glory, dreadful only to his avowed enemies; he forms one of the moſt perfect characters of that age, and the leaſt ſtained with thoſe errors and violences which were then ſo predominant. The Protector ordered him a pompous funeral at the public charge: but the tears of his countrymen were the moſt honourable panegyric on his memory. The Lord Clarendon obſerves, "that he was the firſt man who brought ſhips to contemn caſtles on ſhore, which had ever been thought very formidable, and were diſcovered by him to make a noiſe only, and to fright thoſe who could be rarely hurt by them. He was the firſt that infuſed that degree of courage into ſeamen, by making them ſee by experience what mighty things they could do if they were reſolved; and the firſt that taught them to fight in fire as well as in water.

BLAMONT, a town in the department of Meurthe and late province of Lorrain in France. It is ſeated on a little river called *Veſouze*. E. long. 6. 51. N. lat. 48. 35.

BLANC. See BLANK.

BLANC, a town in the department of Indre and late province of Berry in France. It is ſeated on the river Creuſe, by which it is divided into two parts. The land about it is barren, and full of trees, heath, and lakes. E. long. 1. 13. N. lat. 46. 38.

Mont-BLANC, a ſtupendous mountain in Savoy, the higheſt of the Alps, and encompaſſed by thoſe wonderful collections of ſnow and ice called the *Glaciers*. See ALPS. Of theſe glaciers there are five, which extend almoſt to the plain of the vale of Chamouni, and are ſeparated by wild foreſts, cornfields, and rich meadows; ſo that immenſe tracts of ice are blended with the higheſt cultivation, and perpetually ſucceed to each other in the moſt ſingular and ſtriking viciſſitude. All theſe ſeveral valleys of ice, which lie chiefly in the hollows of the mountains, and are ſome leagues in length, unite together at the foot of Mont-Blanc; the higheſt mountain in Europe, and probably of the ancient world. It was reckoned that the ſummit of this mountain was inacceſſible, before Dr. Paccard, a phyſician at Chamouni, attempted to reach it in Auguſt 1786, and ſucceeded in the attempt. Soon after, the ſame undertaking was reſolved upon and accompliſhed by M. de Sauſſure, who has publiſhed a narrative of the journey.—He arrived at Chamouni, ſituated at the foot of the mountain, in the beginning of July 1787; but bad weather prevented him from aſcending until the firſt of Auguſt, when he began his expedition, accompanied by a ſervant and eighteen guides, who carried his philoſophical and other apparatus. His ſon was left at the Priory in Chamouni, and was employed in making meteorological obſervations, with which thoſe made on the top of the mountain might be compared. Although it is ſcarcely ſix miles and three quarters in a ſtraight line from the Priory of Chamouni to the top of Mont-Blanc, it requires nevertheleſs eighteen hours to gain the ſummit, owing to the bad roads, the windings, and the great perpendicular height of the mountain. That he might be perfectly at liberty to paſs the night on what part of the mountain he pleaſed, he carried a tent with him; and he and his company ſlept in it the firſt night on that eminence which is firſt met with, and which is on the ſouth of the Priory, and about a mile in perpendicular height above the village.

Thus far the journey ſeemed free from danger, or even difficulty; the road being either rocky or covered with graſs: but thence upwards it was either wholly covered with ſnow or conſiſted of the moſt ſlippery ice. But the ſecond day's journey was attended with many difficulties. The ice valley on the ſide of the hill muſt be paſſed, in order to gain the foot of that chain of rocks bordering on the perpetual ſnows which cover Mont-Blanc. The paſſage through this valley is extremely dangerous, ſince it is interſected with numerous wide, deep, and irregular chaſms, which can only be croſſed by means of bridges naturally formed of ſnow, and theſe often very ſlender, extended as it were over an abyſs. One of the guides had almoſt periſhed here the evening before, as he with two others went to reconnoitre the road. They had the precaution to tie themſelves together with a long rope, and he in the middle had the misfortune to have the ſnow-bridge, over a wide and deep chaſm, break under him, ſo that he remained ſuſpended between his two comrades. M. de Sauſſure and his retinue paſſed very near the opening through which this man had fallen, and ſhuddered at the danger in which the poor fellow had been involved. The difficulties they had to encounter in this valley, and the winding road they were obliged to take through it, occaſioned their being three hours in croſſing it, although in a ſtraight line its breadth is not more than three quarters of a mile.

After our travellers had reached the rocks, they mounted in a ſerpentine direction to a valley filled with ſnow, which runs from north to ſouth to the foot of the higheſt pinnacle. The ſurface of the ſnow in this valley has numerous fiſſures, which penetrate ſo deep, that their bottom is nowhere to be ſeen, although they are of conſiderable breadth. The ſides of theſe fiſſures, where the ſnow is broken perpendicularly, afford an opportunity of obſerving the ſucceſſive horizontal layers of ſnow which are annually formed. The guides were deſirous of paſſing the night near one of the rocks on the ſide of this valley; but as the loftieſt of them is at leaſt 1400 yards perpendicularly lower than the ſummit of the mountain, M. de Sauſſure was deſirous of aſcending higher; in conſequence of which it would be neceſſary to encamp on the ſnow: but he found it difficult to convince his companions of the practicability of the plan. They imagined that during the night an inſupportable cold prevailed in thoſe heights which were eternally covered with ſnow, and they were ſeriouſly afraid of periſhing. By proper encouragements, however, he induced them to proceed; and at four in the afternoon they arrived at the ſecond of the three plains of ſnow which they had to paſs. Here they encamped at the height of 3100 yards above the Priory of Chamouni, and 4250 yards above the level of the ſea, which is about 200 yards higher than the peak of Teneriffe. They did not proceed to the laſt plain, on account of the day having been far advanced; and they were alſo apprehenſive of expoſing themſelves to the Avalanches which are frequently tumbling from the ſummit of the mountain. They dug a deep hole in the ſnow, ſufficiently wide to contain the whole company, and covered its top with the tent cloth as completely as they could.

In this undertaking, however, they began to experience the effects of the rarity of the atmoſphere. Robuſt men, to

whom ſeven or eight hours walking or rather climbing were an abſolute nothing, had ſcarcely raiſed five or ſix ſhovels full of ſnow before they were under the neceſſity of reſting and relieving each other, almoſt inceſſantly. One of them who had gone back a ſmall diſtance to fill a caſk with ſome water which he had ſeen in one of the crevices of the ſnow, found himſelf ſo much diſordered in his way, that he returned without the water, and paſſed the night in great pain. M. de Sauſſure, who is ſo much accuſtomed to the air of mountains as to ſay, "That in general I feel myſelf better in ſuch air than in that of the plains," was exhauſted with the fatigue of making his meteorological obſervations. The principal inconvenience which the thinneſs of the air produces, is an exceſſive thirſt. They had no means of procuring water but by melting the ſnow; and the little ſtove which they had carried with them, afforded but a feeble ſupply to allay the thirſt of twenty perſons.

This portion of the mountain preſents to the view nothing but ſnow of the pureſt and moſt dazzling whiteneſs, forming a very ſingular contraſt with the ſky, which appears remarkably black. "No living creature (ſays M. de Sauſſure) is to be ſeen in theſe deſolate regions, nor is the leaſt trace of vegetation to be diſcovered. It is the habitation of cold and ſilence! When I reflected that Dr. Paccard, and his guide Jacques Balmat, who firſt viſited theſe deſerts, arrived here at the decline of the day, without ſhelter, without aſſiſtance, and wholly ignorant where or how they were to paſs the night, without even the certainty that it was poſſible for men to exiſt in the places they had undertaken to viſit; and yet that they were able to purſue their journey with unremitted intrepidity, I could not but admire their ſtrength and courage. My guides were ſo firmly prepoſſeſſed with the fear of cold, that they ſhut up every aperture of the tent with the utmoſt exactneſs; ſo that I ſuffered very conſiderably from the heat and the vitiated air, which had become highly noxious from the breathing of ſo many people in a ſmall room. I was frequently obliged, in the courſe of the night, to go out of the tent, in order to relieve my breathing. The moon ſhone with the brighteſt ſplendour in the midſt of a ſky as black as ebony. Jupiter, rayed like the ſun, roſe from behind the mountain in the eaſt. The light of theſe luminaries was reflected from the white plain or rather baſon in which we were ſituated; and dazzling eclipſed every ſtar except thoſe of the firſt and ſecond magnitude. At length we compoſed ourſelves to ſleep. We were, however, ſoon awakened by the noiſe of an immenſe maſs of ſnow *(avalanche)*, which had fallen down from the top of the mountain, and covered part of the ſlope over which we were to climb the next day."

Having been obliged to melt a great quantity of ſnow, and prepare many neceſſaries for their farther progreſs in their journey, it was late the next morning before they took their departure. "We began our aſcent (continues M. de Sauſſure) to the third and laſt plain, and then turned to the left, in our way to the higheſt rock, which is on the eaſt part of the ſummit. The aſcent is here very ſteep, being about 39 degrees inclined to the horizon, and bounded on each ſide by precipices. The ſurface of the ſnow was ſo hard and ſlippery, that our pioneers were obliged to hew out their footſteps with hatchets. Thus we were two hours in climbing a hill of about 530 yards high. Having arrived at this laſt rock, we turned to the weſtward, and climbed the laſt aſcent, whoſe height is about 300 yards, and its inclination about 28 or 29 degrees. On this peak the atmoſphere is ſo rare, that a man's ſtrength is exhauſted with the leaſt fatigue. When we came near the top, I could not walk fifteen or ſixteen ſteps without ſtopping to take breath; and I frequently perceived myſelf ſo faint, that I was under the neceſſity of ſitting down from time to time; and in proportion as I recovered my breath, I felt my ſtrength renewed. All my guides experienced ſimilar ſenſations, in proportion to their reſpective conſtitutions. We arrived at the ſummit of Mont-Blanc at 11 o'clock in the forenoon.

"I now enjoyed the grand ſpectacle which was under my eyes. A thin vapour, ſuſpended in the inferior regions of the air, deprived me of the diſtinct view of the loweſt and moſt remote objects, ſuch as the plains of France and Lombardy; but I did not ſo much regret this loſs, ſince I ſaw with remarkable clearneſs what I principally wiſhed to ſee, *viz.* the aſſemblage of thoſe high ridges, with the true form and ſituations of which I had been long deſirous of becoming thoroughly acquainted. I could ſcarcely believe my eyes. I thought myſelf in a dream when I ſaw below my feet ſo many majeſtic peaks, eſpecially the Needles, the Midi, Argentiere, and Géant, whoſe baſes had proved ſo difficult and dangerous of acceſs. I obtained a perfect knowledge of their proportion to, and connection with, each other; of their form and ſtructure; and a ſingle view removed more doubts, and afforded more information, than whole years of ſtudy.

"While I was thus employed, my guides pitched my tent and were fixing the apparatus for the experiments I had propoſed to make on boiling water; but when I came to diſpoſe my inſtruments for that purpoſe, I was obliged, almoſt at every inſtant, to deſiſt from my labours, and turn all my thoughts to the means of reſpiration. When it is conſidered that the mercury in the barometer was no higher than 16 inches and a line (17.145 inches Engliſh), and that this air had conſequently little more than half the denſity of that on the plains, the breathing muſt neceſſarily be increaſed, in order to cauſe, in a given time, the paſſage of a ſufficient quantity of air through the lungs. The frequency of reſpiration increaſed the circulation of the blood, more eſpecially as the arteries on the ſurface of the body had not the preſſure they were uſually accuſtomed to. We were all in a feveriſh ſtate, as will be ſeen in the ſequel.

"While I remained perfectly ſtill, I experienced but little uneaſineſs more than a ſlight oppreſſion about my heart; but, on the ſmalleſt bodily exertion, or when I fixed my attention on any object for ſome moments together, and particularly when I preſſed my cheſt in the act of ſtooping, I was obliged to reſt and pant for two or three minutes. My guides were in a ſimilar condition. We had no appetite; and our proviſions, which were all frozen, were not well calculated to excite it: nor had we any inclination for wine or brandy, which increaſed our indiſpoſition, moſt probably by accelerating the circulation of the blood. Nothing but freſh water relieved us; and much time and trouble were neceſſary to procure this article, as we could have no other than melted ſnow. I remained on the ſummit till half paſt three; and though I did not loſe a ſingle moment, I was not able to make all thoſe experiments in four hours and a half which I have frequently done in leſs than three on the ſea-ſide. However, I made with great exactneſs thoſe which were moſt eſſential.

"We returned much eaſier than I could have expected; ſince, in deſcending, we did not experience any bad effects from the compreſſion of the thorax; our reſpiration was not impeded, and we were not under the neceſſity of reſting, in order to recover our breath and ſtrength. The road down to the firſt plain was nevertheleſs by no means agreeable, on account of the great declivity; and the ſun, ſhining ſo bright on the tops of the precipices below us, made ſo dazzling an appearance, that it required a good head to avoid growing giddy from the proſpect. We pitched our tent again on the ſnow, though we were more than 400 yards below our laſt night's encampment. I was here convinced that it was the

rarity of the air, and not the fatigue of the journey, that had incommoded us on the ſummit of the mountain; otherwiſe we ſhould not have found ourſelves ſo well, and ſo able to attack our ſupper with a good appetite. I could now alſo make my meteorological obſervations without any inconvenience. I am perſuaded that the indiſpoſition in conſequence of the rarity of the atmoſphere is different in different people. For my own part, I felt no inconvenience at the height of 4000 yards, or nearly two miles and a quarter; but I began to be much affected when I was higher in the atmoſphere.

"The next day we found that the ice valley which we had paſſed on our firſt day's journey had undergone a conſiderable change from the heat of the two preceding days, and that it was much more difficult to paſs than it had been in our aſcent. We were obliged to go down a declivity of ſnow of no leſs than 50 degrees of inclination, in order to avoid a chaſm which had happened during our expedition. We at length got down as low as the firſt eminence on the ſide, about half after nine, and were perfectly happy to find ourſelves on a foundation which we were ſure would not give way under our feet."

This writer farther acquaints us, that the ſummit of the mountain is a ridge nearly horizontal, lying eaſt and weſt: the ſlope at each extremity is inclined from 28 to 30 degrees, the ſouth ſide between 15 and 20, and the north about 45 or 50. This ridge is ſo narrow as ſcarcely to allow two people to walk abreaſt, eſpecially at the weſt end, where it reſembles the roof of a houſe. It is wholly covered with ſnow; nor is any bare rock to be ſeen within 150 yards of the top. The ſurface of the ſnow is ſcaly, and in ſome places covered with an icy cruſt, under which the ſnow is duſty and without conſiſtence. The higheſt rocks are all granites; thoſe on the eaſt ſide are mixed with ſteatites; thoſe on the ſouth and the weſt contain a large quantity of ſchoerl, and a little *lapis corneus*. Some of them, eſpecially thoſe on the eaſt, which are about 150 yards below the ſummit, ſeem to have been lately ſhivered with lightning.

M. de Sauſſure ſaw no living animal on the mountain except two butterflies, which he ſuppoſes muſt have been driven thither by the wind. Lichens are the only vegetables which are found on the more elevated parts of theſe mountains: the *ſilene acaulis*, which grows in great quantities on the lower parts, diſappears at the height of about two miles above the level of the ſea.

The following, according to M. de Sauſſure, was the ſtate of the barometer on the top of Mont-Blanc. Auguſt 3, at noon, 16 inches, 0 lines, and $\frac{144}{1000}$ of a line, French meaſure (i. e. 16.181 Engliſh); and Reaumur's thermometer was 2.3 below the freezing point. M. Sennebier, at the ſame time, obſerved at Geneva the barometer 27 2 $\frac{1088}{1000}$ (29.020 inches Engliſh); and the thermometer 22.6 above freezing. From theſe data he makes the height of Mont-Blanc 2218 toiſes, or 14180 Engliſh feet (about $2\frac{3}{4}$ miles), according to M. de Lue's rule; and 2272 toiſes, or 14525 Engliſh feet, according to M. Trembley's. To theſe heights 13 toiſes, or 83 feet, the height of M. Sennebier's room above the lake of Geneva, muſt be added, to give the height of the mountain above the level of the lake 14263 feet, according to M. de Luc, and 14608 feet according to M. Trembley. Sir George Shuckburgh made the height of Mont-Blanc, by trigonometrical meaſurement, 14429 feet above the lake, which is almoſt the mean between the other two. The reſult of the obſervations made at Chamouni, contemporary with thoſe on Mont-Blanc, agrees ſtill nearer with Sir George's meaſurement. The general mean reſult makes the ſummit of Mont-Blanc 2450 toiſes, 15673 Engliſh feet, or three miles nearly, above the level of the ſea.

By his electrometer, M. de Sauſſure found that the electricity of the air on the ſummit of the mountain was poſitive. Water boiled at 68.993 degrees of a thermometer, which riſes to 80 with the barometer 27 French inches high. The wind was north and extremely piercing on the ſummit; but, ſouthward of the ridge, the temperature of the air was agreeable. The experiments with lime-water, and with the cauſtic alkali, ſhow that the air was mixed with atmoſpheric acid or fixed air. See ATMOSPHERE.

BLANC-*Manger*, *white food*, is a preparation conſiſting of diſſolved iſinglaſs, milk, ſugar, cinnamon, &c. which, when cold, forms a ſtrong white jelly, and is garniſhed for the table with blanched almonds. It is ſtrengthening and palatable, and being caſt into ornamental ſhapes by the help of a tin-mold, forms a very elegant addition to the tables of the opulent.

BLANCARDS, a name given to a ſort of linen cloths, thus called, becauſe the thread uſed to weave them has been half blanched or bleached before it was uſed. They are manufactured in many parts of France.

BLANCH-FERME, or *Blank-farm*, a white farm, that is, where the rent was to be paid in ſilver, not in cattle. In ancient times, the crown rents were many times reſerved to be paid in *libris albis*, called *blanch firmes*: in which caſe the buyer was holden *dealbare firmam*, viz. his baſe money or coin, worſe than ſtandard, was melted down in the exchequer, and reduced to the fineneſs of ſtandard ſilver; or inſtead thereof he paid to the king 12d. in the pound by way of addition.

BLANCH-*Holding*, in law, a tenure by which the vaſſal is only bound to pay an eluſory yearly duty to his ſuperior merely as an acknowledgment of his right. See LAW.

BLANCHARD (James), an excellent painter, was born at Paris, and learned the rudiments of his profeſſion under Nicholas Bolleri his uncle; but left him at 20 years of age, and travelled into Italy. He ſtaid two years at Rome, and from thence went to Venice, where he was ſo charmed with the works of Titian, Tintoret, and Paul Veroneſe, that he reſolved to follow their manner; and in this he ſucceeded ſo far, that, at his return to Paris, he ſoon became generally eſteemed for the novelty, beauty, and force of his pencil. He painted two galleries at Paris, one belonging to Perault, the firſt preſident, and the other to Bullion, ſuperintendant of the finances; but his capital piece is a picture of the deſcent of the Holy Ghoſt in the church of Notre Dame. He was ſeized, in the flower of his age, with a fever and impoſthume in the lungs, of which he died in 1683. Of all the French painters Blanchard was eſteemed the beſt colouriſt, he having carefully ſtudied this part of painting in the Venetian ſchool.

Carte-BLANCHE. See CARTE.

BLANCHING, the art or manner of making any thing white. See BLEACHING.

BLANCHING *of Iron-plates*, is performed with aquafortis and tin.

BLANCHING *of Woollen-Stuffs*, is done with ſoap, or with chalk, or ſulphur.

BLANCHING *of Silk*, is performed with ſoap and ſulphur.

BLANCHING *of Wax*, is performed by expoſing it repeatedly to the ſun and dew. See WAX.

BLANCHING, in coinage, the operation performed on the planchets, or pieces of ſilver, to give them the requiſite luſtre and brightneſs. They alſo blanch pieces of plate, when they would have them continue white, or have only ſome parts of them burniſhed. Blanching, as it is now practiſed, is performed by heating the pieces on a kind of peel with a wood fire, in the manner of a reverberatory; ſo that the flame paſſes over the peel. The pieces being ſufficiently heated and cooled again, are put ſucceſſively to boil in two pans, which are of copper: in theſe they put water, common ſalt, and tartar of Montpe-

lier. When they have been well drained of this water in a copper ſieve, they throw ſand and freſh water over them; and when dry, they are well rubbed with towels.

Blanching, among gardeners, an operation whereby certain ſallads, roots, &c. are rendered whiter than they would otherwiſe be. It is thus: after pruning off the tops and roots of the plants to be blanched, they plant them in trenches about ten inches wide, and as many deep, more or leſs as is judged neceſſary; as they grow up, care is taken to cover them with earth, within four or five inches of their tops: this is repeated from time to time, for five or ſix weeks; in which time they will be fit for uſe, and of a whitiſh colour where covered by the earth.

Blanching alſo denotes the operation of covering iron plates with a thin coat or cruſt of tin. See Latten.

BLANCO, a cape or promontory of Africa, in the Atlantic ocean. W. long. 18. 30. N. lat. 20. 0.

Blanco, a promontory of Peru in South America, in the South Sea. W. long. 81. 10. N. lat. 11. 50.

BLANDFORD, a town of Dorſetſhire in England. It is pleaſantly ſeated on the river Store near the Downs, but has been ſubject to ſeveral dreadful fires, particularly in 1731, when almoſt the whole town was burnt down; but it was afterwards rebuilt, with many improvements. It has the title of a marquiſate, and lies in W. long. 2. 15. N. lat. 50. 50.

BLANK, or Blanc, in a general ſenſe, ſignifies white; and *blancus*, or *blanca*, is more particularly uſed for a kind of white or ſilver money, of baſe alloy, coined by Henry V. in thoſe parts of France then ſubject to England, valued at 8d. ſterling. They were forbidden by his ſucceſſor to be current in this realm. In ſome ancient charters they are called *ſolida blanci*, *white ſhillings*.

Blank alſo denotes a ſmall copper coin, formerly current in France, at the rate of five deniers Tournois. They had alſo great blanks, or pieces of three blanks, and others of ſix, in reſpect whereof the ſingle ſort were called little blanks; but before the Revolution in France, they all were only monies of account.

Blank, or Blank-*Ticket*, in lotteries, that to which no prize is allotted. The French have a game, under the denomination *blanque*, anſwering to our lottery.

Blank, in coinage, a plate, or piece of gold or ſilver, cut and ſhaped for a coin, but not yet ſtamped.

Blank-*Bar*, in law, is uſed for the ſame with what we call a *common bar*, and is the name of a *plea in bar*, which in an action of treſpaſs is put in to oblige the plaintiff to aſſign the certain place where the treſpaſs was committed.

Blanks, in judicial proceedings, certain void ſpaces ſometimes left by miſtake. A blank (if ſomething material be omitted) in a declaration, abates the ſame; and ſuch a blank is a good cauſe of demurrer.

Blank-*Verſe*, in the modern poetry, that compoſed of a certain number of ſyllables, without the aſſiſtance of rhime. See Poetry.

Point-Blank. See Point-*Blank*.

BLANKENBERG, a town of Germany, in the circle of Weſtphalia and duchy of Berg. E. long. 7. 18. N. lat. 50. 54.

BLANKENBURG, a town of Germany, in the circle of Lower Saxony, and capital of the county of the ſame name, ſubject to the Duke of Brunſwic-Wolfenbuttle. The caſtle or palace is a modern building, and is the reſidence of the princeſs dowager. E. long. 11. 20. N. lat. 51. 50.

BLANKENHEIM, a ſmall territory of Germany with the title of a county, which is part of that of Eyffel, near the archbiſhopric of Cologn and duchy of Juliers.

BLANKET, in commerce, a warm woolly ſort of ſtuff, light and looſely woven, chiefly uſed in bedding. The manufacture of blankets is chiefly confined to Witney in Oxfordſhire, where it is advanced to that height, that no other place comes near it. Some attribute a great part of the excellence of the Witney blankets to the peculiar properties of the water of the river Windruſh, wherewith they are ſcoured; others rather think they owe it to a peculiar way of looſe ſpinning which the people have thereabouts. Be this as it will, the place has engroſſed almoſt the whole trade of the nation for this commodity; inſomuch that the wool fit for it centres here from the furthermoſt parts of the kingdom. Blankets are made of felt-wool, *i. e.* wool from off ſheep-ſkins, which they divide into ſeveral ſorts. Of the head wool and bay wool they make blankets of twelve, eleven, and ten quarters broad; of the ordinary and middle ſort, blankets of eight and ſeven quarters broad; of the beſt tail wool, blankets of ſix quarters broad, commonly called *cuts*, ſerving for ſeamen's hammocks. See Hykes.

Toſſing in a Blanket, a ludicrous kind of puniſhment, of which we find mention in the ancients under the denomination *ſagatio*. Martial deſcribes it graphically enough. *Ibis ab excuſſo, miſſus ad aſtra, ſago*. A late writer repreſents it as one of Otho's imperial delights. But this is turning the tables: that emperor's diverſion, as related by Suetonius, was not to be the ſubject, but the agent, in the affair; it being his practice to ſtroll out in dark nights, and where he met with a helpleſs or drunken man to give him the diſcipline of the blanket.

BLANKOF (John Teuniſz), a painter of great abilities, was born at Alkmaar in 1628, and received his earlieſt inſtruction from Arent Tierling: but afterwards he was ſucceſſively the diſciple of Peter Scheyenburg and Cæſar Van Everdingen. When he had ſpent ſome years with thoſe maſters, he went to Rome, where, during his continuance in that city, he was ſtudiouſly diligent in copying the works of the beſt maſters, and was admitted into the ſocicty of Flemiſh painters called *Bentvogels*, who gave him the name of *Jan Maat* (which in Dutch ſignifies mate or companion), and by that name he is moſt generally known. His ſubjects were landſcapes, with views of rivers or ſea-ſhores, havens or ports, which he executed with a light free pencil; and in the repreſentation of ſtorms and calms (as nature was always his model) he deſcribed thoſe ſubjects with great truth, exactneſs, and neatneſs of handling. The pictures of this maſter which are moſt commended are the Italian ſea-ports, with veſſels lying before them. He poſſeſſed a lively imagination; nor was his hand leſs expeditious than his thoughts; and the connoiſſeurs agreed in opinion, that if he had beſtowed more labour on his pictures than he uſually did, or if he had finiſhed them more highly, he would certainly have deſtroyed a great deal of their ſpirit, force, and effect. His moſt capital performance is a view of the ſea-ſhore, with the waves retiring at ebb tide; which is deſcribed by Houbraken as being wonderfully beautiful and natural. He died in the year 1670.

BLANQUILLE, in commerce, a ſmall ſilver coin current in the kingdom of Morocco, and all that part of the coaſt of Barbary; it is worth about three-halfpence of our money.

BLARE, in commerce, a ſmall copper coin of Bern, nearly of the ſame value with the ratz.

BLAREGNIES, a town of the Auſtrian Netherlands, in the province of Hainault, ſeated in E. long. 3. 35. N. lat. 50. 30. Near this place the Engliſh and their allies under the Duke of Marlborough obtained a very bloody victory over the French in 1709. This is moſt commonly called the *battle of Malplaquet*. See Malplaquet.

BLASE, biſhop of Sebaſtia in Cappadocia, in the ſecond and third centuries, ſuffered death under Dioclefian by decapitation, after being whipped and having his fleſh torn with iron

combs. He is a perſon of great note among the vulgar, who in their proceſſions relative to the woollen trade, always carry a repreſentation of him as the inventor or patron of the art of wool-combing; though that art muſt have been known long before his time. It is difficult to ſay how the invention came to be attributed to him; but it had probably no better origin than the circumſtance of his being tortured by inſtruments uſed in combing of wool.

BLASIA, LEATHER-CUP; a genus of the order of algæ, belonging to the cryptogamia claſs of plants; and in the natural method ranking under the 57th order, *Algæ*. The male calyx is cylindric, replete with grains; the female calyx is naked; the fruit roundiſh, immerſed in the leaves, and many-ſeeded. Of this genus there is but one ſpecies known, the puſilla, which grows naturally on the banks of ditches and rivulets, in a gravelly or ſandy ſoil, both in England and Scotland. It grows flat upon the ground in a circle or patch, compoſed of numerous thin, green, pellucid leaves, marked with a few whitiſh veins near the baſe, divided and ſubdivided into obtuſe ſegments obſcurely crenated on the edges. The margins of the leaves are a little elevated, but the interior parts adhere cloſe to the ground by a fine down which anſwers the purpoſe of roots. The ſeeds are ſo ſmall as to be almoſt imperceptible.

BLASPHEMY, *blaſphemia*, or *blaſphemium*, in middle-age writers, denotes ſimply the blaming or condemning of a perſon or thing. The word is Greek, βλασφημια, from βλαπτω, *lædo*. Among the Greeks to blaſpheme was to uſe words of evil omen, or that portended ſomething ill, which the ancients were careful to avoid, ſubſtituting in lieu of them other words of ſofter and gentler import, ſometimes the very reverſe of the proper ones.

BLASPHEMY is more peculiarly reſtrained to evil or reproachful words ſpoken of the Deity. Auguſtin ſays, *Jam vulgo blaſphemia non accipitur niſi mala verba de Deo dicere*. According to Lindwood, blaſphemy is an injury offered to God, by denying that which is due and belonging to him; or attributing to him what is not agreeable to his nature. By the Moſaic law, blaſphemy was puniſhed with death; Levit. chap. xxiv. ver. 13—16. As alſo by the civil law; Novel. 77. In Spain, Naples, France, and Italy, the pains of death are not now inflicted for it. In the empire, either amputation or death is made the puniſhment of this crime.

By the canon law, blaſphemy was puniſhed only by a ſolemn penance; and by cuſtom either by a pecuniary or corporal puniſhment. By the Engliſh laws, blaſphemies of God, as denying his being or providence, and all contumelious reproaches of Jeſus Chriſt, &c. are offences by the common law, and puniſhable by fine, impriſonment, and pillory. And, by the ſtatute law, he that denies one of the perſons in the Trinity, or aſſerts there are more than one, or denies Chriſtianity to be true, for the firſt offence is rendered incapable of any office; for the ſecond, adjudged incapable of ſueing, being executor or guardian, receiving any gift or legacy, and to be impriſoned for three years.

And by 9 and 10 Wil. 3. c. 32. If any perſon having been educated in, or having made profeſſion of the Chriſtian religion within this realm, ſhall, by writing, printing, teaching, or adviſed ſpeaking, deny any one of the perſons in the Holy Trinity to be God, or ſhall aſſert or maintain, that there are more gods than one, or ſhall deny the Chriſtian religion to be true, or the Holy Scriptures of the Old and New Teſtament to be of divine authority; and ſhall upon indictment or information be thereof lawfully convicted upon the oath of two witneſſes; ſuch perſon ſhall for the firſt offence be incapable to have or enjoy any office or employment, eccleſiaſtical, civil, or military, or profit by them; and the offices, places, and employments, enjoyed by ſuch perſons at their conviction, ſhall be void: and being a ſecond time convicted of any of the aforeſaid crimes, ſhall be diſabled to ſue, proſecute, plead, or uſe any action or information in law or equity; or be guardian of any child, or executor or adminiſtrator of any perſon, or capable of any legacy or deed of gift, or to bear any office, civil or military, or benefice eccleſiaſtical, and ſhall ſuffer three years impriſonment from the time of ſuch conviction, without bail. *ſ.* 1. No perſon ſhall be proſecuted by virtue of this act, for words ſpoken, unleſs the information be given upon oath before ſome juſtice of peace within four days, and the proſecution be within three months after ſuch information. *ſ.* 2. Perſons convicted of any the ſaid crimes ſhall, for the firſt offence, upon renouncing ſuch offence, or erroneous opinions in the court where convicted, within four months after conviction, be diſcharged from all penalties and diſabilities incurred by ſuch conviction. *ſ.* 3.

BLASPHEMY *againſt the Holy Ghoſt*. Divines are not agreed with reſpect to the nature of the crime thus denominated (Mat. chap. xii. ver. 31.), and the grounds of the extreme guilt aſcribed to it. Dr. Tillotſon maintains, that it conſiſted in maliciouſly attributing the miraculous operations which Chriſt performed by the power of the Holy Ghoſt to the devil. Dr. Whitby refers it to the diſpenſation of the Holy Ghoſt, which commenced after our Lord's reſurrection and aſcenſion; and thoſe were guilty of the crime who perſiſted in their unbelief and blaſphemed the Holy Ghoſt, repreſenting him as an evil ſpirit. The crime was unpardonable, becauſe it implied a wilful oppoſition to the laſt and moſt powerful evidence which God would vouchſafe to mankind, and precluded the poſſibility of a recovery to faith and repentance.

BLAST, *flatus*, in the military art, a ſudden compreſſion of the air, cauſed by the diſcharge of the ball out of a great gun. The blaſt ſometimes throws down part of the embraſures of the wall.

BLAST is alſo applied in a more general ſenſe to any forcible ſtream of wind or air, excited by the mouth, bellows, or the like.

BLAST is alſo uſed in agriculture and gardening, for what is otherwiſe called a *blight*, which by ſome is ſuppoſed owing to cold; by others to the want of a due ſupply of ſap; by others to aſcending fumes of the earth; by others to ſharp winds and froſts, immediately ſucceeding rains. That ſpecies called *uredines* or *fire-blaſts*, is ſuppoſed by Mr. Hales to be owing to the ſolar rays reflected from or condenſed in the clouds, or even collected by the denſe ſteams in hop gardens and other places. The effect of them is to wither, ſhrivel, ſcorch, turn black, and as it were burn up the leaves, bloſſoms, and fruits of trees, ſhrubs, herbs, graſs, corn, even for whole tracts of ground. Illiterate perſons alſo ſpeak of a kind of *blaſts* affecting human bodies, and cauſing eryſipelas, palſy, &c.

BLASTS, among miners. See DAMPS.

BLASTED, ſomething ſtruck with a blaſt. Among the Romans, places blaſted with lightning were to be conſecrated to Jupiter, under the name of *lidentalia* and *putealia*. It was alſo a ceremonial of religion to burn blaſted bodies in the fire.

BLASTING, among miners, a term for the tearing up rocks, which they find in their way, by gunpowder. The method of doing it is this: they make a long hole like the hollow of a large gun-barrel in the rock they would ſplit; this they fill with gunpowder; then they firmly ſtop up the mouth of the hole with clay, except a touch-hole, at which they leave a match to fire it. A ſmall quantity of powder does great things in this operation.

BLATTA, or COCKROACH, a genus of inſects belonging to the order of hemiptera, or ſuch as have four ſemicruſtaceous

incumbent wings. See Plate 47. The head of the blatta is inflected towards the breaſt; the antennæ, or feelers, are hard like briſtles; the elytra and wings are plain, and reſemble parchment; the breaſt is ſmooth, roundiſh, and is terminated by an edge or margin; the feet are fitted for running; and there are two ſmall horns above the tail. This inſect reſembles the beetle; and there are 10 ſpecies, viz. 1. The gigantea is of a livid colour, and has ſquare browniſh marks on the breaſt. It is found in Aſia and America, and is about the ſize of a hen's egg. 2. The alba is red, and the margin of the breaſt is white. It is found in Egypt. 3. The ſurinamenſis is livid, and the breaſt edged with white. It is a native of Surinam. 4. The americana is of an iron colour, and the hind part of the breaſt is white. The wings and elytra are longer than its body. It is found in America and the ſouth of France. 5. The pivea is white, with yellow feelers. It is a native of America. 6. The africana is aſh-coloured, and has ſome hairs on its breaſt. It is found in Africa. 7. The orientalis is of a duſky aſh-colour, has ſhort elytra, with an oblong furrow in them. This ſpecies is frequent in America. They get into cheſts, &c. and do much hurt to clothes; they infeſt people's beds in the night, bite like bugs, and leave a very unſavoury ſmell behind them. They avoid the light, and ſeldom appear but in the night-time. The female reſembles a kind of caterpillar, as it has no wings; ſhe lays an egg of about one half the bulk of her belly. They eat bread, raw or dreſſed meat, linen, books, ſilk worms and their bags, &c. Sir Hans Sloane ſays, that the Indians mix their aſhes with ſugar, and apply them to ulcers in order to promote the ſuppuration. 8. The germanica is livid and yelloviſh, with two black parallel lines on the breaſt. It is found in Denmark. 9. The laponica is yellow, and the elytra are ſpotted with black. It is found in Lapland; and feeds upon cheeſe, fiſh, &c. 10. The oblongata is of an oblong figure; the colour is livid and ſhining; and it has two black ſpots on the breaſt. The feelers are red and clavated; and the feet are very hairy. It is a native of America.

BLATTARIÆ, from *Blatta*, a moth or little worm, the title of Scopoli's 12th natural claſs, in his Flora Carniolica. It is taken from the *Blattaria*, which was Tournefort's generic name for the verbaſcum of Linnæus. See VERBASCUM.

BLAUBEUREN, a town of Germany in the circle of Suabia, and duchy of Wirtemberg. E. long. 9. 57. N. lat. 48. 22.

BLAVET, a ſea-port town of the former province of Britanny in France, ſituated at the mouth of a river of the ſame name. It is one of the ſtations of the navy of France, and is ſometimes called *Port Louis*. W. long. 3. 5. N. lat. 47. 40.

BLAYE, an ancient and ſtrong town of France, in the department of Gironde and late province of Guienne. It is ſituated on the river Garonne, has a harbour much frequented by foreigners, and the ſhips which ſail to Bourdeaux are obliged to leave their guns here. The river is 3800 yards broad at Blaye; for which reaſon a battery was built upon an iſland in 1689, to command the veſſels that ſail up. The city is built on a rock, and has a citadel with four baſtions, which is called the *Upper Town*. The lower town is ſeparated from the upper by a ſmall river; and in the lower town the merchants reſide with their magazines. The neighbourhood produces a great deal of corn, which they ſend abroad when the exportation of it is allowed. W. long. 1. 23. N. lat. 45. 6.

BLAZE, a white ſpot in a horſe's face.

BLAZONING, or BLAZONRY, in heraldry, the decyphering the arms of noble families. The word originally ſignified the blowing or winding of a horn; and was introduced into heraldry as a term denoting the deſcription of things borne in arms, with their proper ſignifications and intendments, from an ancient cuſtom the heralds, who were judges, had of winding an horn at juſts and tournaments, when they explained and recorded the achievements of knights. See HERALDRY.

BLEA, in the anatomy of plants, the inner rind or dry bark. See PLANTS.

BLEACHING,

THE art of whitening linen cloth, thread, &c. a proceſs of conſiderable importance to manufacturers, and one in which ſome material improvements have been lately introduced. We ſhall firſt deſcribe the methods which, with ſome few variations, have been practiſed in this country by the bleachers, and which many of them ſtill adhere to; and afterwards ſpeak of the *new proceſs*, for which we are principally indebted to the French chemiſts.

SECT. I. *Of Bleaching in general.*

THE proceſs of bleaching is for the moſt part conducted in the following manner, by thoſe bleachers who have not yet availed themſelves of the late diſcoveries.

After the cloth which is deſigned for bleaching has been aſſorted into parcels of an equal fineneſs, each parcel is latched, linked, and then ſteeped. Steeping is the firſt operation which the cloth undergoes, and is performed in this way: the linens are folded up diſtinctly, and laid in a large wooden veſſel; into which is thrown, blood-warm, a ſufficient quantity of water, or equal parts of water and ley, which has been uſed to whiten cloth only, or water with rye-meal or bran mixed with it, till the whole is thoroughly wet, and the liquor riſes over all. Then a cover of wood is laid over the cloth, and that cover is ſecured with a poſt between the boards and the joiſting, to prevent the cloth from riſing during the fermentation which enſues. About ſix hours after the cloth has been ſteeped in warm water, and about twelve in cold, bubbles of air ariſe, a pellicle is formed on the ſurface of the liquor, and the cloth ſwells when it is not preſſed down. This effect continues from

36 to 48 hours, according to the warmth of the weather; about which time the pellicle or ſcum begins to fall to the bottom. But before this precipitation happens, the cloth muſt be taken out, and the proper time for taking it out is when no more air-bubbles ariſe. The cloth muſt now be well rinſed, diſpoſed regularly by the ſelvage, and waſhed in the put-mill to carry off the looſe duſt. After this it is to be ſpread on the field to dry; and when thoroughly dried, it is ready for bucking; which is the ſecond operation.

Bucking, or the application of ſalts, is thus performed: The firſt, or mother ley, is made in a copper, which we ſhall ſuppoſe, for example, when full, holds 680 gallons of water. The copper is filled three-fourths full of water, which is brought to boil: juſt when it begins, the following proportion of aſhes is put into it, viz. 30lb. of blue, and as much white pearl aſhes; 200lb. of Marcoſt aſhes (or, if they have not theſe, about 300lb. of Caſhub); 300lb. of Muſcovy, or blanch aſhes: the three laſt ought to be well pounded. This liquor is allowed to boil for a quarter of an hour, ſtirring the aſhes from the bottom very often; after which the fire is taken away. The liquor muſt ſtand till it has ſettled, which takes at leaſt ſix hours, and then it is fit for the operation.

Out of the firſt, or mother-ley, the ſecond, or that uſed in bucking, is made in this manner. Into another copper, holding, for example, 160 gallons, are put 150 gallons of water, 2lb. of ſoft ſoap, and 8 gallons of mother-ley; or, for cheapneſs, in place of the ſoap, when they have ley which has been uſed to white linen, called *white linen ley*, they take 56 gallons of it, leaving out an equal quantity of water. This is called *bucking-ley*.

After the linens are taken up from the field to dry, they are ſet in the *vat* or *cave* in rows, endwiſe, that they may be equally wetted by the ley; which, made blood-warm, is now thrown on them, and the cloth is afterwards trodden down by a man with wooden ſhoes. Each row undergoes the ſame operation, until the veſſel is full, or all the cloth in it. At firſt the ley is put on milk-warm, and, after ſtanding a little time on the cloth, it is again let off by a cock into the bucking-copper, heated to a greater degree, and then put on the cloth again. This courſe is repeated for ſix or ſeven hours, and the degree of heat gradually increaſed, till it is, at the laſt turn or two, thrown on boiling hot. The cloth remains after this for three or four hours in the ley; after which the ley is let off, thrown away, or uſed in the firſt buckings, and the cloth goes on to another kind of proceſs.

It is next carried out, generally early in the morning, ſpread on the graſs, pinned, corded down, expoſed to the ſun and air, and watered for the firſt ſix hours, ſo often, that it never is allowed to dry. Afterwards it is allowed to lie till dry ſpots appear before it is watered. After ſeven at night it gets no more water, unleſs it be a very drying night. Next day, in the morning and forenoon, it is watered twice or thrice if the day be very dry; but if the weather be not drying, it gets no water; after which it is taken up dry if the green be clean; if not, it is rinſed, mill-waſhed, and laid out to dry again, to become fit for bucking.

This alternate courſe of bucking and watering is performed for the moſt part from ten to ſixteen times, or more, before the linen is fit for ſouring; gradually increaſing the ſtrength of the ley from the firſt to the middle bucking, and from that gradually decreaſing it till the ſouring begins. The leys in the middle buckings are generally about a third ſtronger than the firſt and laſt.

Souring, or the application of acids to cloth, is the fourth operation. It is not very eaſy to ſay when this operation ſhould commence, as it depends moſtly on the experience of the bleacher. When the cloth has an equal colour, and is moſtly freed from the outer bark of the lint, it is then thought fit for ſouring; which is performed in the following manner. Into a large vat or veſſel is poured ſuch a quantity of butter-milk, or ſour milk, as will ſufficiently wet the firſt row of cloth; which is tied up in looſe folds, and preſſed down by two or three men bare-footed. If the milk be thick, about an eighth of water is added to it; if thin, no water. Sours made with bran, or rye-meal and water, are often uſed inſtead of milk, and uſed milk-warm. Over the firſt row of cloth a quantity of milk and water is thrown, to be imbibed by the ſecond; and ſo it is continued till the linen to be ſoured is ſufficiently wet, and the liquor riſes over the whole. The cloth is then kept down by covers filled with holes, and ſecured with a poſt fixed to the joiſt, that it may not riſe. Some hours after the cloth has been in the ſour, air-bubbles ariſe, a white ſcum is formed on the ſurface, and an inteſtine motion goes on in the liquor. In warm weather it appears ſooner, is ſtronger, and ends ſooner, than in cold weather. Juſt before this fermentation, which laſts five or ſix days, is finiſhed, at which time the ſcum falls down, the cloth ſhould be taken out, rinſed, mill-waſhed, and delivered to the women to be waſhed in ſoap ſuds.

Waſhing with ſoap and water is the fifth operation; and is performed by two women, each placed oppoſite at a tub, made of very thick ſtaves, ſo that the edges, which ſlope inwards, are about four inches in thickneſs. A ſmall veſſel full of warm water is placed in each tub. The cloth is folded ſo that the ſelvage may be firſt rubbed with ſoap and warm water lengthwiſe, till it is ſufficiently impregnated with it. In this manner all the parcel is rubbed with ſoap, and afterwards carried to be bucked.

The ley now uſed has no ſoap in it, except what it gets from the cloth; and is equal in ſtrength to the ſtrongeſt formerly uſed, or rather ſtronger, becauſe the cloth is now put in wet. From the former operation theſe leys are gradually made ſtronger, till the cloth ſeems of an uniform white. After this the ley is more ſpeedily weakened than it was increaſed; ſo that the laſt which the cloth gets is weaker than any it got before.—But the management of ſours is different; for they are uſed ſtrongeſt at firſt, and decreaſed ſo in ſtrength, that the laſt ſour, conſidering the cloth is then always taken up wet, may be reckoned to contain three fourths of water.

After bucking, the cloth goes to the watering, as formerly, obſerving only to overlap the ſelvages, and to tie it down with cords, that it may not tear; then it returns to the ſour, milling, waſhing, bucking, and watering again. Theſe operations ſucceed one another alternately till the cloth is whitened; at which time it is blued, ſtarched, and dried.

This is the method uſed in the whitening *fine* cloths. The following is the method uſed in the whitening of *coarſe* cloths.—Having ſorted the cloths according to their quality, they are ſteeped in the ſame manner as the fine, rinſed, waſhed in the mill, and dried before boiling. In this proceſs boiling ſupplies the place of bucking, as it takes leſs time, and conſequently is cheapeſt. It is done thus: 200 lb. of Caſhub-aſhes, 100 lb. of white Muſcovy, and 30 lb. of pearl-aſhes, boiled in 500 gallons of water for a quarter of an hour, make the mother or firſt ley. The cloth-boiler is then to be filled two-thirds full with water and mother-ley, about nine parts of the former to one of the latter; ſo that the ley uſed for boiling the coarſe cloth is about a third weaker than that uſed in bucking the fine. Such a quantity of cloth is put into the foregoing quantity of ley, when cold, as can be well covered by it. The ley is brought gradually to the boil, and kept boiling for two hours; the cloth being fixed down all the

time, that it does not riſe above the liquor. The cloth is then taken out, ſpread on the field, and watered, as is done for fine cloth.

As the ſalts of the ley are not exhauſted by this boiling, the ſame liquor is continued to be uſed all that day, adding, at each boiling, ſo much of the mother-ley as will bring it to the ſame ſtrength as at firſt. The ley by boiling loſes in quantity ſomewhat betwixt a third and a fourth; and they reckon that in ſtrength it loſes about a half, becauſe they find in practice, that adding to it half its former ſtrength in freſh ley, has the ſame effect on cloth. Therefore ſome freſh ley, containing a fourth part of the water and the half of the ſtrength of the firſt ley, makes the ſecond boiler equal in ſtrength to the firſt. To the third boiler they add ſomewhat more than the former proportion, and go on ſtill increaſing gradually to the fourth and fifth, which is as much as can be done in a day. The boiler is then cleaned, and next day they begin with freſh ley. Theſe additions of freſh ley ought always to be made by the maſter-bleacher, as it requires judgment to bring ſucceeding leys to the ſame ſtrength as the firſt.

When the cloth comes to get the ſecond boiling, the ley ſhould be ſtronger by about a thirtieth part, and the deficiencies made up in the ſame proportion. For ſix or ſeven boilings, or fewer, if the cloth be thin, the ley is increaſed in this way, and then gradually diminiſhed till the cloth is fit for ſouring. The whiteſt cloth ought always to be boiled firſt, that it may not be hurt by what goes before. In this proceſs, if the cloth cannot be got dry for boiling, buſineſs does not ſtop as in the fine; for after the coarſe has drained, on racks made for that purpoſe, it is boiled, making the ley ſtrong in proportion to the water in the cloth.

The common method of ſouring linen is, to mix ſome warm water and bran in the vat, then put a layer of cloth, then more bran, water, and cloth: and ſo on, till the cave is full. The whole is trampled with men's feet, and fixed as in the former proceſs. A thouſand yards of cloth, yard-wide, require betwixt four and ſix pecks of bran. The cloth generally lies about three nights and two days in the ſour. Others prepare their ſour twenty-four hours before, by mixing the bran with warm water in a ſeparate veſſel; and before pouring it on the cloth, they dilute it with a ſufficient quantity of water. After the cloth is taken from the ſour, it ought to be well waſhed and rinſed again. It is then given to men to be well ſoaped on a table, and afterwards rubbed betwixt the rubbing-boards. When it comes from them, it ſhould be well milled, and warm water poured on it all the time, if convenience will allow of it. Two or three of theſe rubbings are ſufficient, and the cloth very ſeldom requires more than that. After the ſouring begins the ley is decreaſed in ſtrength by degrees; and three boilings after that are commonly ſufficient to finiſh the cloth. Afterwards it is ſtarched, blued, dried, and bittled in a machine made for that purpoſe, which ſupplies the place of a calender, and is preferred by many to it.

This method of bleaching of coarſe cloths is very like that practiſed in Ireland for both fine and coarſe. The only material difference is, that there the bleachers uſe no other aſhes but kelp or caſhub. A ley is drawn from the former by cold water, which diſſolves the ſalts, and not the ſulphureous particles of the kelp-aſhes. This ley is uſed till the cloth is half whitened, and then they lay aſide the kelp-ley for one made of caſhub-aſhes.

According to the preceding hiſtory, bleaching naturally divides itſelf into, 1. Steeping and milling. 2. Bucking and boiling. 3. Alternate watering and drying. 4. Souring. 5. Rubbing with ſoap and warm water. 6. Starching, and blueing. We ſhall treat of theſe different parts in their order.

Sect. II. *Of Steeping and Milling.*

Green linen, in the different changes which it has undergone before it arrives at that ſtate, contracts a great degree of foulneſs. This is chiefly communicated to it by the matters uſedin the dreſſing, which ſhould be effectually cleared off.

The firſt thing therefore that is to be done in the bleach-field is to take off all that filth that is foreign to the flax, and might, in unſkilful hands, be fixed in the cloth. This is the object of ſteeping; and to accompliſh this end, the cloth is laid in blood-warm water. A ſmaller degree of heat than that would not diſſolve the dreſſing ſo ſoon; and a greater might coagulate and fix, in the body of the linen, thoſe particles which we deſign to carry off. In a few hours the dreſſing made uſe of in weaving is diſſolved, and mixed with the water; and as it had acquired ſome degree of acidity before application, it becomes a ſpecies of ferment. Each ferment promotes its own particular ſpecies of inteſtine motion; the putrid ferment ſets in motion the putrefactive fermentation; the vinous ferment gives riſe to the vinous fermentation; and the acid ferment to the acetous fermentation. That there is a real fermentation going on in ſteeping is evident from the air-bubbles which immediately begin to ariſe, from the ſcum alſo which gathers on the ſurface, and from the inteſtine motion of the whole liquor. That it muſt be the acetous fermentation, appears from this, that the vegetable particles, already in part ſoured, muſt firſt undergo this proceſs. The conſequence of this operation on the whole is, that the cloth comes out freed in a great meaſure from its ſuperficial dirt, and more pliant and ſoft than it was before.

Whenever the inteſtine motion we have deſcribed is pretty much abated, and before the ſcum ſubſides, bleachers take out their cloth. The ſcum, when no more air-bubbles riſe to ſupport it, ſeparates and falls down; and would again communicate to the cloth great part of the filth. But a longer ſtay would be attended with a much greater diſadvantage. The putrid follows cloſe upon the acetous fermentation: when the latter ends, the former begins, and were this to take place in any conſiderable degree, it would render the cloth black and tender, ſo that we cannot be too careful to prevent this.

The firſt queſtion that ariſes to be determined on theſe principles is, What is the moſt proper liquor for ſteeping cloth? Thoſe uſed by bleachers are plain water; white linen ley and water, equal parts; and rye-meal or bran mixed with water: but they always make uſe of ley when they have it.

After ſteeping, the cloth is carried to the putſtock-mill, to be freed of all its looſe foulneſſes. There can be nothing contrived to anſwer the purpoſe ſo effectually as this mill. Its motion is eaſy, regular, and ſafe. While it preſſes gently, it turns the cloth; which is continually waſhed with a ſtream of water. Care muſt be taken, however, that no water be detained in the folds of the linen, otherwiſe that part may be injured.

Sect. III. *Of Bucking and Boiling.*

This is the moſt important part of the whole proceſs, and deſerves a very nice examination. Its deſign is to looſen, and carry off, by the help of alkaline lixivia, that particular ſubſtance in cloth, which is the cauſe of its brown colour. All aſhes uſed in ley, pearl aſhes excepted, ought to be well pounded, before they are put into the copper; for the marcoſt and caſhub are very hard, and with ſome difficulty yield their ſalt. As theſe two laſt contain a very conſiderable proportion of a matter, which will in ſome degree tinge white

cloth; and as this is diſſolved much more by boiling than by the inferior degrees of heat, while the ſalts may be as well extracted by the latter; the water ſhould never be brought to boil, and ſhould be continued for ſome time longer under that degree of heat. The pearl aſhes ſhould never be put in till near the end, as they are very ſoluble in water.

If theſe ſalts were always of an equal ſtrength, the ſame quantities would make a ley equally ſtrong; but they are not. Salts of the ſame name differ very much from each other. The Muſcovy aſhes become weaker every day, as every bleacher muſt have obſerved, till at laſt they turn quite effete. A decoction from them when new, muſt differ very much from one when they have been long kept. Hence a neceſſity of ſome exact criterion to diſcover when leys are of an equal ſtrength. The taſte cannot ſerve, as that is ſo variable, cannot be deſcribed to another, and is blunted by repeated trials. The proof-ball will ſerve the purpoſe of the bleach-field ſufficiently; and, by diſcovering the ſpecific gravity, will ſhow the quantity of alkaline ſalts diſſolved. But it cannot ſhow the dangerous qualities of theſe ſalts; for the leſs cauſtic and leſs heavy this liquor is, the more dangerous and corroſive it may be for the cloth. The third ley, which they draw from theſe materials by an infuſion of cold water, in which the taſte of lime is diſcoverable, appears plainly to be more dangerous than the firſt. The ſecond ley, which they extract from the ſame aſhes, and which is reckoned about a third in ſtrength, when compared to the firſt, muſt be of the ſame nature; nor ſhould it be uſed without an addition of pearl-aſhes, which will correct it.

It is taken for a general rule, That the ſolution of any body in its menſtruum is equally diffuſed through the whole liquor. The bleachers, depending on this, uſe equal quantities of the top and bottom of their ley, when once clear and ſettled; taking it for granted, that there is an equal quantity of ſalts in equal quantities of the ley. But it is a fact that the ley will be in ſome places much ſtronger than what the cloth can with ſafety bear, and hence there is a neceſſity for uſing a degree of caution to avoid miſchief. That general law of ſolution muſt have taken its riſe from particular experiments, and not from reaſoning. Whether a ſufficient number of experiments have been tried to aſcertain this point, and to eſtabliſh an undoubted general rule, may very reaſonably indeed be called in queſtion.

Dr. Home, who writes on this ſubject, ſays, "When I had diſcovered that lime makes part of the diſſolved ſubſtance, and reflected how long its groſſer parts will continue ſuſpended in water, there appeared ſtronger reaſons for ſuſpecting that this rule, though it may be pretty general, does not take place here; at leaſt it is worth the purſuit of experiment.

"I weighed at the bleach-field a piece of glaſs in ſome cold ley, after it had been boiled, ſtood for two days, and about the fourth part of it had been uſed. The glaſs weighed 3 drams $1\frac{1}{2}$ grains in the ley, and 3 drams $7\frac{1}{2}$ grains in river-water. The ſame glaſs weighed in the ſame ley, when almoſt all uſed, 2 grains leſs than it had done before. This ſhows, that the laſt of the ley contained a third more of the diſſolved body; and, conſequently, was a third ſtronger than the firſt of the ley. As this might, perhaps, be owing to a continuation of the ſolution of the ſalts, I repeated the experiment in a different way.

"I took from the ſurface ſome of the ley, after the ſalts were diſſolved, and the liquor was become clear. At the ſame time I immerſed a bottle, fixed to a long ſtick, ſo near the bottom, as not to raiſe the aſhes there, and, by pulling out the cork by a ſtring, filled the bottle full of the ley near the bottom. The glaſs weighed in river-water 3 drams $38\frac{1}{2}$ grains; in the ley taken from the ſurface 3 drams $34\frac{1}{2}$ grains; and in the ley taken from the bottom 3 drams $31\frac{1}{2}$ grains. This experiment ſhows, that the ley at the bottom was, in this caſe, $\frac{4}{7}$ths ſtronger than the ley at the ſurface.

"At other times when I tried the ſame experiment, I found no difference in the ſpecific gravity; and therefore, I leave it as a queſtion yet doubtful, though deſerving to be aſcertained by thoſe who have an opportunity of doing it. As the ley ſtands continually on the aſhes, there can be no doubt but what is uſed laſt muſt be ſtronger than the firſt. I would therefore recommend, to general practice, the method uſed by Mr. John Chriſtie, who draws off the ley, after it has ſettled into a ſecond receptacle, and leaves the aſhes behind. By this means it never can turn ſtronger; and he has it in his power to mix the top and bottom, which cannot be done ſo long as it ſtands on the aſhes."

Having thus conſidered the ley, let us next inquire how it acts. On this inquiry depends almoſt the whole theory of bleaching, as its action on cloth is, at leaſt in this country, abſolutely neceſſary. It is found by experiment, that one effect they have on cloth is the diminiſhing of its weight; and that their whitening power is generally in proportion to their weakening power. Hence ariſes a probability, that theſe leys act by removing ſomewhat from the cloth, and that the loſs of this ſubſtance is the cauſe of whiteneſs. This appears yet plainer, when the bucking, which laſts from Saturday night to Monday morning, is attended to.

Opinions differ greatly with regard to the operations of theſe ſalts; whether they act by altering the external texture of the cloth, or by ſeparating the mucilaginous parts from the reſt, or by extracting the oil which is laid up in the cells of the plant. The laſt is the general opinion, or rather conjecture, for none of them deſerves any better name; but we may venture to affirm, that it is ſo without any better title to pre-eminence than what the others have. Alkaline ſalts diſſolve oils, therefore that theſe ſalts diſſolve the oil of the cloth, is all the foundation which this theory has to reſt on; too ſlight, when unſupported by experiment, to be relied on. Dr. Home endeavours to ſettle this queſtion by the following experiments and obſervations.

"Wax (ſays he) is whitened by being expoſed to the influence of the ſun, air, and moiſture. A diſcovery of the change made on it by bleaching may throw a light upon the queſtion. Six drams of wax were ſliced down, expoſed on a ſouth window, September 10, and watered. That day being clear and warm, bleached the wax more than all the following. It ſeemed to me to whiten quicker when it had no water thrown on it than when it had. September 15, it was very white, and 1 dram 3 grains lighter. $3\frac{1}{2}$ drams of this bleached wax, and as much of unbleached, taken from the ſame piece, were made into two candles of the ſame length and thickneſs, having cotton wicks of the ſame kind. The bleached candle burnt 1 hour 33 minutes; the unbleached 3 minutes longer. The former ran down four times, the latter never. The former had an obſcure light and dull flame; the latter had a clear pleaſant one, of a blue colour at the bottom. The former, when burning, ſeemed to have its wick thicker, and its flame nearer the wax, than the latter. The former was brittle, the latter not. It plainly appears from theſe facts, that the unbleached wax was more inflammable than the bleached; and that the latter had loſt ſo much of an inflammable ſubſtance as it had loſt in weight; and conſequently the ſubſtance loſt in bleaching of wax is the oily part.

"As I had not an opportunity of repeating the former experiment, I do not look on it as entirely concluſive; for it is poſſible that ſome of the duſt, flying about in the air, might

have mixed with the bleached wax, and ſo have rendered it leſs inflammable. Nor do I think the analogical reaſoning from wax to linen without objections. Let us try then if we cannot procure the ſubſtance extracted from the cloth, ſhow it to the eye, and examine its different properties. The proper place to find it, is in a ley already uſed, and fully impregnated with theſe colouring particles.

"I got in the bleach-field ſome ley, which had been uſed all that day for boiling coarſe linen, which was tolerably white, and had been twice boiled before. There could be no dreſſing remaining in theſe webs. No ſoap had ever touched that parcel; nor do they mix ſoap with the ley uſed for coarſe cloth. Some of this impregnated ley was evaporated, and left a dark-coloured matter behind. This ſubſtance felt oily betwixt the fingers, but would not lather in water as ſoap does. It deflagrated with nitre in fuſion, and afforded a tincture to ſpirit of wine. By this experiment the falts ſeem to have an oily inflammable ſubſtance joined with them.

"Could we ſeparate this colouring ſubſtance from theſe falts, and exhibit it by itſelf, ſo that it might become the object of experiment, the queſtion would be ſoon decided. Here chemiſtry lends us its aſſiſtance. Whatever has a ſtronger affinity or attraction to the falts with which it is joined than this ſubſtance has, muſt ſet it at liberty, and make it viſible. Acids attract alkaline ſalt from all other bodies; and therefore will ſerve our purpoſe.

"Into a quantity of the impregnated ley mentioned in the former experiment, I poured in oil of vitriol. Some bubbles of oil aroſe, an inteſtine motion was to be perceived, and the liquor changed its colour from a dark to a turbid white. It curdled like a ſolution of ſoap, and a ſcum ſoon gathered on the ſurface, about half an inch in thickneſs, the deepneſs of the liquor not being above ſix inches. What was below was now pretty clear. A great deal of the ſame matter lay in the bottom; and I obſerved that the ſubſtance on the ſurface was precipitated, and ſhowed itſelf heavier than water, when the particles of air, attached to it in great plenty, were diſpelled by heat. This ſubſtance was in colour darker than the cloth which had been boiled in it.

"I procured a conſiderable quantity of it by ſkimming it off. When I tried to mix it with water, it always fell to the bottom. When dried by the air, it diminiſhed very much in its ſize, and turned as black as a coal. In this ſtate it deflagrated ſtrongly with nitre in fuſion; gave a ſtrong tincture to ſpirit of wine; and, when put on a red-hot iron, burnt very ſlowly, as if it contained a heavy ponderous oil; and left ſome earth behind.

"From the inflammability of this ſubſtance, its rejecting of water, and diſſolving in ſpirit of wine, we diſcover its oleaginous nature; but from its great ſpecific gravity we ſee that it differs very much from the expreſſed or cellular oil of vegetables; and yet more from their mucilage. That it diſſolves in ſpirit of wine, is not a certain argument of its differing from expreſſed oils; becauſe theſe, when joined to alkaline falts, and recovered again by acids, become ſoluble in ſpirit of wine. The quantity of earthy powder left behind after burning, ſhows that it contains many of the ſolid particles of the flax. The ſubſtance extracted from cloth by alkaline leys appears then to be a compoſition of a heavy oil, and the ſolid earthy particles of the flax.—In what manner theſe falts act ſo as to diſſolve the oils, and detach the ſolid particles, is uncertain; but we ſee evidently how much cloth muſt be weakened by an improper uſe of them, as we find the ſolid particles themſelves are ſeparated."

It is abſolutely neceſſary that cloth ſhould be made dry before bucking, that the falts may enter into the body of the cloth along with the water; for they will not enter in ſuch quantity if it be wet, and, by acting too powerfully on the external threads, may endanger them. The degree of heat is a very material circumſtance in this operation. As the action of the falts is always in proportion to the heat, it would appear more proper to begin with a boiling heat, by which a great deal of time and labour might be ſaved. The reaſon why this method is not followed appears to be this: If any vegetable or vegetable ſubſtance is to be ſoftened and to have its juices extracted, it is found more proper to give it gentle degrees of heat at firſt, and to advance gradually, than to plunge it all at once in boiling water. This laſt degree of heat is ſo ſtrong, that, when applied at once to a vegetable, it hardens inſtead of ſoftening its texture. Dried vegetables are immediately put into boiling water by cooks, that theſe ſubſtances may preſerve their green colour, which is only to be done by hindering them from turning too ſoft. Boiling water has the ſame effect on animal ſubſtances; for, if ſalt beef is put into it, the water is kept from getting at the falts from the outſide of the beef being hardened.

But if it be conſidered how much of an oily ſubſtance there is in the cloth, eſpecially at firſt, which will for ſome time keep off the water, and how the twiſting of the threads, and cloſeneſs of the texture, hinders the water from penetrating, we ſhall find that, if boiling water were put on it at once, the cloth might be liable, in ſeveral parts, to a dry heat, which would be much worſe than a wet one. That the leys have not acceſs to all parts of the cloth at firſt, appears plainly from this, that when it has lain after the firſt bucking, till all the leys are waſhed out, it is as black, in ſome parts, as when it was ſteeped. This muſt be owing to the diſcharge of the colouring particles from thoſe places to which the ley has acceſs, and to their remaining where it has not. It would ſeem adviſable then, in the firſt bucking or two, when the cloth is foul, to uſe the ley conſiderably below the boiling point; that, by this ſoaking or maceration, the foulneſs may be entirely diſcharged, and the cloth quite opened for the ſpeedy reception of the boiling ley in the buckings which ſucceed. The leys ſhould likewiſe be weakeſt in the firſt buckings, becauſe then they act only on the more external parts; whereas, when the cloth is more opened, and the field of action is increaſed, the active powers ought to be ſo too. For this reaſon they are at the ſtrongeſt after ſome ſourings.

The only thing that now remains to be conſidered, is, the management of the coarſe cloth, where *boiling* is ſubſtituted in place of *bucking*. This ſpecies of linen cannot afford the time and labour neceſſary for the latter operation; and therefore they muſt undergo a ſhorter and more active method. As the heat continues longer at the degree of boiling, the leys uſed to the coarſe cloth muſt be weaker than thoſe uſed to the fine. There is not ſo much danger from heat in the coarſe as in the fine cloth, becauſe the former is of a more open texture, and will allow the ley to penetrate more ſpeedily. In the cloſer kinds, however, the firſt application of the falts ſhould be made without a boiling heat being uſed.

Sect. IV. *Of Alternate Watering and Drying.*

After the cloth has been bucked, it is carried out to the field, and frequently watered for the firſt ſix hours. For if, during that time, when it is ſtrongly impregnated with falts, it is allowed to dry, the falts approaching cloſer together, and aſſiſted by a greater degree of heat, increaſing always in proportion to the dryneſs of the cloth, act with greater force, and deſtroy its very texture. After this time, dry ſpots are allowed to appear before it gets any water. In this ſtate it profits moſt, as the latter part of the evaporation comes from the more internal parts of the cloth, and will carry away

moſt from thoſe parts. The bleaching of the wax, in a preceding experiment, helps to confirm this; for it ſeemed to whiten moſt when the laſt particles of water were going off.

This continual evaporation from the ſurface of the cloth ſhows, that the deſign of the operation is to carry off ſomewhat remaining after the former proceſs of bucking. This appears likewiſe from a fact known to all bleachers, that the upper ſide of cloth, where the evaporation is ſtrongeſt, attains to a greater degree of whiteneſs than the under ſide. But it is placed beyond all doubt by experiment, which ſhows, that cloth turns much lighter by being expoſed to the influence of the ſun, air, and winds, even though the ſalts have been waſhed out of it.

Of what nature, then, is this ſubſtance? As we have diſcovered in the former ſection, that the whitening, in the operation of bucking, depends on the extracting or looſening the heavy oil, and ſolid particles of the flax; it appears highly probable, that the effects of watering, and expoſure to the ſun, air, and winds, are produced by the evaporation of the ſame ſubſtance, joined to the ſalts, with which compoſite body the cloth is impregnated when expoſed on the field. That theſe ſalts are in a great meaſure carried off or deſtroyed, appears from the cloth's being allowed to dry without any danger after the evaporation has gone on for ſome time. "If we can ſhow (ſays Dr. Home) that oils and ſalts, when joined together, are capable of being exhaled, in this manner, by the heat of the atmoſphere, we ſhall reduce this queſtion to a very great degree of certainty. September 10, I expoſed in a ſouth weſt window half an oz. of Caſtile ſoap, ſliced down and watered. September 14, when well dried, it weighed but 3 dr. 6 gr. September 22, it weighed 2 dr. 2 gr. September 24, it weighed 1 dr. 50 gr. It then ſeemed a very little whiter; but was much more mucilaginous in its taſte, and had no degree of ſaltneſs which it had before.—It appears from this experiment, that ſoap is ſo volatile, when watered, and expoſed to air not very warm, that it loſes above half its weight in 14 days. The ſame muſt happen to the ſaponaceous ſubſtance, formed from the conjunction of the alkaline ſalts, heavy oil, and earthy particles of the flax. The whole deſign, then, of this operation, which by way of pre-eminence gets the name of *bleaching*, is to carry off, by the evaporation of water, whatever has been looſened by the former proceſs of bucking.

"Againſt this doctrine there may be brought two objections, ſeemingly of great weight. It is a general opinion amongſt bleachers, that linen whitens quicker in March and April than in any other months: but as the evaporation cannot be ſo great at that time as when the ſun has a greater heat; hence the whitening of cloth is not in proportion to the degree of evaporation; and therefore the former cannot be owing to the latter. This objection vaniſhes, when we conſider, that the cloth that comes firſt into the bleach-field, in the ſpring, is cloſely attended, having no other to interfere with it for ſome time; and as it is the whiteſt, gets, in the after-buckings, the firſt of the ley; while the ſecond parcel is often bucked with what has been uſed to the firſt. Were the fact true, on which the objection is founded, this would be a ſufficient anſwer to the objection. But it appears not to be true, from an obſervation of Mr. John Chriſtie, That cloth laid down in the beginning of June, and finiſhed in September, takes generally leſs work, and undergoes fewer operations, than what is laid down in March, and finiſhed in June.

"The other objection is, That cloth dries much faſter in windy weather than in calm ſun-ſhine; but it does not bleach ſo faſt. This would ſeem to ſhow, that the ſun has ſome particular influence independent on evaporation. In anſwer to this objection, let it be conſidered, that it is not the evaporation from the ſurface, but from the more internal parts, that is of benefit to the cloth. Now, this latter evaporation muſt be much ſtronger in ſunſhine than in windy weather, on account of the heat of the ſun, which will make the cloth more open; while the coldneſs of windy weather muſt ſhut it up, ſo that the evaporation will all be from the ſurface. Clear ſun-ſhine, with a very little wind, is obſerved to be the beſt weather for bleaching; a convincing proof that this reaſoning is juſt.

"It would ſeem to follow as a corollary from this reaſoning, that the number of waterings ſhould in general be in proportion to the ſtrength of the ley; for the ſtronger the ley is, the more there is to be evaporated; and the greater the danger, in caſe the cloth ſhould be allowed to dry. But there is an exception to this general rule, ariſing from the conſideration of another circumſtance. It is obſerved, that cloth when brown dries ſooner than when it becomes whiter, ariſing from the cloſeneſs and oilineſs which it then has not allowing the water a free paſſage. Perhaps that colour may retain a greater degree of heat, and in that way aſſiſt a very little. Cloth therefore, after the firſt buckings, muſt be more carefully watered than after the laſt.

"It follows likewiſe from this reaſoning, that the ſoil of the bleach-field ſhould be gravelly or ſandy, that the water may paſs quickly through it, and that the heat may be increaſed by the reflection of the ſoil, for the ſucceſs of this operation depends on the mutual action of heat and evaporation. It is likewiſe neceſſary that the water ſhould be light, ſoft, and free from mud or dirt, which not being able to riſe along with the water, muſt remain behind. When there is much of this, it becomes neceſſary to rinſe the cloth in water, and then give it a milling, to take out the dirt; elſe it would be fixed in the cloth by the following bucking, as it is not ſoluble by the ley.

"This operation has more attributed to it by bleachers than it can juſtly claim. The cloth appears, even to the eye, to whiten under theſe alternate waterings and dryings; and theſe naturally get the honour of it, when it more properly belongs to the former operation. Here lies the fallacy. Alkaline ſalts give a very high colour to the decoctions or infuſion of vegetables. This is probably owing to the ſolution of the oleaginous colouring particles of the plant; which particles, being opened and ſeparated by the ſalts, occupy a greater ſpace, and give a deep colour to the liquor. The cloth participates of the liquor and colour. Hence bleachers always judge of the goodneſs of the bucking by the deepneſs of its colour. The rule, in general, is good. I obſerve that in thoſe buckings which continue from the Saturday night to the Monday morning, the cloth has always the deepeſt colour. When that cloth has been expoſed ſome hours to the influence of the air, theſe colouring particles, which are but looſely attached to it, are evaporated, and the linen appears of a brighter colour. This operation does no more than complete what the former had almoſt finiſhed. If its own merit were thoroughly known, there would be no occaſion to attribute that of another operation to it. Thread, and open cloths, ſuch as diaper, may be reduced to a great degree of whiteneſs, after one bucking, by it alone. No cloth, as would appear, can attain to a bright whiteneſs without it.

"Since the only advantage of watering is the removal of the ſalts, and what they have diſſolved, might we not effectuate this by ſome cheaper and more certain method? for it occupies many hands; and muſt depend altogether on the uncertainty of the weather; ſo that in the beginning of the ſeaſon, the bleacher is often obliged to repeat his buckings without bleaching. We might take out the alkaline ſalts by acids; but then the other ſubſtance would be left alone in the cloth, nor would any waſhing be able to remove it. Mill-waſhing appears a

more probable method of taking out both falts and oils; and it would feem that this might in a great meafure fupply the place of watering; but upon trial it does not fucceed. Two parcels of linen were managed equally in every other refpect, except in this, that one was watered, and expofed to the influence of the air, and the other was only mill-waſhed. This method was followed until they were fit for fouring. The cloth which had been mill-waſhed had a remarkable green colour, and did not recover the bright colour of the pieces managed in the common way, until it had been treated like them for a fortnight. The green colour was certainly owing to a precipitation of the fulphureous particles, with which the ley is impregnated, upon the furface of the cloth; owing to the falts being waſhed off more fpeedily than the fulphur, to which they are united in the ley. The attachment betwixt thefe two bodies we know is very loofe, and the feparation eafily made. Evaporation then alone is fufficient to carry off thefe fulphureous particles."

Sect. V. *Of Souring.*

It is well known to all chymiſts, that alkaline falts are convertible, by different methods, into abforbent earths. Frequent folution in water, and evaporation of it again, is one of thefe. The tranſmutation then of thefe falts, which are not volatiliſed or waſhed away, muſt be continually going on in the cloth under thefe alternate waterings and dryings of the former proceſs: not much indeed after the firſt two or three buckings; becauſe the falts, not having entered deep into the cloth, are eaſily waſhed off, or evaporated. But when they penetrate into the very compoſition of the cloth and minuteſt fibres, of which the firſt veſſels are made, they find greater difficulty of eſcaping again, and muſt be more fubject to this tranſmutation. But if we conſider the bleaching aſhes as a compoſition of lime and alkaline falts, we muſt diſcover a freſh fund for the depoſition of this abforbent earth. The common cauſtic, a compoſition of this very kind, ſoon converts itſelf, if expoſed to the open air, into a harmleſs earthy kind of powder.

The effect of frequent buckings and bleachings, is that of loading the cloth with this ſubſtance. It becomes then neceſſary to take it out. No waſhing can do that, becauſe earth is not ſoluble in water. Nothing but acids can remove it. Theſe are attracted by the abſorbent earth, join themſelves to it, and compoſe a kind of neutral imperfect falt, which is ſoluble in water, and therefore eaſily waſhed out of the cloth. The acid liquors commonly uſed, are butter-milk, which is reckoned the beſt, four-milk, infuſion of bran, rye-meal, &c. kept for ſome days till they four. Sour whey is thought to give the cloth a yellow tinge.

The linen ought to be dried before it is put in the four, that the acid particles may penetrate, along with the watery, through the whole. A few hours after it has been there, air-bubbles ariſe, the liquor ſwells, and a thick ſcum is formed; manifeſt ſigns of a fermentation. The following experiment, ſays Dr. Home, ſhows the degree of heat which attends it. "May 25, I put a thermometer of Fahrenheit's into ſome butter-milk, of which the bleachers were compoſing their ſours, and which ſtood in a vat adjoining to another, where the milk was the ſame, and the ſouring proceſs had been going on for two days. After the thermometer had been 20 minutes in the butter-milk, the mercury ſtood at 64 degrees. In the ſouring vat it roſe to 68 degrees. An increaſe of four degrees ſhows a pretty briſk inteſtine motion.

"To what are all theſe effects owing? To the acetous fermentation going on in thoſe vegetable liquors, whoſe acids, extricating themſelves, produce heat, inteſtine motion, and air-bubbles. As the change is ſlow, the proceſs takes five or ſix days before it is finiſhed. During this time the acid particles are continually uniting themſelves to the abſorbent earth in the cloth. That this fermentation goes on in the liquor alone, appears from this conſideration, that the ſame effects, *viz.* air-bubbles, and ſcum, are to be ſeen in the butter-milk alone. The only effect then it has is, by the ſmall degree of heat, and inteſtine motion, which attend it, to aſſiſt the junction of the acid and abſorbent particles. We ſhall preſently ſee that this proceſs may be carried on to as great advantage, without any fermentation; and therefore it appears not abſolutely neceſſary.

"When theſe abſorbent particles are fully ſaturated, the remaining acids may unite with, and have ſome ſmall effect in extracting the colouring particles. This appears from the two following experiments.

"Sept. 20, a piece of cloth which had been ſteeped, weighing 41½ gr. was put into a half-pound of butter-milk, whigged, and well foured, by a mixture of water, and by boiling. Sept. 24, when taken out, and waſhed in water, it appeared a very little whiter. The mineral acids, as will appear afterwards, whiten cloth, even though they are very much diluted.

"Juſt before the acetous fermentation is finiſhed, the cloth ſhould be taken out; otherwiſe the ſcum will fall down and lodge in the cloth, and the putrefaction which then begins will weaken it. This appears from the following experiment.

"Sept. 16, a piece of cloth weighing 42 gr. was laid in butter milk unwhigged. Novem. 15, the milk had a putrefied ſmell. The cloth was a little whiter, but very tender; and weighed, when well waſhed in warm water and dried, 40 gr."

Such fours as are made of bran, rye-meal, &c. ought to be prepared before uſe; for by this means ſo much time will be ſaved. Beſides, when the water is poured upon the cloth and bran, as is done in the management of coarſe cloth, the linen is not in a better ſituation than if it had been taken up wet from the field; and by this means the acid particles cannot penetrate ſo deep. Again, this method of mixing the bran with the cloth, may be attended with yet worſe conſequences. All vegetable ſubſtances, when much preſſed, fall into the putrefcent, and not the acetous fermentation. This often happens to the bran preſſed betwixt the different layers on the linen, which muſt weaken the cloth. Hence, all fours ſhould be prepared before the cloth is ſteeped in them; and none of the bran or meal ſhould be mixed with the cloth. The fours are uſed ſtrongeſt at firſt, and gradually weakened till the cloth has attained to its whiteneſs. In the firſt fourings, there is more of the earthy matter in the cloth, from the many buckings it has undergone, than what there can be afterwards. As the quantity of this matter decreaſes, ſo ſhould the ſtrength of the four. There is not, however, the leaſt danger, at any time, from too ſtrong a four.

What is moſt wanted in this operation is a more expeditious and cheap method of obtaining the ſame end. As it takes five or ſix days, it retards the whitening of the cloth conſiderably; and as bleachers are obliged to ſend for milk to a great diſtance, it becomes very dear. This laſt conſideration makes them keep it ſo long, that, when uſed, it can have no good effect; perhaps it may have a bad one.

There is however one conſideration that may lead us to ſhorten the time. It is obſerved, that the fouring proceſs is ſooner finiſhed in warm than in cold weather. Heat quickens the fermentation, by aiding the inteſtine motion. The vats therefore ſhould not be buried in the ground, as they always are, and which keeps them cold: there ſhould rather be pipes along the walls of the room, to give it that degree of heat which, on trial, may be found to anſwer beſt. There are few days in ſummer ſo hot as is neceſſary; and the beginning and end of the ſeaſon are by much too cold. That this is no ideal

ſcheme, the following fact is a ſufficient proof. There are two vats in Salton bleach-field, adjoining to a partition wall, at the back of which there is a kitchen fire. In theſe vats the ſouring proceſs is finiſhed in three days, whereas it laſts five or ſix days in thoſe that are placed round the ſame room.

This improvement, though it ſhortens the time of ſouring a very little, yet is no remedy againſt the ſcarcity and dearneſs of milk ſours. Such a liquor as would ſerve our purpoſe, muſt be found either among the vegetable acids, which have no further fermentation to undergo, or among the mineral acids. The former are a large claſs, and contain within themſelves many different ſpecies; ſuch as the acid juice of ſeveral plants, vinegars made of fermented liquors, and acid ſalts, called *tartars*. But there is one objection againſt theſe vegetable acids: they all contain, along with the acid, a great quantity of oily matter, which would not fail to diſcolour the cloth. Beſides, the demand of the bleach-fields would raiſe their price too high.

But the mineral acids have neither of theſe objections. They are exceedingly cheap, and contain no oil. "I will freely own (ſays Dr. Home), that at firſt I had no great opinion of ſucceſs from the mineral, from two reaſons; their want of all fermentation, which I then looked on as neceſſary; and their extreme corroſiveneſs. But the experience of two different ſummers, in two different bleach-fields, has convinced me, that they will anſwer all the purpoſes of the milk and bran ſours; nay, in ſeveral reſpects be much preferable to them. I have ſeen many pieces of fine cloth, which had no other ſours but thoſe of vitriol, and were as white and ſtrong as thoſe bleached in the common way. I have cut ſeveral webs through the middle, and bleached one half with milk and the other with vitriol; gave both the ſame number of operations, and the latter were as white and ſtrong as the former."

The method in which it has been hitherto uſed is the following: The proportion of the oil of vitriol to the water, with which it is diluted, is half an ounce, or at moſt three quarters, to a gallon of water. As the milk-ſours are diminiſhed in ſtrength, ſo ought the vitriol-ſours. The whole quantity of the oil of vitriol to be uſed, may be firſt mixed with a ſmall quantity of water, then added to the whole quantity of water, and well mixed together. The water ſhould be milk-warm; by which means the acid particles will penetrate further, and operate ſooner. The cloth ſhould then be put dry into the liquor, and it is obſerved, that this ſour performs its taſk much ſooner than that compoſed of milk and bran; ſo that ſome, in making the trial, have been uſed to lay the milk-ſours 24 hours before the vitriol. Five hours will do as much with this ſour as five days with the common ſort. But the cloth can receive no harm in allowing it to remain for ſome days in the ſour; but rather, on the contrary, an advantage. The cloth is then taken out, well rinſed, and mill-waſhed in the ordinary way.

The liquor, while the cloth lies in this ſour, is leſs acid the ſecond day than the firſt, leſs the third than the ſecond, and ſo diminiſhes by degrees. At firſt it is clear, but by degrees a mucilaginous ſubſtance is obſerved to float in it, when put into a glaſs. This foulneſs increaſes every day. This ſubſtance, extracted by the acid, is the ſame with what is extracted by the alkaline ſalts; and blunts the acidity of the former, as it does the alkaleſcency of the latter. Hence the liquor loſes by degrees its acidity. But as the acid ſalts do not unite ſo equally with oily ſubſtances as the alkaline do, the liquor is not ſo uniformly tinged in the former as in the latter caſe, and the mucous ſubſtance preſents itſelf floating in it.

In the firſt ſouring, which is the ſtrongeſt, the liquor, which was a pretty ſtrong acid before the cloth was put in, immediately afterwards becomes quite vapid; a proof how very ſoon it performs its taſk. But in the following operations, as the linen advances in whiteneſs, the acidity continues much longer; ſo that in the laſt operations the liquor loſes very little of its acidity. This happens although the firſt buckings after the firſt ſourings are increaſed in ſtrength, while the ſours are diminiſhed. There are two cauſes to which this is owing. The texture of the cloth is now ſo opened, that although the leys are ſtrong, the alkaline ſalts and abſorbent earth are eaſily waſhed out; and the oily particles are in a great meaſure removed which help to blunt the acidity of the liquor.

Two objections however are made againſt the uſe of vitriolic ſours. One is, that the proceſs of ſouring with milk is performed by a fermentation; and as there is no fermentation in the vitriol-ſours, they cannot ſerve the purpoſe ſo well: the other, that they may hurt the texture of the cloth. The anſwer to the former objection is very ſhort; that the vitriol-ſours operate ſucceſsfully without a fermentation, as experience ſhows; and therefore in them a fermentation is unneceſſary. As to the latter objection, that oil of vitriol, being a very corroſive body, may hurt the cloth; that will vaniſh likewiſe, when it is conſidered how much the vitriol is diluted with water, that the liquor is not ſtronger than vinegar, and that it may be ſafely taken into the human body. Indeed that it may be ſafely uſed much ſtronger than what is neceſſary in the bleach-field, appears from the following experiment with regard to the ſtamping of linen. After the linen is boiled in a ley of aſhes, it is bleached for ſome time. After this, in order to make it receive the colour, it is ſteeped in a ſour of water and oil of vitriol, about 15 times ſtronger than that made uſe of in the bleach-field; for to 100 gallons of water are added two and a half of oil of vitriol. Into this quantity of liquor, made ſo warm as the hand can juſt be held in it, is put ſeven pieces of 28 yards each. The linen remains in it about two hours, and comes out remarkably whiter. The fine cloth often undergoes this operation twice; nor is there any danger if the oil of vitriol is well mixed with the water. But if the two are not well mixed together, and the vitriolic acid remains in ſome parts undiluted, the cloth will of courſe be corroded into holes.

We propoſe now to conſider what are the advantages which the vitriol-ſours have over thoſe of milk. The latter is full of oily particles, ſome of which muſt be left in the cloth; but the caſe is worſe when the ſcum is allowed to precipitate upon the cloth. The former is liable to neither of theſe objections. The common ſours haſten very faſt to corruption; and if, from want of proper care, they ever arrive at that ſtate, muſt damage the cloth very much. As the milk is kept very long, it is often putrid before it is uſed: and, without acting as a ſour, has conſiderable bad effects, whilſt the vitriol-ſours are not ſubject to putrefaction at all. The milk takes five days to perform its taſk; but the vitriol-ſours do it in as many hours; nay, perhaps as many minutes. Their junction with the abſorbent particles in the cloth muſt be immediate, whenever theſe acid particles enter with the water. An unanſwerable proof that the fact is ſo, ariſes from the circumſtances which happen when the cloth is firſt ſteeped in the vitriol-ſour; the cloth has no ſooner imbibed the acid liquor, than it loſes all acidity, and becomes immediately vapid. This effect of vitriol-ſours muſt be of great advantage in the bleach-field, as the bleachers are at preſent hindered from enjoying the ſeaſon by the tedious neſs of the ſouring proceſs. The whole round of operations takes ſeven days; to anſwer which they muſt have ſeven parcels, which are often mixing together, and cauſing miſtakes. As three days at moſt will be ſufficient for all the operations when vitriol-ſours are uſed, there will be no more than three parcels. The cloth will be kept a ſhorter time in the bleaching, and arrive ſooner at market.

Milk-fours, it is known, are very dear, and often difficult to get; thofe of vitriol are cheap, may be eafily procured, and at any time.

There is yet another advantage in the ufe of vitriol, and that is its power of whitening cloth. Even in this diluted ftate, its whitening power is very conſiderable. We have already ſeen, that it removes the ſame colouring particles which the alkaline leys do. What then remains of it, after the alkaline and abſorbent particles are neutralized in the cloth, muſt act on theſe colouring particles, and help to whiten the cloth. That this is really the caſe, appears from the following fact. One of the bleachers of this country being obliged to chooſe 20 of the whiteſt pieces out of 100, five of the twenty were taken out of ſeven pieces which were bleached with vitriolic acid. On the whole, from both reaſon and experience it appears, that it muſt be for the advantage of our linen manufactures to uſe vitriolic in the place of milk-fours.

Sect. V. *Of Hand-rubbing with Soap and Warm Water, Rubbing-boards, Starching, and Blueing.*

After the cloth comes from the fouring, it ſhould be well waſhed in the waſhing-mill, to take off all the acid particles which adhere to its ſurface. All acids decompoſe ſoap, by ſeparating the alkaline ſalts and oily parts from each other. Were this to happen on the ſurface of the cloth, the oil would remain; nor would the waſhing-mill afterwards be able to clean it. From the waſhing-mill the fine cloth is carried to be rubbed by women's hands, with ſoap and water. As the liquors, which are generally employed for fouring, are impregnated with oily particles, many of theſe muſt lodge in the cloth, and remain, notwithſtanding the preceding milling. It is probable that all the heavy oils are not evaporated by bleaching. Hence it becomes neceſſary to apply ſoap and warm water, which unite with, diſſolve, and carry them off. It is obſerved, that if the cloth, when it is pretty white, gets too much ſoap, the following bleaching is apt to make it yellow; on that account they often wring out the ſoap.

It is a matter worth enquiring into, whether it be better to uſe hard or ſoft ſoap for the cloth. Moſt bleachers agree, that the hard is apt to leave a yellowneſs in the cloth, and it is ſaid, that hard ſoap is diſuſed in Holland on that account. As there muſt be a conſiderable quantity of ſea-ſalt in the hard, which is not in the ſoft ſoap, and as this ſalt appears prejudicial to cloth, the ſoft ſoap ought certainly to be preferred.

But the management of the *coarſe* cloth is very different, in this operation, from *fine*. Inſtead of being rubbed with hands, which would be too expenſive, it is laid on a table, run over with ſoap, and then put betwixt the rubbing-boards, which have ridges and grooves from one ſide to another, like teeth. Theſe boards have ſmall ledges to keep in the ſoap and water, which ſaves the cloth. They are moved either by hand or by a water-wheel, which is more equal and cheap. The cloth is either drawn by degrees through the boards, by men; or, which is better, the ſame wheel moves two rollers, with ridge and groove, ſo that the former enters the latter, and by a gentle motion round their own axis, the cloth is gradually pulled through the boards. This mill was invented in Ireland about thirty years ago, and the Iriſh bleachers uſe it for their fine as well as coarſe cloths.

But the objections againſt theſe rubbing-boards are conſiderable. By rubbing on ſo unequal a ſurface, the fibrous part of the cloth is worn; by which means it is much weakened. Theſe boards alſo give the cloth a cottony ſurface, ſo that it does not long keep clean. They alſo flatten the threads, and take away all that roundneſs and firmneſs which is the diſtinguiſhing property of cloth bleached in the Dutch method. For theſe reaſons they muſt be very prejudicial to *fine* cloth, and ſhould never be uſed in bleaching it. As they ſeem to be in ſome meaſure neceſſary to leſſen the expence of bleaching *coarſe* linen, they ought never to be uſed above twice, or thrice at moſt. They might be rendered much more ſafe, by lining their inſides with ſome ſoft elaſtic ſubſtance, that will not wear the cloth ſo much as the wooden teeth do. Short hair has been tried in one inſtance, and is found to anſwer very well.

When the coarſe cloth has undergone a rubbing, it ſhould be immediately milled for an hour, and warm water poured now and then on it to make it lather. This milling has very good effects; for it clears away all the dirt which the rubbing-boards have looſened, and which, at the next boiling, would have diſcoloured the cloth; and beſides that, it makes the cloth leſs cottony, and more firm, than when whitened by rubbing only.

Of *Starching and Blueing*, which is the laſt operation, we need ſay nothing in this place, as there is nothing peculiarly different in the proceſs from that to which laundry women are accuſtomed. It often happens indeed, that the cloth, when expoſed to the weather to be dried after this operation, gets rain, which undoes all again, and forces the bleacher to a new expence. To remedy this inconvenience, ſome bleachers very properly employ a dry-houſe, where the cloth may be dried, after this operation, in any kind of weather.

Sect. VI. *Of Bleaching with Lime.*

There is ſome reaſon to believe that the proceſs of bleaching may be very ſafely undertaken with the aſſiſtance of *lime*. Dr. Home has found by repeated trials, that alkaline ſalts added to lime, diminiſh its power of weakening and corroding cloth; and that too in proportion to the quantity of theſe ſalts added to the lime. This compoſition, as it is not ſo dangerous as lime alone, ſo it is not ſo expeditious in whitening. When equal parts of each are uſed, the whitening power is ſtrong, and the weakening power not very conſiderable; ſo that they might be uſed with ſafety to bleach cloth, in the proportion of one part of lime to four of pure alkaline ſalts. This fully accounts for an obſervation made by all bleachers, That the bleaching ſalts, when mixed together, operate ſafer and better than when uſed ſeparately. For the corroſive power of the Muſcovy, Marcoſt, and Caſhub aſhes, is corrected by the pearl aſhes, and the whitening quality of the latter is increaſed by that of the former.

There is not a more cauſtic ſubſtance, when applied to animal bodies, than alkaline ſalts and lime joined together, eſpecially when fuſed in the fire. But lime alone, or lime-water will preſerve animal matter in a ſound ſtate. It appears then ſurpriſing, that ſalts and lime ſhould be found ſo little deſtructive of linen cloth, when lime, or lime-water alone, deſtroys it ſo remarkably. But that this is a fact, is made evident by many experiments, and has been practiſed both with ſucceſs and ſafety, by a bleacher who gives the following account of his method of employing lime.

"Firſt (ſays he), I ſteep the cloth in warm water for 24 hours; then clean it in a waſhing-mill, of all the dreſſing, or ſowen, as the vulgar term it. Afterwards I buck cloth with cow-dung and water, and bleach it with this for three days; then clean it again, and boil it with a ley made of Caſhub aſhes. A pound to each piece of 18 or 20 yards long is ſufficient. This I do twice, as no lime ought to be given to cloth before it is a full third whitened; as it by no means advances the whitening of the cloth, but, on the contrary, protracts it: for, inſtead of looſening the oil and dirt in the cloth, when brown, it rather fixes them; juſt as when fine cloth is bucked with over-warm leys in the firſt buckings. Lime is by no

means fit for diſcharging the oil in the cloth, but for cleaning it of the dead part, commonly called *ſprat*. The cloth, being cleaned, is laid upon a dreeper. It muſt not be drier before bucking with lime, otherwiſe it will take in more than can be got out again before the next application: for as I have obſerved already, that lime is only fit for diſcharging the dead part, bucking thus wet makes it reſt on the outſide of the cloth. I take a lippy of the fineſt and richeſt powdered lime that can be got, of the brighteſt white colour, as poor lime does more hurt than good, to thirty pieces of the above length; and make a cold ley of it, by ſtirring and pouring water off the lime, until all be diſſolved but the droſs, which is thrown away: then I add a little ſoap, which makes the ley have the neareſt reſemblance to milk that breaks in boiling, of any thing I can think of: for this ſoap blunts the hotneſs of the lime. Then I take the cloth and dip it in the lime-ley, and that moment out again, and lay it on a dreeper until it be bucked: then put it on the field, watering it carefully; for if allowed to dry, it is much damaged. This is done always in the morning; as it cannot be done at night, in regard of the hot quality of the lime, which ſoon heats the cloth and tenders it. If a hot ſun-ſhine follows, it has great effect; for lime is juſt like all other materials for bleaching, that have more or leſs effect according as the weather is good or bad. I take it up the ſecond day after bucking, and give it a little milling, or hand-rubbing, or bittling, commonly called *knocking*; and lay it on the field again, watering it carefully as before. The effect is more viſible the ſecond than the firſt day. As all cloth when limed ſhould have a great deal of work, otherwiſe more than half the effect is loſt; and not only that, but a great deal of labour and pains is requiſite to take the lime out of the cloth again; it muſt never be expoſed on the Sabbath-day, but carefully kept wet always while uſed in this way. Thus bucking for three or four times at moſt, is ſufficient for any cloth, except that made of flax pulled either over-green, or which grows in a droughty ſeaſon, or perhaps not ſo well heckled as it ſhould be. This ſort occaſions great trouble and expence to the bleacher. But the moſt effectual and expeditious way I ever found for this kind was, after boiling, to take a little of the warm ley, and mix a very ſmall quantity of lime with it, and draw the cloth through that as hot as poſſible, and put it on the field directly, watering it carefully. This will clean it of the ſprat ſurpriſingly. Then I boil it with pearl aſhes, and give it the laſt boil with ſoap.

"There are innumerable miſtakes in the uſe of lime committed by the vulgar, who are ignorant of its quality and effects. They know only this in general, that it is a thing which whitens cloth cheap, and is eaſy purchaſed; therefore they will uſe it. Some of them begin whitening of their cloth with it, which I have already obſerved to be wrong, and given reaſons for it, and continue it until the cloth is bleached; give it a boil or two at moſt, and then waſh it up while the groſs body of the lime is in the ſubſtance of the cloth. This makes limed cloth eaſily diſtinguiſhable from unlimed, as the former has a yelloviſh colour, and is full of a powder. Beſides, as lime is of a very hot corroding nature, it muſt by degrees weaken the cloth. The bad effects of this ſubſtance do not end here. When the cloth is put on board, it contracts a dampneſs, which not only makes it yellow, and loſe any thing of colour it has, but directly rots it. And although it ſhould eſcape this, which it is poſſible it may, by a quick and ſpeedy paſſage; yet whenever it is put in any warehouſe, it will meet with moiſture there, eſpecially if the winter ſeaſon ſhould come on before it is diſpoſed or made uſe of. Theſe I take to be the principal reaſons for ſo much complaint in bleaching with this material." It is evident, the whole art and ſafety in uſing lime, according to this method, depends on the junction of the alkaline ſalts, during the bucking, to the particles of lime which were on the ſurface of the cloth.

As the operation of bleaching depends on the extraction of a certain quantity of phlogiſtic matter from the cloth, it is natural to ſuppoſe that it might be accelerated by rendering the alkali very cauſtic. Thus the ſalt would be entirely freed from the fixed air, with which in the uſual experiments of chemiſtry it appears to have a greater affinity than with oil; for ſoap may be partially decompoſed by fixed air, nor can it be prepared without an exceedingly cauſtic alkaline ley. In this light the matter has appeared to ſome very eminent chemiſts; and Dr. Black thought it of importance ſufficient to publiſh printed directions to the practical bleachers how to render their alkali ſufficiently cauſtic with lime, and at the ſame time recover it from the chalky reſiduum with as little loſs as poſſible. This method has accordingly been tried; but is not found altogether to anſwer the ſanguine expectations at firſt raiſed by the propoſal. It is found that in the large way of operating, fixed alkali quits the fixed air to unite with the oily or other matter to be extracted from the cloth. The only advantage therefore to be gained by Dr. Black's improvement is, that the action of the alkali is thus quickened, and ſome quantity of fuel ſaved; but this is not, by the bleachers, reckoned an equivalent to the trouble of rendering the alkali cauſtic, unleſs in places where fuel is very ſcarce.

Sect. VII. *Of the New Method of Bleaching.*

In bleaching, the uſe of acids was formerly in a great meaſure unaccounted for; but from the late diſcoveries concerning the uſe of dephlogiſticated ſpirit of ſalt in this art, it appears probable that they act by means of the dephlogiſticated air they contain. This, however, is not always the caſe; for ſilk is rendered yellow by the action of dephlogiſticated air, though rendered white by the action of the volatile ſulphureous acid, which undoubtedly contains a portion of this kind of air, though much leſs than the concentrated vitriolic acid. The nitrous acid, which contains a great quantity of dephlogiſticated air, likewiſe communicates a yellow colour to ſilk; and indeed ſeems very much inclined to produce this colour upon all the ſubſtances it touches. At any rate, its price would be a ſufficient objection againſt its uſe in bleaching. The marine acid, more generally known by the name of ſpirit of ſalt, in its common ſtate, is ſaid by M. Berthollet to be uſed with ſucceſs by ſome bleachers in France inſtead of the vitriolic; but ſuch experiments as have been made upon it in this country have not anſwered the purpoſe. The new method of bleaching is founded upon the remarkable property which that acid when dephlogiſticated poſſeſſes, of deſtroying vegetable colours; and various attempts have been made to introduce it into practice, though in this country the difficulties or diſadvantages attending it have prevented it from coming into general uſe, ſo that many of our bleachers obſtinately perſevere in the old method. M. Scheele was the inventor of this kind of acid; but M. Berthollet ſeems to have been the firſt who attempted to apply it in the operation of bleaching.—From a treatiſe on the new method of bleaching, which has been lately publiſhed in Edinburgh, we have collected the following particulars.

1. M. Berthollet having procured the dephlogiſticated marine acid in as ſtrong and concentrated a ſtate as he could, immerſed into it thread and cloth; which by that means were conſiderably whitened. In a ſhort time the liquor ſeemed to loſe its ſtrength; upon which it was poured off, and more put in its place; and ſo on until the ſubſtance immerſed became perfectly white. Thus, however, the proceſs was not only very expenſive, but the ſtuff was conſiderably injured; ſometimes

even loſing its coheſion altogether, ſo that there was a neceſſity for trying ſome other method.

2. Uſing a diluted ſpirit, he ſucceeded perfectly in rendering the cloths completely white; but by keeping them for ſome time, or expoſing them for a little to the action of an alkaline ley, they became again brown or yellow.

3. On conſidering the proceſs of bleaching in the common method, he found that the action of the ſun and air are ſubſervient to bleaching only as they prepare the colouring particles for being diſſolved and ſeparated by alkaline lixivia. To inveſtigate this ſubject, he examined the nature of the dews, both ſuch as are precipitated from the atmoſphere and thoſe which tranſpire from vegetables. Both of theſe were found ſo ſtrongly impregnated with dephlogiſticated air, that they deſtroyed the colour of paper when faintly tinged with turnſole. Hence our author obſerves, that it is by no means improbable that the ancient prejudices concerning May-dews might have ariſen from ſome obſervations analogous to this, more eſpecially as in that month the tranſpiration of plants is extremely copious.

4. By imitating with the dephlogiſticated marine acid and alkaline ley the common proceſs of bleaching, he ſucceeded in making a perfect and permanent white. For this purpoſe an alkaline lixivium was employed alternately with the dephlogiſticated marine acid; the latter being no longer uſed in a concentrated ſtate. Thus he avoided both the inconvenience ariſing from the ſuffocating ſmell of the liquid, and that of its deſtroying the texture of the ſtuff immerſed in it.

5. The cloth is prepared for bleaching in this manner, by ſteeping it 24 hours in water, to extract the dreſſing it receives from the weaver: a little old ley, which has already loſt the greateſt part of its ſtrength in other proceſſes, may be uſed with advantage. It is next to be expoſed once or twice to the action of ſome good freſh alkaline ley; in order to ſeparate, by means of this cheaper liquid, all the colouring matter which it can extract, and thereby ſave the dephlogiſticated acid.

6. The ſtuff muſt now be carefully waſhed with water to ſeparate any remains of the ley which might adhere to it and weaken the action of the liquor. It is then to be diſpoſed of in wooden troughs, ſo that the dephlogiſticated acid may paſs freely through every part of it; to allow which, it muſt lie quite looſe, without being tightened or ſtraitened in any part. All theſe troughs ought to be conſtructed entirely of wood without any iron, as that would eaſily be corroded and ſtain the cloth.

7. The firſt immerſion in the dephlogiſticated acid is to continue three hours; after which the cloth is to be removed, and the liquor wrung out of it. It muſt then be waſhed a ſecond time with alkaline ley; which being alſo waſhed out, it is to be again immerſed in dephlogiſticated acid.

8. The ſecond immerſion in the acid is to continue only about half an hour; after which it is to be taken out and wrung as before. The ſame liquor may ſerve for ſeveral immerſions; only when it appears to be much exhauſted, it is to be reſtored by an addition of freſh liquor.

9. After the cloth ſeems to be ſufficiently whitened, excepting only ſome few black threads and the ſelvages, it is to be ſtiled with black ſoap, and ſtrongly rubbed for ſome time; after which it is to be again waſhed in alkaline ley, and receive another immerſion in the acid liquor.

10. It has not yet been determined what number of immerſions in the acid are neceſſary to whiten linen cloth, though our author ſuppoſes from ſix to eight to be ſufficient for the purpoſe.

Sect. VIII. *Of the Method of preparing the dephlogiſticated Marine Acid.*

With regard to the proceſs of preparing the dephlogiſticated acid, M. Berthollet recommends ſix ounces of black manganeſe finely powdered, 16 ounces of ſea-ſalt likewiſe in powder, and 12 ounces of concentrated vitriolic acid to be diluted with eight ounces of water: but the quantity of this laſt muſt be varied according to the ſtrength of the acid and the dryneſs of the ſalt. If the manganeſe is impure, its quantity is to be augmented in proportion to the ſuppoſed impurity; and it is known whether a ſufficient quantity has been employed, by a portion remaining behind and retaining its black colour. When the materials are prepared, the manganeſe and common ſalt, both reduced to fine powder, muſt be mixed accurately together, and put into the diſtilling veſſel placed in a ſand-bath; the vitriolic acid diluted with water and allowed to cool is then to be poured upon them, and the junctures exactly luted. The receiver may be of wood covered in the inſide with wax, and of a very large ſize; for the gas is abſorbed in proportion to the ſurface of the water it acts upon. Our author deſcribes an apparatus, rather complicated, but of which we have given a repreſentation in 2d Plate 48.

Fig. 1. is an elevation of the apparatus, in which is repreſented a reverberatory furnace A B C D, having, on a line with B, many ſmall openings in its circumference, to ſerve as chimneys; within which, upon a ſand-bath *a*, is placed a matraſs *b*, the neck of which ſtands out above the furnace, running through the opening D, which is to be cloſed with clay. The mouth F, of the neck of the matraſs, is cloſed by a cork G, through the middle of which paſſes a tube H, which forms a communication between the inſide of the matraſs *b*, and the intermediate veſſel K, where it alſo paſſes through a cork I, which cloſes one of the three openings of that veſſel. The corks G and I ought to be prepared beforehand, and well fitted to each end of the tube of communication H, which is to be ſo diſpoſed that it may be fitted in immediately after the mixture is made in the matraſs.

The intermediate veſſel K is about an eighth part full of water; into it is plunged the tube of ſafety L, to prevent danger from regurgitation. This tube ought to be ſo high, that the weight of the water which enters into it, by the preſſure of the gas, may be great enough to cauſe the gas to paſs into the pneumatic tub N O P, by the tube of communication M, which is plunged therein, and reaches to the bottom, where it is bent horizontally, ſo that the gas may be emitted under the firſt of the three wooden, or (if they can be procured) ſtone-ware cavities, or receivers, which are placed in the inſide of the tub, one above the other. O is a handle which ſerves to turn the agitator E, the movement of which facilitates the combination of the gas with the water. P is a ſpigot and faucet to draw off the liquor.

Fig. 2. *Upper part of the pneumatic Tub.* In this Q R S T are four ſtaves which are thicker than the others, and which project within the tub, when they are hollowed ſo as to receive the ends of two wooden bars U N, which ſerve to keep in their places the cavities or receivers X.

Fig. 3. *Section of the Tub.* Each cavity X is ſo conſtructed that it may receive the gas which is emitted at *i* from the tube of communication M. The gas, as it comes out, is collected under the loweſt cavity, and increaſes in quantity until it paſſes by the funnel Z to that in the middle, and afterwards to the upper one. The opening through which the agitator E paſſes, in the centre of each cavity, is in the ſhape of a funnel, and is ſo formed as to hinder the gas from eſcaping along the agitator, which is furniſhed with three tranſverſe arms *c*, each

being fastened by a wedge *d*; *e f* represents one of these arms in a horizontal direction.

The bent tube *g h* serves to draw off the atmospheric air which is contained under the cavities, after the tub has been filled with water. To make use of this tub, the bent part is successively introduced under each cavity, as is shewn at *g*; we must then blow into it, at the end *h*, till the water in it is forced out: after which the air contained under the cavity will immediately make its escape.

Fig. 4. *Apparatus for the distillation of muriatic acid.* In this, *l* represents a retort, which is to be placed in a reverberatory furnace; the mouth of the retort is to be closed by a cork *m*, having two holes, through one of which passes the tube *n*, bent at *o*, and terminating at the top in the form of a funnel *p*, by means of which the vitriolic acid is to be introduced into the retort. The only hole of the cork *m* receives the end of a tube *q*, which forms a communication between the retort and a vessel *r*; which vessel has three openings, and is to be about an eighth part full of water, into which is to be plunged the tube of safety *s*, to prevent danger from regurgitation: the vessel *r* has a communication with a second vessel *u*, by means of the tube *t*: this second vessel is to be half full of water, and is to have a communication with a third: this third vessel should be also provided with a tube of safety, and is to communicate with a fourth.

In the construction of an apparatus for this purpose, it is evident the requisites are, that the receiver should not only be capacious but broad, in order that the gas, which is very volatile, may meet with a large surface of water to absorb as much of it as possible. It is very improbable, however, that all the gas can be absorbed by a single receiver, let us make it as large as we will; for which reason it will be proper to have several of them connected with each other by glass tubes, so that what escapes from one may be absorbed by another. Thus we are sure of having the water fully impregnated with the gas; though we cannot by any means concentrate this liquid like the mineral acids. By means of condensing engines, indeed, a greater quantity of it might be forced into the water than it can naturally contain: but this could answer no useful purpose; for the moment that a bottle containing such liquor was opened, the superfluous gas would fly off with violence and danger to the person who opened it. The bottles themselves would also be liable to burst on every slight alteration of temperature in the atmosphere. It is proper therefore not to attempt the preparation of the liquor in any great degree of strength; though this is indeed attended with a very considerable inconvenience, viz. the difficulty of transporting it from the place where it is prepared to the bleachfield, on account of the great bulk and weight of it. M. Berthollet proposes to have it made at the place where the cloth is to be bleached; and so near, that the dephlogisticated spirit of salt might be conveyed by spouts to the troughs which contain the cloth. This, however, must in many cases be impracticable, unless we suppose the generality of bleachers to be possessed of a skill in managing chemical operations which at present they have not. When great quantities of liquor are to be brought from distant places, however, it must undoubtedly be a great discouragement, especially if the best methods, and the cheapest also, have not been used in the preparation of the acid.

Sect. IX. *Of the comparative Advantages between the New and Old Methods of Bleaching.*

It would add much to the importance of this new method of bleaching if a comparative estimate of the expence of that and of the old mode were fairly laid before the public, and the preference in this respect appeared justly due to the former. This, however, has not yet been done; nor even the first and most essential step towards it taken, viz. the determining how much stuff a certain quantity of dephlogisticated spirit of salt will whiten. From such experiments as we have made on the subject, it is probable that the acid drawn from one pound of salt will whiten four of linen cloth without any addition.—This may seem a small expence; but if we consider the vitriolic acid to be made use of, and that the residuum is useless, it would soon be found very considerable. Glauber's salt may indeed be prepared from the residuum of the distillation; but so much of that article is prepared otherwise, that at present the making of it is no object. M. Berthollet mentions the separation of the mineral alkali from the residuum; and says he has received some instructions on this head from M. Morveau and others, but conceals them on account of their being communicated as secrets.

In order that the reader may judge for himself on the subject of the expence of M. Berthollet's method, we shall here transcribe the latter part of his memoir in which this part of the subject is more particularly considered.

"If (says he) at present, when the oxygenated muriatic acid costs nearly three *deniers* (about half an English farthing) a quart in the provinces which are not subject to the *gabelle* (no longer existing in France), the new method of bleaching, when properly conducted, is frequently advantageous notwithstanding this expence; it is not to be doubted but that it may become much more so, by means of these œconomical practices which I have just now mentioned. But, so long as the preparation of the bleaching liquor is at all expensive, there will always be a great advantage in favour of fine cloths; because, in equal quantities of surface, they present a less quantity of matter, and are bleached much easier; so that an ell, or a pound, of fine cloth, requires much less liquor than an ell, or a pound, of coarser cloth.

"But, that the advantages of this process may be fully enjoyed, it is necessary to establish it in a country which is not subject to the tax on salt, called the *gabelle*; for, where salt is not at a low price, the oxygenated muriatic acid becomes too expensive.

"Nevertheless, it is not by the expence of the new process, rigorously compared with that of the ordinary method of bleaching, that we must judge of its advantages, as it is attended with some particular ones which would compensate a superior price. Cloths and thread, which in some places require many months, may be easily bleached in five or six days, even in a large manufactory; and the bleaching of a few pieces only, may, without difficulty, be terminated in two or three days. Besides, the new method of bleaching may be executed in the winter as well as in the summer, only the drying requires more time.

"An industrious countryman, whose family employ their intervals of leisure in spinning, is obliged to wait for favourable weather, and perhaps to send his thread and cloths to a great distance, where they remain a long time in bleaching; or, if his necessities are pressing, he is obliged to sell them, at a loss, to some intermediate factor, who lays a tax upon his poverty. But, if the manufactories for making oxygenated muriatic acid increase in number sufficiently, those who weave a piece of cloth will be able to bleach it themselves, and to enjoy the whole fruit of their labour as soon as it is out of their hands.

"The warehouseman, in a season which is unfavourable to the ordinary method of bleaching, is not able to fulfil his engagements without great difficulty; he is obliged to employ a considerable capital to fill his warehouse in the season in which

the bleaching is executed; he is frequently unable to enter upon ſpeculations which might lead to profit (by his taking advantage of opportunities which unexpectedly offer themſelves), becauſe it would require too much time to bleach the quantity of cloths which he may want.

"The conſumer will alſo find his advantage, as there will not only, in the end, reſult ſome diminution in the price of cloths and thread, but the new bleaching, when properly executed, diminiſhes the original ſtrength of flax and hemp much leſs than the long and often-repeated operations of common bleaching. It even appears, by the experiments of M. Decroiſille, that the oxygenated muriatic acid, by contracting the pores of cotton, gives it more ſolidity, and alſo communicates to it the property of taking more brilliant colours.

"As the cloths are leſs worn, an apparent diſadvantage ariſes, in the eyes of ſome dealers, from this new method; which is, that they do not appear ſo fine as cloths of the ſame quality bleached in the common manner. M. Bonjour has even been obliged to contrive methods of wearing the cloths which had been bleached in the manufactory which he directs. It is evident that ſuch methods are not difficult to be found; but thoſe who are willing to give up this apparent fineneſs, will, of courſe, have their cloths of greater ſtrength.

"Beſides, may not thoſe vaſt meadows, which in very fertile countries are taken up with cloths (which it is neceſſary to keep ſpread over them all the fine weather), be gained for the purpoſes of agriculture, to which they are now almoſt loſt?

"If I do not deceive myſelf, the proceſs which I have deſcribed ought to be diſtinguiſhed from thoſe which merely contribute to the progreſs of the arts; it deſerves to be warmly patronized by thoſe whoſe duty it is to watch over the public proſperity, as, beſides its advantage to commerce, it may directly contribute to improve the country, which, being the primary ſource of our riches, has the ſtrongeſt claim to our attention.

"I ſhall now proceed to deſcribe ſome other uſes, in which the oxygenated muriatic acid may be employed. It appears that it may be ſucceſsfully made uſe of to deſtroy the madder-ground of printed cloths. When theſe cloths are printed with different corroſives, they are paſſed through the madder-bath, where the deſigns take different ſhades, according to the nature of the corroſives, but at the ſame time the ground of theſe cloths takes the colour of the madder: this colour, which is much leſs permanent than that which has been fixed by the corroſives, it is neceſſary to deſtroy by means of cow-dung and bran, and by long expoſure in the fields. When I firſt tried, inſtead of theſe means, to uſe the oxygenated muriatic acid, I found that the colours, which ought to be preſerved, were themſelves much injured.

"But Mr. Henry, of Mancheſter, an able chemiſt, found that mild alkalis, either vegetable or mineral, prevented this bad effect of the liquor, and he has ſince that time uſed it with ſucceſs; I am not acquainted with the particulars of the method which he follows. M. Decroiſille wrote to me, nearly about the ſame time, that he had made the ſame obſervation, and I ſoon after was convinced of the truth of it, by making uſe of the proceſs which I deſcribed when ſpeaking of the Javelle ley, namely, by weakening, with a great deal of water, the liquor thereby obtained. M. Oberkampf, to whom I communicated this proceſs, and who neglects nothing which may contribute to the perfection of his excellent manufactory a Jouy, immediately began to make ſome trials, which he has lately continued with M. Royer, and which promiſe to be ſucceſsful, except with reſpect to colours in which iron has been employed; for, thoſe are weakened; the reds, on the contrary, become brighter than by the ordinary proceſs; but my knowledge of this art is not yet ſufficiently perfect to enable me to be more particular *.

"In the trials made at Jouy, the expence has been greater than that of the ordinary proceſs, on account of the price of ſalt; this is a great diſadvantage to manufactories of printed cloths eſtabliſhed in countries ſubject to a tax on ſalt."

With regard to the preparation of mineral alkali, ſome celebrated chemiſts have aſſerted, that the calces of lead, or lead itſelf, will decompoſe ſea-ſalt, and thus afford an eaſy method of procuring it. On this principle indeed attempts have been made to procure it, but hitherto without ſucceſs; and from ſuch experiments as we have made, it ſeems to be totally impracticable. The method of decompoſing Glauber's ſalt and other vitriolic ſalts by means of charcoal, is perhaps the only one that ſeems to promiſe ſucceſs. The difficulty here is, that the ſalt is converted into an hepar ſulphuris, which cannot be decompounded but by means of an acid.

A method of applying *ſorrel* for this purpoſe has lately been tried, and not without a proſpect of ſucceſs. The particulars hitherto diſcovered concerning this method are, 1. Sea-ſalt yields one half its weight of pure alkali. 2. From 20 to 25 pounds of freſh ſorrel leaves are to be uſed for every pound of ſea-ſalt. 3. The plant is eaſily cultivated, yields three crops annually if properly managed, and is ſuperior in acidity in its cultivated ſtate to the wild ſorrel. The above calculation was made with wild ſorrel. 4. An acre of ground will produce as much ſorrel as is ſufficient for making from a ton to a ton and an half of alkali. It will not thrive except in moiſt ground. From theſe particulars it is probable, that by combining the proceſs of making dephlogiſticated ſpirit of ſalt with that of preparing the mineral alkali, bleaching might be performed at an eaſier and cheaper rate than has yet been done: though even here there is ſome doubt, that without an encouragement from government by taking off the duties from ſalt and ſulphur uſed in the different operations, a project of this kind might miſcarry, to the great detriment of the individual who ſhould attempt it. On the whole, the principal objections to the new method of bleaching are, that little or none of the alkali commonly uſed can be ſaved. The air alſo and light of the ſun, which in the common way is had for nothing, muſt in the new way be bought at a certain price. The only advantage therefore is, that in the new method, a conſiderable portion of time is ſaved. Hence it is impoſſible to make an exact comparative calculation of the expence of both methods, without eſtimating how much labour is ſaved in the new way. If the price of the labour ſaved exceeds that of the dephlogiſticated ſpirit of ſalt, there is no doubt that the uſe of it will be attended with profit, but not otherwiſe. It is aſſerted by M. Berthollet, that in the new way of bleaching, the texture of the cloth is leſs hurt than in the old one: this too muſt be reckoned an advantage; though by the bleachers, and indeed by the public in general, it will probably be overlooked, unleſs they are induced by the *cheapneſs* to prefer the new to the old proceſs.

* It appears, from what I have juſt learnt from Mr. Taylor, a celebrated manufacturer at Mancheſter, where they begin to make uſe of the new method, that there is not always a neceſſity for adding alkali to the oxygenated muriatic acid; and that the colours which contain iron are not always weakened. Theſe different effects probably depend upon the various methods uſed in printing the cloths.

We ſhall conclude this ſubject with ſome particulars publiſhed by M. Berthollet in the Annales de Chimie, in addition to what he had before advanced.

" It was always my intention (ſays he), when I publiſhed the deſcription of the method of bleaching by means of the muriatic acid, to communicate to the public every uſeful remark I could add to it, whether they aroſe from my own obſervations, or from thoſe of my correſpondents, provided the latter were not made known to me under the tie of ſecrecy; for, it is natural that thoſe who devote themſelves to the practice of any particular art, ſhould wiſh to keep ſecret thoſe improvements which they may ſucceed in making; and there is no kind of property which ought to be more reſpected than thoſe diſcoveries which ariſe from induſtry.

" M. Welter has found it of advantage to finiſh the proceſs of bleaching, by expoſing the cloths and thread on the field for three or four days, during which they ſhould be ſometimes wetted, and afterwards waſhed in pure water. He thinks that this expoſition is abſolutely neceſſary, in order to take away a yellow tinge, which they are apt to retain, but he obſerves that cotton does not want this operation.

" Others, however, have bleached, to the entire ſatisfaction of the dealers, without this expoſition, and I have convinced myſelf, by many experiments, that linen may be brought to the moſt perfect whiteneſs without it; nevertheleſs, when thread or cloth is preſſed together in any parts, during the proceſs (which, when a large quantity is bleached at the ſame time, it is very difficult to avoid), thoſe parts are apt to preſerve a yellow tinge, which it would perhaps require ſeveral operations to efface equally throughout; theſe repeated operations would increaſe the charge, and tend to weaken the texture of the linen; whereas a ſhort expoſition on the field entirely takes away that tinge. This practice, therefore, ſeems to me proper to be adopted with reſpect to linen; it requires but a ſmall extent of ground, and it occaſions but a ſmall loſs of time.

" M. Decroiſille, whoſe eſtabliſhment at Rouen is in full vigour, has made many advantageous alterations in the proceſs; as indeed might be expected from the attention of ſo able a chemiſt. I have his permiſſion to publiſh the following extract from one of his letters. " We bleach here (at about the ſame " price as other bleachers) coarſe cotton cloths, fine linen for " ſhirts, ſtockings, caps, &c. made of thread and cotton. I " flatter myſelf, alſo, that I have improved upon your diſco- " very: my great recipient, in the diſtilling apparatus, is of a " kind entirely new; I have no wood in any part of it, and " each of my diſtilling matraſſes contains ſixty pounds of vi- " triolic acid, &c. I have alſo left off uſing wood for thoſe " veſſels in which the ſubjects to be bleached are plunged; and " the whiteneſs of our goods is now eſteemed to be ſuperior " to that produced by the Engliſh before your diſcovery. " Cotton-yarn bleached by your proceſs takes, very advanta- " geouſly, the red dye called the Turkey red; as, by means " of that proceſs, about one-third of the uſual labour is " ſpared; leſs oil is required in the preparation; and your ley, " employed in certain ſtages of the operation, in concurrence " with the other ingredients, produces a much more beautiful " colour. Your diſcovery will be particularly uſeful to our " city, many merchants finding it worth while to give us dyed " cloths to have their colours diſcharged; no colour reſiſts, " and we return them their cloths as ſound and as white as if " they had never been dyed or printed."

" The making uſe, inſtead of wood (for the pneumatic tub, and troughs), of a matter which is not acted upon by the liquor, is certainly of great advantage to the ſucceſs of this method of bleaching; as, by that means, we not only avoid the loſs of that portion of the liquor which exerts its action upon the wood, but we alſo ſave expence in repairing the veſſels, which are very ſoon worn out.

" I have ſaid that the cloths, when taken out of the water acidulated with vitriolic acid, ought to be plunged into common water; but that precaution is not ſufficient, they muſt be plunged into a weak cauſtic ley, moderately warm, and kept in it during ſome minutes.

" When the liquor is immediately drawn off into the troughs, as I directed, we muſt take care that it is firſt well ſtirred with the agitator; otherwiſe, that which is at the bottom of the tub, and is moſt ſaturated with acid, would firſt run off, and would act too ſtrongly upon the cloths. We may, indeed, omit the uſe of the agitator, by drawing off only half, or three quarters, of the liquor, which muſt afterwards be mixed with a proper quantity of water, according to the proportions I have pointed out; and the reſt of the liquor, which is but weakly impregnated, may ſerve, with an additional quantity of water, for another diſtillation.

" Many perſons have attempted to execute this proceſs without having any knowledge of chemiſtry, and without attending to the quality of the thread and cloth they meant to bleach; and it either did not ſucceed with them, or the expence of it, according to their calculation, was too great.

" No one muſt flatter himſelf that he can execute this proceſs, ſimple as it is, unleſs he is guided at firſt by ſome perſon who is accuſtomed to the operations of chemiſtry. Reſpecting the expences of the proceſs, I think it right to be more particular: we muſt not expect a decreaſe, or even an equality of expence (in compariſon with the common method), except in bleaching fine cloths, unleſs we are acquainted with a good proceſs for extracting the mineral alkali from the reſidue of the diſtillations; and, without this advantage, we ought not to undertake to bleach the coarſer kinds of cloth, except in thoſe caſes where the quickneſs of the operation, the power of executing it in all places and ſeaſons, and the diminution of the capital required in the linen trade, may compenſate for the increaſe of expence.

" It is impoſſible to eſtabliſh *data* upon which to determine in every particular caſe, but I would adviſe thoſe who are intereſted in this ſubject, to begin by trials upon a ſmall ſcale, and, from them, to form fair calculations, without ſeeking to flatter themſelves; on the other hand, they muſt not be led aſtray by thoſe loſſes to which every one is liable, before he becomes familiarized with the management of the proceſs; it is, however, not very expenſive to follow, for a certain time, ſuch operations on a ſmall ſcale as may lead us afterwards to undertake, with advantage, others on a large one."

BLE

BLEAK, in ornithology. See BARBEL.

BLECHINGLY, a town of Surry in England, which ſends two members to parliament, and the bailiff who returns the members is choſen annually at the lord of the manor's court. The town ſtands on a hill, and has a fine proſpect as far as the South Downs in Suſſex. W. long. 0. 15. N. lat. 51. 20.

BLE

BLEEDING, in therapeutics. See MEDICINE. As a chirurgical operation. See SURGERY.

BLEEDING *at the Nose*, called *Epistaxis*. See SURGERY.

BLEEDING is also used for a hæmorrhage or flux of blood from a ruptured vessel, either spontaneously produced, or in consequence of a wound, or other accident. See HÆMORRHAGE.

BLEEDING *of a Corpse*, is a phenomenon said to have frequently happened in the bodies of persons murdered, on the touch, or even the approach, of the murderer. Formerly, a bleeding from the nose, ears, &c. was admitted in England, and, to the disgrace of these enlightened times, is still allowed in some other countries, to be a sort of proof of criminality in the person suspected. Numerous instances of these posthumous hæmorrhages are given by superstitious writers, but they are not worth repeating.

BLEEDING is also used for the drawing out the sap of plants, otherwise called *tapping*. See TAPPING.

BLEKING, a territory in the south part of Sweden, having the Baltic Sea on the south, Smaland on the north, and the province of Schonen on the west. Its principal towns are Christianstadt, Elleholm, Ahuys, Roterby, and Christianople, which last is the capital.

BLEMYES, or BLEMMYES, a fabulous people of Ethiopia, said to have had no heads; their eyes, mouth, &c. being situated in their breasts. See ACEPHALOUS.

BLENCH, or BLANCH. See BLANCH.

BLEND, or BLINDE. See BLINDE.

BLEND-*Water*, called also *morehough*, a disease incident to black cattle, but little understood by common farriers, who, in order to cure it, give bole armeniac, charcoal-dust, and the inner bark of the oak, dried and pounded together.

BLENHEIM, a village of Germany, in the circle of Suabia, situated in E. long. 2. 30. N. lat. 48. 40. This village is remarkable for the defeat of the French and Bavarians in 1704, by the English and their confederates under Prince Eugene and the Duke of Marlborough. The French army amounted to 60,000 veterans, who had shared in the conquests of their grand monarque; and were now commanded by two generals the most distinguished at that time in France, Marshal Tallard and the Duke of Bavaria. The former had established his reputation by many victories. He was active and penetrating; his ardour often rose to impetuosity; yet he was so short-sighted as to be incapable of seeing objects even at a small distance. The Duke of Bavaria was equally experienced in the field, and had stronger motives for activity: his country was ravaged before his eyes, and nothing remained of his possessions but the army which he commanded. The allied army, commanded by Eugene and Marlborough, amounted to about 52,000 men, troops who had long been familiar with victory, and who had seen the French, the Turks, and the Russians, fly before them. Both armies, after many marches and countermarches, approached each other. The French were posted on a hill near the town of Hochstet; their right covered by the Danube and the village of Elenheim; their left by the village of Lutzengen; and their front by a rivulet, the banks of which were steep and the bottom marshy. The right wing of the French was commanded by Marshal Tallard; their left by the Duke of Bavaria, and under him General Marsin, an experienced Frenchman. Their position being advantageous, they were willing to await the enemy rather than offer battle. On the other hand, Marlborough and Eugene were stimulated to engage them at all events, in consequence of an intercepted letter from Villeroy, intimating that he was preparing to cut off all communication between the Rhine and the allied army. The dispositions, therefore, being made for the attack, and the orders communicated to the general officers, the allied forces advanced into the plain, and were ranged in order of battle. The cannonading began about nine in the morning, and continued to about half after twelve. The troops then advanced to the attack; the right under the direction of Prince Eugene, the left headed by Marlborough, and opposed to Marshal Tallard. Marlborough, at the head of the English troops, having passed the rivulet, attacked the cavalry of Tallard with great bravery. This general being then reviewing the disposition of his troops to the left, his cavalry fought for some time without the presence of their commander. Prince Eugene had not yet attacked the forces of the elector; and it was near an hour before he could bring up his troops to the engagement. Tallard was no sooner informed that his right was attacked by the duke, than he flew to its head, where he found a furious encounter already begun; his cavalry being thrice driven back, and rallying as often. He had posted a large body of forces in the village of Blenheim; and he made an attempt to bring them to the charge. They were attacked by a detachment of Marlborough's troops so vigorously, that instead of assisting the main body they could hardly maintain their ground. All the French cavalry being thus attacked in flank, was totally defeated. The English army now penetrated between the two bodies of the French commanded by the marshal and elector, while the forces in the village of Blenheim were separated by another detachment. In this distressed situation Tallard flew to rally some squadrons; but from his short-sightedness mistaking a detachment of the enemy for his own, he was made prisoner by the Hessian troops, who were in the allied army. Meanwhile, Prince Eugene on his part, after having been thrice repulsed, at last put the enemy into confusion. The rout then became general, and the flight precipitate. The consternation of the French soldiers was such, that they threw themselves into the Danube, without knowing whither they fled. The allies being now masters of the field of battle, surrounded the village of Blenheim, where a body of 13,000 men had been posted in the beginning of the action, and still maintained their ground. These troops seeing themselves cut off from all communication with the rest of the army, and despairing of being able to force their way through the allies, threw down their arms, and surrendered themselves prisoners of war. Thus ended the battle of Blenheim, one of the most complete victories that ever was obtained. Twelve thousand French and Bavarians were slain in the field or drowned in the Danube; 13,000 were made prisoners of war; and there were taken 100 pieces of cannon, 22 mortars, upwards of 100 pair of colours, 200 standards, 17 pair of kettle-drums, upwards of 3600 tents, 34 coaches, 300 loaded mules, two bridges of boats, and all the French baggage, with their military chest. Next day, when the Duke of Marlborough visited his prisoner the marshal, the latter assured him that he had overcome the best troops in the world. "I hope, Sir (replied the duke), you will except those troops by whom they were conquered." The allies, in consequence of this victory, became masters of a country 100 leagues in extent.

BLENHEIM-*House*, a noble and princely house erected in honour of the Duke of Marlborough at Woodstock near Oxford, which, with the manor of Woodstock, is settled on the Duke and his heirs, in consideration of the eminent services by him performed for the public; and for building of which house the sum of 500,000l. was granted by parliament, &c.—The tenure by which his Grace holds the manor of Woodstock is the presenting at the castle of Windsor annually on the day in which the battle of Blenheim was fought, a flag embroidered with fleurs-de-lis; which flag is shown to all strangers who visit the castle.

BLENNIUS, in ichthyology, a genus of fishes belonging to the order of jugulares; the characters of which are these: The head slants or declines to one side; there are six rays in

the membrane of the gills; the body tapers towards the tail; the belly-fins have only two blunt bones; and the tail-fin is diſtinct. The ſpecies are 13: *viz.* 1. The galeria, with a tranſverſe membranous creſt upon the head. It is found in the European ſeas. 2. The criſtatus, with a longitudinal briſtly creſt betwixt the eyes. 3. The cornutus, with a ſimple ray above the eyes, and a ſingle black fin. The above two are natives of the Indies. 4. The ocellaris, with a furrow betwixt the eyes, and a large ſpot on the back-fin. 5. The gattorugine, with ſmall palmated fins about the eye-brows and neck. It is about ſeven or eight inches long. Theſe two laſt are found in the European ſeas. 6. The ſuperciliоſus, with ſmall fins about the eye-brows, and a curved lateral line. It is a native of India. 7. The phycis, with a kind of creſted noſtrils, a cirrus or beard on the under lip, and a double fin on the back. It has ſeven rays in the gill-membrane; the anus is ſurrounded with a black ring; and the tail is roundiſh. 8. The pholis, has a ſmooth head, a curve line upon the ſides, and the upper jaw is larger than the under one. The two laſt are found in the Mediterranean Sea. 9. The gunellus, has 10 black ſpots on the back-fin. It is found in the Atlantic Ocean. 10. The muſtelaris, has three rays on the fore-part of the back-fin. It is a native of India. 11. The viviparus has two tentacula at the mouth. Schonevelde firſt diſcovered this ſpecies; Sir Robert Sibbald afterwards found it on the Scottiſh coaſt. They bring forth two or three hundred young at a time. Their ſeaſon of parturition is a little after the depth of winter. Before midſummer, they quit the bays and ſhores; and retire into the deep, where they are commouly taken. They are a very coarſe fiſh, and eaten only by the poor. They are common in the mouth of the river Eſk, at Whitby, Yorkſhire; where they are taken frequently about the bridge. They ſometimes grow to the length of a foot. Their form is ſlender, and the back-bone is green, as that of a ſca-needle. 12. The lumpenus, has ſeveral duſky-coloured areolæ running acroſs its body. The two laſt are found in the European ſeas. 13. The raninus, with ſix diviſions in the belly-fins, is found in the lakes of Sweden. It is remarkable, that when this fiſh appears in the lake, all the other fiſhes retire; and what is worſe, it is not fit for eating.

BLENNY. See the laſt mentioned article.

BLESS (Henry), a painter of hiſtory and landſcape, was born at Bovine, near Dinant, in 1480. He acquired his ſkill in the art merely by the ſtrength of his natural genius, aſſiſted by a diligent ſtudy and obſervation of the works of Patenier, without having any other inſtructor: and at laſt rendered himſelf very eminent, particularly by his landſcapes. His beſt performances were bought up by the Emperor Rodolph, and they are ſtill preſerved at Vienna. His ſtyle of compoſition in hiſtorical ſubjects reſembled the ſtyle of the Flemiſh artiſts of that age, and exhibited a great number of figures finiſhed with extreme neatneſs. But he crowded ſeveral ſubjects into one deſign; as in his picture of the diſciples at Emmaus, he repreſented not only that incident, but in different groups diſpoſed in the back ground, he repreſented likewiſe the different parts of the paſſion of our Saviour. And yet, notwithſtanding the impropriety of that manner of compoſing, his pictures were ſo delicately pencilled and finiſhed, and his landſcapes in particular ſo agreeably invented, ſo full of variety, and well executed, that even in Italy his works were in great requeſt, and were diſtinguiſhed there by the appellation of the *owl-pictures*: for he fixed an owl, as his peculiar mark, in every picture he painted; by which the works of this maſter are always indiſputably known. He died in the year 1550.

BLESTIUM, the ancient name of a town in Britain: now *Old town*, not far from Hereford.

BLETONISM, a faculty of perceiving and indicating ſubterraneous ſprings and currents by ſenſation. The term is modern, and derived from a Mr. Bleton, who for many years excited univerſal attention by poſſeſſing the above faculty, which has been thought to depend on ſome peculiar organization. Concerning the reality of this extraordinary faculty, there occurred great doubts among the learned; but M. Thouvenel, a Frenchman of ſome conſequence, and a philoſopher, is ſaid to have put the matter beyond diſpute, in two memoirs which he publiſhed upon the ſubject. We will not undertake to decide whether this unuſual talent in Mr. Bleton was real or pretended; nor whether the teſts to which his art was ſubmitted by M. Thouvenel ought or ought not to be relied on, but we conceive the ſubject not worthy of a long inveſtigation in this place, and therefore refer thoſe of our readers who are curious to know farther particulars to M. Thouvenel's two memoirs.

BLIGHT, in huſbandry, a diſeaſe incident to plants, which affects them variouſly, the whole plant ſometimes periſhing by it, and ſometimes only the leaves and bloſſoms, which will be ſcorched and ſhrivelled up, the reſt remaining green and flouriſhing. Some have ſuppoſed that blights are produced by an eaſterly wind, which brings vaſt quantities of inſects' eggs along with it, from ſome diſtant place. Theſe being lodged upon the ſurface of the leaves and flowers of fruit-trees, cauſe them to ſhrivel up and periſh.

To cure this diſeaſe, ſome adviſe the burning of wet litter on the windward ſide of the plants, that the ſmoke of it may be carried to them by the wind, which they ſuppoſe will ſtifle and deſtroy the inſects, and thereby cure the miſchief. Others direct the uſe of tobacco-duſt, or to waſh the trees with water wherein tobacco ſtalks have been infuſed for 12 hours; which they ſay will deſtroy thoſe inſects, and recover the plants. Pepper-duſt ſcattered over the bloſſoms of fruit-trees, &c. has been recommended as very uſeful in this caſe; and there are ſome that adviſe the pulling off the leaves that are affected.

But the true cauſe of blights ſeems to be continued dry eaſterly winds for ſeveral days together, without the intervention of ſhowers, or any morning dew, by which the perſpiration in the tender bloſſom is ſtopped; and if it ſo happen that there is a long continuance of the ſame weather, it equally affects the tender leaves, whereby their colour is changed, and they wither and decay. The beſt remedy perhaps is, gently to waſh and ſprinkle over the tree, &c. from time to time with common water; and if the young ſhoots ſeem to be much infected, let them be waſhed with a woollen cloth, ſo as to clear them, if poſſible, from this glutinous matter, that their reſpiration and perſpiration may not be obſtructed. This operation ought to be performed early in the day, that the moiſture may be exhaled before the cold of the night comes on: nor ſhould it be done when the ſun ſhines very hot.—Another cauſe of blights in the ſpring, is ſaid to be ſharp hoary froſts, which are often ſucceeded by hot ſunſhine in the day-time. This is the moſt ſudden and certain deſtroyer of the fruit that is known.

BLIGHTED CORN. See SMUT.

BLIND, an epithet applied to a human or brute creature deprived of ſight. Such at leaſt is the literal acceptation of the term; but it is likewiſe uſed in a metaphorical ſenſe, to ſignify mental or intellectual darkneſs; and frequently implies, at the ſame time, ſome moral or ſpiritual depravity in the ſoul. It is, however, our preſent intention to conſider the word merely in its natural and primary ſenſe; and alſo to enquire by what means this inexpreſſible misfortune may be compenſated or alleviated to thoſe who ſuſtain it; what advantages

and conſolations they may derive from it; of what acquiſitions they may be ſuſceptible; and by what culture they may become uſeful to themſelves, and of ſome uſe in ſociety.

There is not perhaps any ſenſe or faculty of the corporeal frame, which affords ſo many reſources of utility and entertainment as the power of viſion; nor of courſe is there any loſs or privation which can be productive of diſadvantages or calamities ſo multiform, ſo various, and ſo bitter, as the want of ſight. By no avenue of corporeal perception is knowledge in her full extent, and in all her forms, ſo acceſſible to the rational and inquiring ſoul, as by the glorious and delightful medium of the light. For this not only reveals external things in all their beauties, in all their changes, and in all their varieties; but gives body, form, and colour to intellectual ideas and abſtract eſſences; ſo that the whole material and intelligent creation lie in open proſpect, and the majeſtic frame of nature, in its whole extent, is, if we may ſo ſpeak, perceived at a ſingle glance. To the blind, on the contrary, the viſible univerſe is totally annihilated; he is perfectly conſcious of no ſpace but that in which he ſtands, or to which his extremities can reach. Sound, indeed, gives him ſome ideas of diſtant objects; but thoſe ideas are extremely obſcure and indiſtinct. They are obſcure, becauſe they conſiſt alone of the objects whoſe oſcillations vibrate on his ear, and do not neceſſarily ſuppoſe any other bodies with which the intermediate ſpace may be occupied, except thoſe which give the ſound alone: they are indiſtinct, becauſe ſounds themſelves are frequently ambiguous, and do not uniformly and excluſively indicate their real cauſes. And though by them the idea of diſtance in general, or even of ſome particular diſtances, may be obtained; yet they never fill the mind with thoſe vaſt and exalting ideas of extenſion which are inſpired by ocular perception. For though a clap of thunder, or an exploſion of ordnance, may be diſtinctly heard after they have traverſed an immenſe region of ſpace; yet, when the diſtance is uncommonly great, it ceaſes to be indicated by ſound; and therefore the ideas, acquired by auricular experiment, of extenſion and interval, are extremely confuſed and inadequate. The living and comprehenſive eye darts its inſtantaneous view over expanſive valleys, lofty mountains, protracted rivers, illimitable oceans. It meaſures in an indiviſible point of time, the mighty ſpace from earth to heaven, or from one ſtar to another. By the aſſiſtance of teleſcopes, its horizon is almoſt indefinitely extended, its objects prodigiouſly multiplied, and the ſphere of its obſervation nobly enlarged. By theſe means, the imagination inured to vaſt impreſſions of diſtance, can not only recal them in their greateſt extent with as much rapidity as they were at firſt imbibed; but can multiply them, and add one to another, till all particular boundaries and diſtances are loſt in immenſity. Thus nature, by profuſely irradiating the face of things, and clothing objects in a robe of diverſified ſplendour, not only invites the underſtanding to expatiate on a theatre ſo extenſive, ſo diverſified, and ſo attractive; but entertains and inflames the imagination with every poſſible exhibition of the ſublime or beautiful. The man of light and colours beholds the objects of his attention and curioſity from afar. Taught by experience, he meaſures their relative diſtances; diſtinguiſhes their qualities; determines their ſituations, poſitions, and attitudes; preſages what theſe tokens may import; ſelects his favourites: traverſes in ſecurity the ſpace which divides them from him; ſtops at the point where they are placed; and either obtains them with eaſe, or immediately perceives the means by which the obſtacles that intercept his paſſage to them may be ſurmounted. The blind not only may be, but really are, during a conſiderable period, apprehenſive of danger in every motion towards any place from whence their contracted powers of perception can give them no intelligence. All the various modes of delicate proportion, all the beautiful varieties of light and colours, whether exhibited in the works of nature or art, are to them irretrievably loſt. Dependent for every thing, even for ſubſiſtence, on the good offices of others; obnoxious to injury from every point, which they are neither capacitated to perceive nor qualified to reſiſt; they are, during the preſent ſtate of being, rather to be conſidered as priſoners at large, than citizens of nature. The ſedentary life, to which by privation of ſight they are deſtined, relaxes their frame, and ſubjects them to all the diſagreeable ſenſations which ariſe from dejection of ſpirits. Hence the moſt feeble exertions create laſſitude and uneaſineſs. Hence the native tone of the nervous ſyſtem, which alone is compatible with health and pleaſure, deſtroyed by inactivity, exaſperates and embitters every diſagreeable impreſſion. Natural evils, however, are always ſupportable; they not only ariſe from blind and undeſigning cauſes, but are either mild in their attacks, or ſhort in their duration: the miſeries which are inflicted by conſcious and reflecting agents alone, can deſerve the name of evils. Theſe excruciate the ſoul with ineffable poignancy, as expreſſive of indifference or malignity in thoſe by whom ſuch bitter potions are cruelly adminiſtered. The negligence or wantonneſs, therefore, with which the blind are ſometimes too inconſiderately treated, is an unpardonable enormity which cannot be too ſeverely reprobated.

Thoſe amongſt them who have had ſenſibility to feel, and capacity to expreſs, the effects of their misfortunes, have deſcribed them in a manner capable of penetrating the moſt callous heart. Homer, the venerable father of epic poetry, in the perſon of Demodocus the Phæatian bard has moſt feelingly deſcribed his own ſituation: and Milton, in his addreſs to light, after a ſublime deſcription of its arduous and gloomy journey from the regions of primeval darkneſs to this our viſible diurnal ſphere, apoſtrophiſes the celeſtial beam in terms the moſt animated and pathetic. Oſſian, the Caledonian bard, who lived before the authenticated hiſtory of his nation dates its origin, who in his old age participated the ſame calamity, has in more than one paſſage of his works deſcribed his ſituation in a manner ſo delicate, yet ſo touching as to excite the fineſt feelings of the heart.

The blind being thus dependent on every creature, and paſſive to every accident, can we be ſurpriſed if they are ſometimes at variance with themſelves and every thing around them? With the ſame inſtincts of ſelf-preſervation, the ſame iraſcible paſſions which are common to the ſpecies, and exaſperated by a ſenſe of inability either for retaliation or defence; can they be the objects of our reſentment or contempt, even when they ſeem peeviſh or vindictive? But this in fact is not always their character. Their behaviour is often highly expreſſive, not only of reſignation, but even of cheerfulneſs; and though they are often coldly and inhumanly treated by men, yet are they not ſo entirely deſtitute and forſaken as ſome ſuppoſe them. Even from their loſs, however oppreſſive and irretrievable, they derive advantages; not indeed adequate to recompenſe, yet ſufficient to alleviate their miſery. The attention of the ſoul, confined to theſe avenues of perception which ſhe can command, is neither diſſipated nor confounded by the immenſe multiplicity nor the rapid ſucceſſion of ſurrounding objects. Hence her contemplations are more uniformly fixed upon herſelf, and the revolutions of her own internal frame. Hence her perceptions of ſuch external things as are contiguous and clear to her obſervation become more lively and exquiſite. Hence even her inſtruments of corporeal ſenſation are more aſſiduouſly cultivated and improved; ſo that from them ſhe derives ſuch notices and preſages of approaching pleaſure or im-

pending danger as entirely eſcape the attention of thoſe who depend for ſecurity on the reports of their eyes. A blind man, when walking ſwiftly or running, is kindly and effectually checked by nature from rudely encountering ſuch hard and extended objects as might hurt or bruiſe him. When he approaches bodies of this kind, he feels the atmoſphere more ſenſibly reſiſt his progreſs; and in proportion as his motion is accelerated, or his diſtance from the object diminiſhed, the reſiſtance is increaſed. He diſtinguiſhes the approach of his friend from far by the ſound of his ſteps, by his manner of breathing, and almoſt by every audible token which he can exhibit. Prepared for the dangers which he may encounter from the ſurface of the ground upon which he walks, his ſtep is habitually firm and cautious. Hence he not only avoids thoſe falls which might be occaſioned by its leſs formidable inequalities, but from its general bias he collects ſome ideas how far his ſafety is immediately concerned; and though theſe conjectures may be ſometimes fallacious, yet they are generally ſo true, as to preſerve him from ſuch accidents as are not incurred by his own temerity. The rapid torrent and the deep caſcade not only warn him to keep a proper diſtance, but inform him in what direction he moves, and are a kind of audible cynoſures to regulate his courſe. In places to which he has been accuſtomed, he as it were recogniſes his latitude and longitude from every breath of varied fragrance that tinges the gale, from every aſcent or declivity in the road, from every natural or artificial ſound that ſtrikes his ear; if theſe indications be ſtationary, and confined to particular places. Regulated by theſe ſigns, the *blind* have not only been known to perform long journeys themſelves, but to conduct others through dangerous paths at the dark and ſilent hour of midnight, with the utmoſt ſecurity and exactneſs, inſtances of which are upon record.

Whether the blind are able to diſtinguiſh colours, is a queſtion into which it is not very material that we ſhould enter; the teſtimonies for this fact ſtill appearing to us much too vague and general to deſerve credit. That their acouſtic perceptions however are diſtinct and accurate, we may fairly conclude from the rapidity with which they aſcertain the relative acuteneſs or gravity of different tones, and from their exact diſcernment of the various kinds and modifications of ſound, and of ſonorous objects, if the ſounds themſelves be in any degree ſignificant of their cauſes. From this vivacity and accuracy of external ſenſation, and from the aſſiduous and vigorous applications of a comprehenſive and attentive mind alone, we are able to account for the rapid and aſtoniſhing progreſs which ſome of them have made, not only in thoſe departments of literature which were moſt obvious to their ſenſes and acceſſible to their underſtandings, but even in the abſtracteſt, and (if we may be allowed the expreſſion) in the moſt occult ſciences. What, for inſtance, can be more remote from the conceptions of a blind man than the abſtract relations and properties of ſpace and quantity? Yet the incomprehenſible attainments of Dr. Sanderſon in all the branches of mathematics are now fully known and firmly believed by the whole literary world, both from the teſtimony of his pupils and the publication of his works. But ſhould the fact be ſtill uncertain, it might be ſufficiently verified by a living inſtance in the perſon of Dr. Moyes, who, though blind from his infancy, by the ardour and aſſiduity of his application, and by the natural force of genius, has not only made great advances in mechanical operations, in muſic, and in the languages; but is likewiſe a complete maſter of what is known and taught by other philoſophers, in geometry, in optics, in algebra, in aſtronomy, in chemiſtry, and in moſt other branches of natural philoſophy. His example alone is abundantly ſufficient to do away the vulgar prejudice, which preſumes to think blindneſs and learning incompatible; and that the cultivation of the talents of blind perſons is an unpromiſing taſk.

Many attempts have been made to inveſtigate, as well *à priori* as from experiment, what might be the primary effects of light and luminous objects upon ſuch as have been born blind, or early deprived of ſight, if at a maturer period they ſhould inſtantaneouſly recover their viſual powers. But upon this topic there is much reaſon to fear, that nothing ſatisfactory has yet been ſaid. The fallacy of hypotheſis and conjecture, when formed *à priori* with reſpect to any organ of corporeal ſenſation and its proper object, is too obvious to demand illuſtration. But from the nature of the eye, and the mediums of its perception, to attempt an inveſtigation of the various and multiform phenomena of viſion, would be a moſt romantic undertaking. Even the diſcoveries which are ſaid to accrue from experiment, may be held as extremely doubtful and precarious; becauſe in theſe experiments it does not appear to have been aſcertained, that the organs to which viſible objects were preſented immediately after chirurgical operations, could be in a proper ſtate to perceive them. Yet, after all, it is extremely probable, that figure, diſtance, and magnitude, are not immediate objects of ocular ſenſation, but acquired and adjuſted by long and reiterated experience *. There are, however, many deſiderata, which the perceptions of a man born blind might conſiderably illuſtrate, if his inſtruments of viſion were in a right ſtate, and aſſiſted by a proper medium. Such a perſon might perhaps give a clearer account, why objects, whoſe pictures are inverted upon the retina of the eye, ſhould appear to the mind in their real poſitions; or why, though each particular object is painted upon the retina of both our eyes, it ſhould only be perceived as ſingle. Perhaps, too, this new ſpectator of viſible nature might equally amuſe our curioſity and improve our theory, by attempting to deſcribe his earlieſt ſenſations of colour, and its original effects upon his organ and his fancy. It is far from being certain, however, that trials of this kind have ever been fairly made. For a more minute detail of theſe points the reader may conſult M. Diderot's *Lettre ſur les aveugles, à l'uſage de ceux qui voyent*; alſo *Mr. Cheſelden's Anatomy*, and *Locke's Eſſay on the human underſtanding*.

When we ruminate on the numberleſs advantages derived from the uſe of ſight, and its immenſe importance, in extending the human capacity, or in improving and cultivating every faculty and every function of the mind, we might be ſtrongly tempted to doubt the fidelity of thoſe reports which we have heard concerning ſuch perſons as, without the aſſiſtance of light, have arrived at high degrees of eminence even in thoſe ſciences which appear abſolutely unattainable but by the interpoſition of external mediums. It has, however, been demonſtrated by Dr. Reid, in his Inquiry into the Human Mind, that *blind* men, by proper inſtruction, are ſuſceptible almoſt of every idea, and of every truth which can be impreſſed on the mind by the mediation of light and colours, except the ſenſations of light and colours themſelves. Yet there is one phenomenon of this kind which ſeems to have eſcaped the attention of that great philoſopher, and for which no author has hitherto been able to offer any tolerable ſolution. Although

* A gentleman who was couched by Mr. Cheſelden after having been blind from his birth, had no idea of diſtance; but thought that all the objects he ſaw touched his eyes, as what he felt did his ſkin. It was alſo a conſiderable time before he could remember which was the cat and which the dog, though often informed, without firſt feeling them.

we ſhould admit, that the blind can underſtand with great perſpicacity all the phenomena of light and colours; though it were allowed, that in theſe ſubjects they might extend their ſpeculations beyond their inſtructions, and inveſtigate the mechanical principles of optics by the mere force of genius and application, from the data which they had already obtained; yet it will be difficult, if not impoſſible, to aſſign any reaſon why theſe objects ſhould be more intereſting to a blind man than any other abſtract truths whatever. It is poſſible for the blind, by a retentive memory, to tell you, That the ſky is an azure; that the ſun, moon, and ſtars, are bright; that the roſe is red, the lily white or yellow, and the tulip variegated. By continually hearing theſe ſubſtantives and adjectives joined, he may be mechanically taught to join them in the ſame manner; but as he never had any ſenſation of colour, however accurately he may ſpeak of coloured objects, his language muſt be like that of a parrot; without meaning, or without ideas. Homer, Milton, and Oſſian, had been long acquainted with the viſible world before they became blind, and might ſtill retain the warm and pleaſing impreſſions of what they had ſeen. Their deſcriptions might be animated with all the rapture and enthuſiaſm which originally fired their boſoms when the grand or delightful objects which they delineated were immediately beheld. Nay, that enthuſiaſm might ſtill be heightened by a bitter ſenſe of their loſs, and by that regret which a ſituation ſo diſmal might naturally inſpire. But how ſhall we account for the ſame energy, the ſame tranſport of deſcription, exhibited by thoſe on whoſe minds viſible object were either never impreſſed, or have been entirely obliterated? Yet, however unaccountable this fact may appear, it is no leſs certain than extraordinary. We only mention the fact, however, as one amongſt the few reſources for entertainment, and avenues to reputation, which are ſtill reſerved for the *blind*.

By our readers we truſt we ſhall not be ſuſpected of unneceſſarily inſerting here a character of Dr. Blacklock, written by one who was a foreigner, a ſtranger to his perſon, and prepoſſeſſed in his favour by his works alone: He ſays,

"Blacklock will appear to poſterity a fabulous character: even now he is a prodigy. It will be thought a fiction and a paradox, that a man quite blind ſince he was three years old, beſides having made himſelf ſo good a maſter of various languages, of Greek, Latin, Italian, and French, ſhould alſo be a great poet in his own; and without hardly ever having ſeen the light."

After what we have already ſaid, the impoſſibility of entering into a detail of particulars with reſpect to the education of the blind, cannot but be obvious. Theſe muſt be determined by the genius, the capacity, and the circumſtances, of thoſe to whom the general rules which we ſhall proceed to give, can be applied. Much therefore muſt depend on theſe particulars: beſides which, the taſk of inſtructing the blind, is ſo much more arduous, as no aſſiſtance can be derived from thoſe who have written on the general ſubject of education. And though the blind have excelled in more than one ſcience; yet, except in the caſe of Saunderſon, profeſſor of mathematics in the univerſity of Cambridge, it does not appear that any of them have attained to that degree of eminence, at which they arrived, upon a premeditated or defined plan. It is more likely that they have been led through the ordinary forms of diſcipline; and that, if any circumſtances were favourable to their genius, they rather proceeded from accident than deſign.

It will readily occur to the reader, that, if the pupil ſhould not happen to be placed in eaſy circumſtances, muſic is his readieſt and moſt probable reſource. Civil and eccleſiaſtical employments have either ſomething in their own nature, or in the invincible prejudices of mankind, which renders them almoſt entirely inacceſſible to thoſe who have loſt the uſe of ſight. No liberal and cultivated mind however can entertain the leaſt heſitation in concluding, that there is nothing, either in the nature of things, or even in the poſitive inſtitutions of genuine religion, repugnant to the idea of a blind clergyman. But the novelty of the phenomenon probably has hitherto prevented its being put in practice, though in itſelf ſo evidently ſuitable. Dr. Nicholas Verulam, a deſcendant of the celebrated lord Verulam, who, in the city of Bruſſels, was created doctor of laws, was deprived of ſight at nine years of age. But, notwithſtanding this accident, he purſued the ſame plan of education in which he had been engaged; and having heard that one Nicaſius de Vourde, born blind, who lived towards the end of the 15th century, after having diſtinguiſhed himſelf by his ſtudies in the univerſity of Lovain, took his degree as doctor of divinity in the univerſity of Cologne, he reſolved to make the ſame attempt. The profeſſors, however, were diſpoſed to treat his plan with contempt, and admitted him into their ſchools, rather from an impreſſion that it might amuſe, than become of any uſe to him. However, contrary to their expectations, he obtained the firſt places among his condiſciples: upon which it was then ſaid, that ſuch rapid advances might be made in the preliminary branches of his education; but would ſoon be effectually checked by ſtudies of a more profound and abſtracted nature. This, it ſeems, was repeated from ſchool to ſchool, through the whole climax of his purſuits; and when, in the courſe of academical learning, it became neceſſary to ſtudy poetry, it was the general voice that all was over, and that at length he had reached his *ne plus ultra*. But here likewiſe he ſet their prepoſſeſſions at defiance, and taught them the immenſe difference between blindneſs of body and blindneſs of ſoul. After continuing his ſtudies for two years more, he applied himſelf to law, took his degree in that ſcience, commenced advocate in the council of Brabant, and has had the pleaſure of terminating almoſt every ſuit in which he has been engaged to the ſatisfaction of his clients.

Had it not been for a fact ſo ſtriking and ſo well authenticated, though there could have been no doubt that a blind man might diſcharge the office of a chamber-counſel with ſucceſs; yet, as a barriſter, his difficulties muſt have appeared more formidable, if not abſolutely inſuperable. For he ſhould remember all the ſources, whether in natural equity or poſitive inſtitutions, whether in common or ſtatute law, from whence his argument ought to be drawn. He muſt be able to ſpecify, and to arrange in their proper order, all the material objections of his antagoniſts: theſe he muſt likewiſe anſwer as they were propoſed, *extempore*. When, therefore, it is conſidered how difficult it is to temper the natural aſſociations of memory with the artificial arrangements of judgment, the deſultory flights of imagination with the calm and regular deductions of reaſon, the energy and perturbation of paſſion with the coolneſs and tranquillity of deliberation; ſome idea may be formed of the arduous taſk which every blind man muſt achieve, who undertakes to purſue the law as a profeſſion. Perhaps aſſiſtances might be drawn from Cicero's Treatiſe on Topics and on Invention; which, if happily applied, might leſſen the diſparity of a blind man to others, but could ſcarcely place him on an equal footing with his brethren.

In ſpeaking of the learned profeſſions, we have for obvious reaſons omitted phyſic, as unattainable to blind perſons. The moſt important view we can entertain in the education of a perſon deprived of ſight, is to redreſs as effectually as poſſible the natural diſadvantages with which he is encumbered; or, in other words, to enlarge as far as poſſible the ſphere of his knowledge and activity. This can only be done by the improvement of his intellectual, imaginative, or mechanical, powers; and which of theſe ought to be moſt aſſiduouſly cultivated, the genius of every individual alone can determine. From

the original dawning, however, of reaſon and ſpirit, the parents and tutors of the blind ought to inculcate this maxim, That it is their indiſpenſable duty to excel, and that it is abſolutely in their power to attain a high degree of eminence. To impreſs this notion on their minds, the firſt objects preſented to their obſervation, and the firſt methods of improvement applied to their underſtanding, ought, with no great difficulty, to be comprehenſible by thoſe internal powers and external ſenſes which they poſſeſs. Not that improvement ſhould be rendered quite eaſy to them, if ſuch a plan were poſſible: for all difficulties, which are not really or apparently inſuperable, heighten the charms and enhance the value of thoſe acquiſitions which they ſeem to retard. But care ſhould be taken that theſe difficulties be not magnified or exaggerated by imagination; for, in fact, the blind have a painful ſenſe of their own incapacity, and conſequently a ſtrong propenſity to deſpair. For this reaſon, parents and relations ought never to be too ready in offering their aſſiſtance to the blind in any office which they can perform, or in any acquiſition which they can procure for themſelves, whether they are prompted by amuſement or neceſſity. A blind boy ſhould be accuſtomed to walk through the neighbourhood without a guide, not only though he ſhould run ſome hazard, but even though he ſhould ſuffer ſome pain in the experiment.

If he has a mechanical turn, let him not be denied the uſe of edge-tools; for it is better that he ſhould loſe a little blood, or even break a bone, than be perpetually confined to the ſame place, debilitated in his frame, and depreſſed in his mind. Such a being can have no employment but to feel his own weakneſs, and become his own tormentor; or to transfer to others all the malignity and peeviſhneſs ariſing from the natural, adventitious, or imaginary evils which he feels. Scars, fractures, and diſlocations in his body, are trivial misfortunes compared with imbecility, timidity, or fretfulneſs of mind. Theſe impreſſions, which, even in his moſt improved ſtate, will be too deeply felt by every blind man, are redoubled by that utter incapacity of action which muſt reſult from the officious humanity of thoſe who would anticipate or ſupply all his wants, who would prevent all his motions, who would do or procure every thing for him without his own interpoſition. It is poſſible they may ſurvive thoſe who, by the ties of blood and nature, are more immediately intereſted in their happineſs than the reſt of mankind; and when this happens, their diſappointments may be many: their petitions will often be refuſed, ſeldom fully gratified; and, even when granted, the conceſſion will be ſo ungraceful, as to render its want much more tolerable than its fruition. For all theſe reaſons, in the education of a blind man, it is infinitely better to direct than ſuperſede his own exertions. From the time that he can move and feel, let him be taught to ſupply his own exigences; to dreſs and feed himſelf; to run from place to place, either for exerciſe, or in purſuit of what he wants. In theſe excurſions, however, it will be highly proper for ſome one to ſuperintend his motions, though this ſhould always be at a diſtance, and without ſeeming to watch over him. A vigilance too apparent, may impreſs him with a ſuſpicion as to the true motive. When dangers are to be avoided indeed, the pupil ought to be acquainted, that it is neceſſary to be preſent with him, purely for his preſervation, whenever his temerity renders it neceſſary. But objects of a nature leſs noxious, which may give him ſome pain without any permanent injury or mutilation, may with deſign be thrown in his way; provided, however, that this deſign be always induſtriouſly concealed. For his own experience of their bad effects will be an infinitely more eloquent and ſenſible monitor, than the counſels of any adviſer whatever.

When the ſeaſon of puerile amuſement is expired, through the whole demeanour of his pupil the tutor will probably obſerve a more ſenſible degree of timidity and precaution, and his activity will then require to be ſtimulated more than reſtrained. In this criſis, exerciſe will be found requiſite, rather to preſerve health, than merely for recreation; and of all the different kinds of exerciſe, riding, not in a machine, but on horſeback, is by far the moſt eligible. On theſe occaſions, however, care muſt be taken that the horſes employed be tame and manageable; and in theſe excurſions, whether long or ſhort, his companion or attendant ought conſtantly to be with him; and the horſe ſhould always either be taught implicitly to follow its guide, or be conducted by a leading rein beſides the bridle which he himſelf holds. Next to this mode of exerciſe, is walking. If the conſtitution of the blind boy be tolerably robuſt, let him be taught to endure every viciſſitude of weather. For if he has been bred with too much delicacy, particular accidents may ſuperſede all his former ſcruples, and ſubject him to the neceſſity of ſuffering what will not only be ſevere in its immediate ſenſation, but dangerous in its future conſequences. Yet, when the weather is too unfavourable for exerciſe abroad, there are methods of domeſtic exerciſe, which, though not equally ſalutary, may ſtill be eligible; ſuch are dumb-bells, the bath-chair, &c. which ſhould be reſorted to.

To theſe modes of domeſtic exerciſe may be alſo added that of a ſwing, ſuſpended from two ſcrews, ſtrongly fixed in the joiſts of a capacious chamber, with a board and a cuſhion for a ſeat, and cords faſtened behind and before, leſt the impetuoſity of the motion ſhould give the patient a fall. We ſhall not dwell on the ſubject of *diet*, which ſhould be ſimply that which would diſpoſe a young perſon to health in other inſtances.

The natural curioſity of children, which renders them in all inſtances very inquiſitive, is often peculiarly prevalent in the blind. Parents and tutors, therefore, ſhould gratify it whenever their anſwers can be intelligible to the pupil; when it is otherwiſe, let them candidly confeſs the impoſſibility or impropriety of anſwering his queſtions. At this period, if their powers be inventive, they may render his amuſements the vehicles, and his toys the inſtruments, of improvement: why, for inſtance, may not the centrifugal and centripetal forces be illuſtrated from the motion of a top, or the nature and power of elaſticity by the rebound of a ball? Theſe hints may lead to others, which, if happily improved and applied, may wonderfully facilitate the progreſs of knowledge. Nor will the violence of exerciſe, and the tumult of play, be productive of ſuch perils and accidents as may be apprehended. It has been found by experience, that though, till the age of twenty, ſome blind perſons were on moſt occaſions permitted to walk, run, or play at large, they have yet eſcaped without any bodily injury from theſe exerciſe.

Parents of middle, or of higher rank, who are ſo unfortunate as to have blind children, ought, by all poſſible means, to keep them out of vulgar company. The herd of mankind have a wanton malignity, which eternally impels them to impoſe upon the blind, and to enjoy the painful ſituations in which theſe impoſitions place them. This is a ſtricture upon the humanity of our ſpecies, which nothing but the love of truth and the dictates of benevolence could have extorted from us. But it is a fact, that blind people have infinitely more to fear from the levity and ignorance, than from the ſelfiſhneſs and ill-nature, of mankind. In ſerious and important negotiations, pride and compaſſion ſuſpend the efforts of knavery or ſpleen; and that very infirmity, which ſo frequently renders the blind defenceleſs to the arts of the inſidious, or to the attempts of malice, is a powerful incentive to pity, which is capable of diſarming fury itſelf. Villany, which frequently piques itſelf more upon the arts by which it prevails, than upon the advantages which it obtains, may often with contempt reject the blind, as

ſubjects beneath the dignity of its operation; but the ill-natured buffoon conſiders the moſt malicious effects of his merriment as a mere jeſt, without reflecting on the ſhame or indignation which they inſpire when inflicted on a ſenſible temper.

But vulgar credulity and ignorance are no leſs dangerous to thoſe who want ſight, than the falſe and mechanical wit ſo univerſally practiſed in common life. We know, we ſympathetically feel, the ſtrong propenſity of every illiterate mind, to relate or to believe whatever is marvellous and dreadful. Theſe impreſſions, when early imbibed, can ſcarcely be eradicated by all the conſpiring efforts of mature reaſon and confirmed experience. Thoſe philoſophers who have attempted to break the alliance between darkneſs and ſpectres, were certainly inſpired by laudable motives. But they muſt give us leave to aſſert, that there is a natural and eſſential connection betwixt night and *orcus*. Were we endued with ſenſes to advertiſe us of every noxious object before its contiguity could render it formidable, our panics would probably be leſs frequent and ſenſible than we really feel them. Darkneſs and ſilence, therefore, have ſomething dreadful in them, becauſe they ſuperſede the vigilance of thoſe ſenſes which give us the earlieſt notices of things. If you talk to a blind boy of inviſible beings, let benevolence be an inſeparable ingredient in their character. You may, if you pleaſe, tell him of departed ſpirits, anxious for the welfare of their ſurviving friends; of miniſtering angels, who deſcend with pleaſure from heaven to execute the purpoſes of their Maker's benignity; you may even regale his imagination with the ſportive gambols and innocent frolics of fairies; but let him hear as ſeldom as poſſible, even in ſtories which he knows to be fabulous, of appalling ghoſts, vindictive fiends, or avenging furies. They ſeize and pre-occupy every avenue of terror which is open in the ſoul; nor are they eaſily diſpoſſeſſed. Sooner ſhould we hope to exorciſe a ghoſt, or appeaſe a fury, than to obliterate their images in a warm and ſuſceptible imagination, where they have been habitually impreſſed, and where theſe feelings cannot be diſſipated by external phænomena. If horrors of this kind ſhould agitate the heart of a blind boy (which may happen notwithſtanding the moſt ſtrenuous endeavours to prevent it), the ſtories which he has heard will be moſt effectually diſcredited by ridicule. This, however, muſt be cautiouſly applied, by gentle and delicate gradations. If he is inſpired with terror by effects upon his ſenſes, the cauſes of which he cannot inveſtigate, indefatigable pains muſt be taken to explain theſe phænomena, and to confirm that explication, whenever it can be done, by the teſtimony of his own ſenſes and his own experience. The exertion of his locomotive and mechanical powers will ſenſibly contribute to diſpel theſe ill-grounded terrors.

His inventive faculties ought likewiſe to be indulged with the ſame freedom. The data which they explore may be preſented in ſuch a manner, as to render diſcoveries eaſy; but ſtill let invention be allowed to co-operate. The internal triumph and exultation which the mind feels from the attainment and conviction of new truths, heightens their charms, impreſſes them deep on the memory, and gives them an influence in practice, of which they could not otherwiſe have boaſted.

There are a ſort of people in the world, whoſe views and education have been ſtrictly confined to one province, and whoſe converſation is of conſequence limited and technical. Theſe, in literary intercourſe, or faſhionable life, are treated with univerſal contempt, and brand'led with the odious name of *mere men of buſineſs*. Nor is it any wonder that the converſation of ſuch ſhould prove naufeous and diſguſting. It would be arrogance in them to expect, that indifferent perſons ſhould either enter into their private intereſts, or the peculiarities of their craft, with a warmth equal to their own. We have known the intrution of ſuch a perſon involve a numerous company in gloom, and terminate the freedom and vivacity of agreeable diſcourſe in lazy yawning and diſcontented ſilence. Of all innocent characters, this ought to be avoided by the blind; becauſe, of all others, it is the character which they run the greateſt hazard of adopting. The limitation of their powers naturally contracts their views and purſuits, and, as it were, concentres their whole intellectual faculties in one, or at beſt in few objects. Care ſhould therefore be taken to afford the mind a theatre for its exertions, as extenſive as poſſible, without diverting it from one great end, which, in order to excel, it ought for ever to have in proſpect.

There are few ſciences in which the blind have not diſtinguiſhed themſelves: even thoſe whoſe acquiſition ſeemed eſſentially to depend upon viſion, have at laſt yielded to genius and induſtry, though deprived of that advantage. Mr. Saunderſon, whom we formerly mentioned, has left behind him the moſt ſtriking evidences of aſtoniſhing proficiency in thoſe retired and abſtract branches of mathematics which appeared leaſt acceſſible to perſons of his infirmity. *Sculpture* is not, perhaps, the moſt practicable of the arts for a blind man; yet he is not wholly excluded from that pleaſing employment. There are inſtances of perſons who have been enabled to take the figure and idea of a face by the touch, and mould it in wax with the utmoſt exactneſs; as was the caſe of the blind ſculptor mentioned by De Piles, who thus took the likeneſs of the Duke de Bracciano in a dark cellar, and made a marble ſtatue of King Charles I. with great elegance and juſtneſs. However unaccountable it may appear to the abſtract philoſopher, yet nothing is more certain in fact, than that a blind man may alſo, by the efforts of a cultivated genius, exhibit in *poetry* the moſt natural images and animated deſcriptions, even of viſible objects, without incurring the imputation of plagiariſm.

In the ſiſter art of *muſic*, there are, at preſent, many aſtoniſhing proofs, how far the blind may proceed. If we look into former periods, we ſhall find them pregnant with examples, how amply nature has capacitated the blind to excel both in the ſcientific and practical departments of muſic. In the 16th century, when the progreſs of improvement both in melody and harmony was rapid and conſpicuous, Franciſcus Salinas was eminently diſtinguiſhed. He was born A. D. 1513, at Burgos in Spain; and was ſon to the treaſurer of that city. Though afflicted with incurable blindneſs, he was profoundly ſkilled both in the theory and practice of muſic. As a performer, he is celebrated by his cotemporaries with the higheſt encomiums. As a theoriſt, his book, if we may believe Sir John Hawkins, is equal in value to any now extant in any language. Though he was deprived of ſight in his earlieſt infancy, he does not content himſelf to delineate the various phænomena in muſic, but the principles from whence they reſult, the relations of ſound, the nature of arithmetical, geometrical, and harmonical ratios, which at that period were eſteemed eſſential to the theory of muſic, with a degree of intelligence which would have deſerved admiration though he had been in full poſſeſſion of every ſenſe requiſite for theſe diſquiſitions. He was taken to Rome in the retinue of Petrus Sarmentus archbiſhop of Compoſtella; and having paſſed twenty years in Italy, he returned to Salamanca, where he obtained the profeſſorſhip of muſic, an office at that time equally reſpectable and lucrative. Having diſcharged it with reputation and ſucceſs for ſome time, he died at the venerable age of 77. In the ſame period flouriſhed Caſpar Crumbhorn, blind from the third year of his age: yet he compoſed ſeveral pieces in many parts with ſo much ſucceſs, and performed both upon the flute and viola ſo exquiſitely, that he was diſtinguiſhed by Auguſtus elector of Saxony. But preferring his native Silefia to every other country, he returned thither, and was appointed organiſt of the church of St. Peter and Paul in the city of

Lignitz, where he likewiſe had often the direction of the muſical college, and died June 11th 1621. To theſe might be added Martini Peſenti of Venice, a compoſer of vocal and inſtrumental muſic almoſt of all kinds, though blind from his nativity; with other examples equally worthy of public attention. But if vulgar prejudice is capable of bluſhing at its own contemptible character, or of yielding to conviction, thoſe already quoted are more than ſufficient to ſhow the muſical jugglers of our time, who are generally as abſolute ſtrangers to learning and taſte as to virtue, that their art is no monopoly with which thoſe alone who ſee are inveſted by the irreverſible decree of heaven.

For Saunderſon's method of calculation, both in *arithmetic* and *algebra*, we refer the reader to an account prefixed to his treatiſe on that ſubject. But there is a much more circumſtantial detail both of its nature and uſes, given by Mr. Didoret in his "Letter concerning the Blind, for the uſe of thoſe who ſee," which we ſhall here inſert. "It is much eaſier (ſays that author) to uſe ſigns already invented, than to become their inventor; as one is forced to do, when engaged in circumſtances for which he is not provided. Of what advantage might not this be to Saunderſon to find a palpable arithmetic already prepared for him at five years of age, which he might otherwiſe have felt the neceſſity of inventing for himſelf at the advanced period of twenty-five? This Saunderſon, Madam, is an author deprived of ſight, with whom it may not be foreign to our purpoſe to amuſe you. They relate prodigies of him; and of theſe prodigies there is not one, which his progreſs in the belles lettres, and his mathematical attainments, do not render credible.

"The ſame inſtrument ſerved him for algebraical calculations, and for the conſtruction of rectilineal figures. You would not perhaps be ſorry that I ſhould give you an explication of it, if you thought your mind previouſly qualified to underſtand it: and you ſhall ſoon perceive that it preſuppoſes no intellectual preparations of which you are not already miſtreſs; and that it would be extremely uſeful to you if you ſhould ever be ſeized with the inclination of making long calculations by touch.

"Imagine to yourſelf a ſquare, ſuch as you ſee fig. 1. in Plate 49. divided into four equal parts by perpendicular lines at the ſides, in ſuch a manner, that it may preſent you the nine points 1, 2, 3, 4, 5, 6, 7, 8, 9. Suppoſe this ſquare pierced with nine holes capable of receiving pins of two kinds, all of equal length and thickneſs, but ſome with heads a little larger than the others.

"The pins with large heads are never placed any where elſe but in the centre of the ſquare; thoſe with ſmaller heads never but at the ſides, except in one ſingle caſe, which is that of making the figure 1, where none are placed at the ſides. The ſign of 0 is made by placing a pin with a large head in the centre of the little ſquare, without putting any other pin at the ſides. See fig. 2. The number 1 is repreſented by a pin with a ſmall head placed in the centre of the ſquare, without putting any other pin at the ſides: the number 2, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 1: the number 3, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 2: the number 4, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 3: the number 5, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 4: the number 6, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 5: the number 7, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 6: the number 8, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 7: the number 9, by a pin with a large head placed in the centre of the ſquare, and by a pin with a ſmall head placed on one of the ſides at the point 8.

"Here are plainly ten different expreſſions obvious to the touch, of which every one anſwers to one of our ten arithmetical characters. Imagine now a table as large as you pleaſe, divided into ſmall ſquares, horizontally ranged, and ſeparated one from the other at ſimilar diſtances, as you ſee it in fig 3. Thus you will have the inſtrument of Sanderſon.

"You may eaſily conceive that there is not any number which one cannot expreſs upon this table; and, by conſequence, no arithmetical operation which one cannot execute upon it.

"Let it be propoſed, for inſtance, to find the ſum, or to work the addition of the nine numbers following.

1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	0
7	8	9	0	1
8	9	0	1	2
9	0	1	2	3

"I expreſs them on the table in the order as they are dictated to me; the firſt figure at the left of the firſt number, upon the firſt ſquare to the left of the firſt line; the ſecond figure, to the left of the firſt number, upon the ſecond ſquare to the left of the ſame line; and ſo of the reſt.

"I place the ſecond number upon the ſecond row of ſquares, units beneath units, and tens beneath tens, &c.

"I place the third number upon the third row of ſquares, and ſo of the reſt. Then with my fingers running over each of the rows vertically from the bottom to the top, beginning with that which is neareſt to my right, I work the addition of the numbers which are expreſſed, and mark the ſurplus of the tens at the foot of that column. I then paſs to the ſecond column, advancing towards the left: upon which I operate in the ſame manner; from thence to the third; and thus in ſucceſſion I finiſh my addition.

"We ſhall now ſee how the ſame table ſerved him for demonſtrating the properties of rectilineal figures. Let us ſuppoſe this propoſition to be demonſtrated, That parallelograms which have the ſame baſis and the ſame height are equal in their ſurfaces. He placed his pins as may be ſeen fig. 4. He gave names to the angular points, and finiſhed his demonſtration with his fingers.

"If we ſuppoſe that Sanderſon only employed pins with large heads to mark the limits of his figures, around theſe he might arrange his pins with ſmall heads in nine different manners, all of which were familiar to him. Thus he ſcarcely found any embarraſſment but in thoſe caſes where the great number of angular points which he was under a neceſſity of naming in his demonſtration obliged him to recur to the letters of the alphabet. We are not informed how he employed them.

"We only know, that his fingers ran over the board with aſtoniſhing agility; that he undertook with ſucceſs the longeſt calculations; that he could interrupt the ſeries, and diſcover his miſtakes; that he proved them with the greateſt caſe; and that his labours required infinitely leſs time than one could

have imagined, by the exactneſs and promptitude with which he prepared his inſtruments and diſpoſed his table.

"This preparation conſiſted in placing pins with large heads in the centres of all the ſquares: having done this, no more remained to him but to fix their values by pins of ſmaller heads, except in caſes where it was neceſſary to mark an unit; then he placed in the centre of a ſquare a pin with a ſmall head, in the place of a pin with a large head with which it had been occupied.

"Sometimes, inſtead of forming an entire line with theſe pins, he contented himſelf with placing ſome of them at all the angular points or points of interſection; around which he tied ſilk threads, which finiſhed the formation of the limits of his figures." See fig. 4. It may be added by way of improvement, that for the diviſion of one ſeries of numbers from another, a thin piece of timber in the form of a ruler with which lines are drawn, having a pin at each end for the holes in the ſquares, might be interpoſed between the two ſeries to be diſtinguiſhed.

By the notation here exhibited every modification of number may be expreſſed, and of conſequence every arithmetical operation ſucceſsfully performed; but we have repreſented in the Plate, and ſhall now deſcribe another form of palpable arithmetic, equally comprehenſive and much more ſimple than that of Sanderſon, the invention of Dr. Moyes. He ſpeaks of it in the following terms:

"The following brief account of a palpable notation I have generally uſed for theſe 20 years to aſſiſt my memory in numerical computations. When I began to ſtudy the principles of arithmetic, which I did at an early period of life, I ſoon diſcovered to my mortification, that a perſon entirely deprived of ſight could ſcarcely proceed in that uſeful ſcience without the aid of palpable ſymbols repreſenting the ten numerical characters. Being at that time unacquainted with the writings of Sanderſon, in which a palpable notation is deſcribed, I embraced the obvious, though, as I afterwards found, imperfect expedient of cutting into the form of the numerical characters thin pieces of wood or metal. By arranging theſe on the ſurface of a board, I could readily repreſent any given number, not only to the touch, but alſo to the eye; and by covering the board with a lamina of wax, my ſymbols were prevented from changing their places, they adhering to the board from the ſlighteſt preſſure. By this contrivance, I could ſolve, though ſlowly, any problem in the ſcience of numbers: but it ſoon occurred to me, that my notation, conſiſting of ten ſpecies of ſymbols or characters, was much more complicated than was abſolutely neceſſary, and that any given number might be diſtinctly expreſſed by three ſpecies of pegs alone. To illuſtrate my meaning, let A, B, C, D, (fig. 5), repreſent a ſquare piece of mahogany a foot broad and an inch in thickneſs; let the ſides A B, B C, C D, D A, be each divided into 24 equal parts; let every two oppoſite diviſions be joined by a groove cut in the board ſufficiently deep to be felt with the finger, and let the board be perforated at each interſection with an inſtrument a tenth of an inch in diameter.

"The ſurface of the board being thus divided into 576 little ſquares, with a ſmall perforation at each of their angles, let three ſets of pegs or pins, reſembling thoſe repreſented in the Plate at the figures 6, 7, 8, be ſo fitted to the holes in the board, that when ſtuck into them they may keep their poſitions like thoſe of a fiddle, and require ſome force to turn them round. The head of each peg belonging to the firſt ſet is a right-angled triangle about one-tenth of an inch in thickneſs; the head of each peg belonging to the ſecond ſet differs only from the former in having a ſmall notch in its ſloping ſide or hypothenuſe; and the head of each peg belonging to the third ſet is a ſquare of which the breadth ſhould be equal to the baſe of the triangle of the other two. Theſe pegs ſhould be kept in a caſe conſiſting of three boxes or cells, each cell being allotted to a ſet, and the caſe muſt be placed cloſe by the board previous to the commencement of every operation. Each ſet ſhould conſiſt of 60 or 70 pegs (at leaſt when employed in long calculations); and when the work is finiſhed, they ſhould be collected from the board, and carefully reſtored to their reſpective boxes.

"Things being thus prepared, let a peg of the firſt ſet be fixed into the board, and it will acquire four different values according to its poſition reſpecting the calculator. When its ſloping ſide is turned towards the left, it denotes one, or the firſt digit; when turned upwards, or from the calculator, it denotes two, or the ſecond digit; when turned to the right, it repreſents three; and when turned downwards, or towards the calculator, it denotes four, or the fourth digit. Five is denoted by a peg of the ſecond ſet, having its ſloping ſide or hypothenuſe turned to the left; ſix, by the ſame turned upwards; ſeven, by the ſame turned to the right; and eight, by the ſame turned directly down, or towards the body of the calculator. Nine is expreſſed by a peg of the third ſet when its edges are directed to right and left; and the ſame peg expreſſes the cypher when its edges are directed up and down. By three different pegs the relative values of the ten digits may therefore be diſtinctly expreſſed with facility; and by a ſufficient number of each ſet the ſteps and reſult of the longeſt calculation may be clearly repreſented to the ſenſe of feeling. It ſeems unneceſſary to illuſtrate this by an example; ſuffice it to expreſs in our characters, the preſent year of the Chriſtian æra 1788: Take a peg of the firſt ſet and fix it in the board with its ſloping ſide turned towards the left equal to one; take now a peg of the ſecond ſet and fix it in the next hole in the ſame groove, proceeding as uſual from left to right, with its ſloping ſide turned to the right equal to 7; next take a peg of the ſame ſet and fix it in the next hole, with its ſloping ſide turned downwards, equal to 8; laſtly, take another peg of the ſame ſet and place it in the next hole in the ſame poſition, equal to 8; and the whole will expreſs the number required.

"When it is neceſſary to expreſs a vulgar fraction, I place the numerator in the groove immediately above, and the denominator in that immediately below the groove in which the integers ſtand; and in decimal arithmetic an empty hole in the integer-groove repreſents the comma or decimal point. By ſimilar breaks I alſo denote pounds, ſhillings, pence, &c. and by the ſame expedient I ſeparate in diviſion the diviſor and quotient from the dividend.

"This notation, which ſupplies me completely with coefficients and indices in algebra and fluxions, ſeems much ſuperior to any of the kind hitherto made public in the weſt of Europe. That invented and deſcribed by Mr. Grenville, having no leſs than ten ſets of pegs, is by much too complicated for general practice; and that which we owe to the celebrated Saunderſon is apt to puzzle and embarraſs the calculator, as the pegs repreſenting the numerical digits can ſeldom or never be in the ſame ſtraight line."

In the higher parts of mathematics, ſuch as conic ſections, the ſame ſolid figures which are mediums of perception to thoſe who ſee, may perform the ſame uſeful office to the blind. But, for the ſtructure of ſuperficial figures, we ſhould imagine, that a kind of matter might be found, ſoft enough to be eaſily ſuſceptible of impreſſions, yet hard enough to retain them till effaced by an equal preſſure. Suppoſe, for inſtance, a table were formed, four feet broad and eight in length; for the figures, that they may be the more ſenſible to the touch, ought to be larger than ordinary. Suppoſe this table had brims or a moulding round it, riſing an inch above the ſurface: let the whole expanſe, then, be filled with bees-wax, and the ſurface

above preſſed extremely even with a poliſhed board, formed exactly to fit the ſpace within the mouldings. This board will always be neceſſary to efface the figures employed in former propoſitions, and prepare the ſurface for new ones. We think we have imagined the minuteſt inconvenience that can ariſe from this method of delineating and conceiving geometrical truths; and, after all, the table appears to us the beſt and the leaſt troubleſome apparatus which a blind man can uſe. We can ſee no reaſon why general ideas of geography or topography might not be conveyed to him in the ſame manner, by ſpheres compoſed of or covered with the ſame impreſſible matter.

But although the extenſive view we propoſed to take of this ſubject has led us to notice the different inventions for the improvement of the blind, which have had their origin in our own country, we ſhould by no means omit a plan publiſhed at Paris under the title of "An Eſſay on the Education of the Blind," which ſuperſedes every former attempt to facilitate their improvement. The invention of a plan ſo arduous in its appearance, and ſo practicable in its execution, demanded the higheſt exertions of the nobleſt genius to produce it, and the moſt ſtrenuous efforts of indefatigable humanity to render it effectual. Its object is to teach them, by palpable characters impreſſed on paper, not only the liberal arts and ſciences, but likewiſe the principles of mechanical operation, in ſuch a manner, that thoſe who have no genius for literary improvement may yet become reſpectable, uſeful, and independent members of ſociety, in the capacity of common artiſans. By theſe tangible ſignatures they are taught to read, to write, and to print; they are likewiſe inſtructed in geometry, in algebra, geography, and, in ſhort, in every branch of natural philoſophy. Nor are their efforts circumſcribed by mere utility; a taſte for the fine arts has likewiſe been cultivated among them. They have been taught to read muſic with their fingers as others do with their eyes; and though they cannot at once feel the notes and perform them upon an inſtrument, yet they are capable of acquiring any leſſon with as much exactneſs and rapidity as thoſe who enjoy all the advantages of ſight. But we ſhall now give a more particular account of the wonderful topics contained in this eſſay. In his firſt chapter the author diſcovers the end propoſed by that delineation of culture which he offers to the blind; it is to enlarge their ſphere of knowledge, and of conſequence to increaſe their capacities and improve their powers of action, ſo that they may become happy and independent in themſelves, and uſeful and agreeable to others. The 2d chapter contains an anſwer to the objections urged againſt the general utility of this inſtitution. Theſe objections are candidly ſtated, and anſwered in the moſt ſatisfactory manner; but were we to recapitulate them in detail, it would protract this article to an unjuſtifiable length. The 3d chapter treats of reading as adapted to the practice of the blind. The 4th chapter conſiſts of anſwers to various objections againſt the method of reading propoſed for the blind; but theſe, for reaſons formerly given, we cannot with propriety delineate in this article. In the 5th chapter is ſhown the art of printing as practiſed by the blind for their peculiar uſe. In the 6th chapter is deſcribed the manner of teaching the blind the art of printing for thoſe that ſee. In the 7th is repreſented the manner of teaching the blind to write. The 8th chapter explains the method of teaching the blind arithmetic; the 9th, geography; the 10th, muſic. The 11th contains an account of the mechanic arts in which the blind are employed, and of the way by which they are formed for ſuch occupations. The 12th ſhows in general the proper manner of inſtructing the blind, and draws a parallel between their education and that of the deaf and dumb. Chapter 13th treats of the method of inſtructing them in the languages, mathematics, hiſtory, &c. What remains of the book is taken up with notes which illuſtrate each particular chapter; a ſhort hiſtorical account of the riſe, the progreſs, and the preſent ſtate, of the academy for the formation of the blind; an ode on the cultivation of the blind, by one that laboured under that affliction; an extract from the regiſter of the royal academy of ſciences; opinion of the printers; models of the various pieces which blind children are capable of printing; and an account of the exerciſes performed by blind children in preſence of the king, queen, and royal family, during the Chriſtmas ſolemnities in 1786.

Having thus given a curſory view of the various topics contained in the eſſay, we proceed to give ſome account of the manner in which the blind print and write. The blind compoſitor, then, has a box for every alphabetical character in uſe; on the outſide of theſe boxes are palpably marked the peculiar character belonging to each; they are filled with types, which he chooſes and ſets as they are called for, but not in the poſition in which they are to be read; on the contrary, they are inverted as objects are ſeen painted on the retina of an eye by an optician. Having thus fixed and arranged his types, he chooſes a page of the ſtrongeſt paper that can be found, which he gently moiſtens in a degree ſufficient to render it more eaſily ſuſceptible of impreſſions, without being dilacerated or worn by the ſhock which it muſt afterwards undergo. He then lays it upon the types; and by the cautious operation of the preſs, or by the eaſy ſtrokes of a little hammer, which are frequently repeated over the whole expanſe, he cauſes the impreſſion of the type to riſe on the oppoſite ſide of the paper, where, when dry, it continues not only obvious to the ſight but the touch, and is far from being eaſily effaced. On the upper ſide of the paper the letters appear in their proper poſition, and by their ſenſible elevation above the common ſurface render it practicable for the blind to read them with their fingers. Their manner of writing is analogous to this operation: the pupil, by repeated experiments, having familiariſed himſelf to the forms of the letters, both in their inverted and in their proper poſition, gradually learns to delineate them upon paper, moiſtened as before, with the point of an iron pen, which has no ſplit, and which is juſt ſharp enough to impreſs without piercing the paper: thus, on the ſide next to the writer's hand, the letters are formed ſunk and inverted; but when the paper is turned they appear right and *in relievo*. Thus the blind are enabled to form and decypher, not only the characters required in common language, but alſo mathematical diagrams, arithmetical and geographical proceſſes, and all the characters uſed in the written language of muſic. That theſe are not idle pretences, or intended to impoſe on the credulous, many undeniable facts might be adduced to prove. And in fact, the blind themſelves are made to exhibit at their own academy every Wedneſday and Saturday to crowds of charitable admirers, by whoſe liberal donations the inſtitution is now chiefly ſupported.

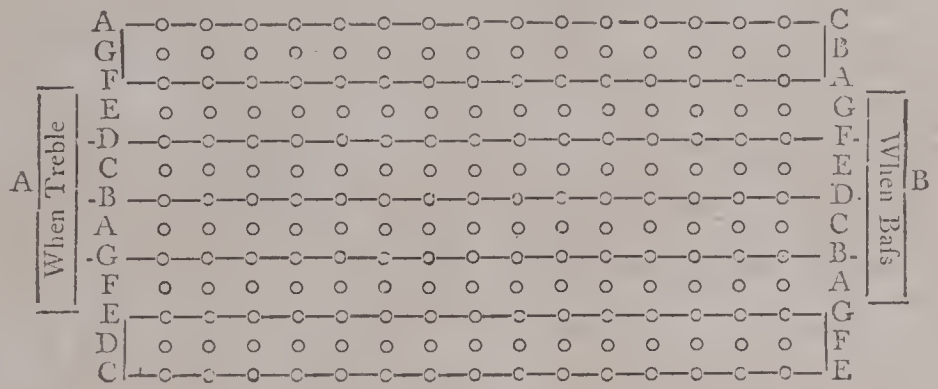
There is little doubt but that the blind are capable of being taught aſtronomy, natural and moral philoſophy, theology, grammar, logic, hiſtory and the belles lettres; but above all muſic, which is perhaps of all other ſciences the moſt attainable, the moſt practicable, and the moſt conſolatory to the mind. If the pupil, however, be not endowed with natural talents for the latter, ſuffer him by no means to be initiated in it. If his natural genius favours the attempt, the harpſichord, harp, or organ, are the moſt proper inſtruments for him to begin with; becauſe by theſe inſtruments he may be made more eaſily acquainted with the extent of muſical ſcales, with the powers of harmony, with the relations of which it is conſtituted, and of courſe with the theory of his art. It would be not only unneceſſary, but impracticable, to carry him deep into the theory, before he has attained ſome facility in the practice. Let, there-

fore, his head and his hands (if we may uſe the expreſſion), be taught to go *pari paſſu*. Let the one be inſtructed in the ſimpleſt elements, and the others conducted in the eaſieſt operations firſt: contemplation and exerciſe will produce light in the one, and promptitude in the other. But as his capacity of ſpeculation and powers of action become more and more mature, diſcoveries more abſtract and retired, taſks more arduous and difficult, may be aſſigned him. He ſhould be taught the names and gradations of the diatonic ſcale, the nature and uſe of time, the diverſity of its modes whether ſimple or mixed. He ſhould be taught the quantity or value of notes, not only with reſpect to their pitch, but to their duration. Yet, let him be inſtructed not to conſider theſe durations as abſolutely fixed, but variable according to the velocity of the movements in which they are placed. Thus we reckon a ſemibreve equal to 4 vibrations of a pendulum; a minim to 2; a crotchet to 1, &c. But if the number of aliquot parts, into which a ſemibreve is divided, be great, and conſequently the value of each particular part ſmall, the minim, crotchet, quaver, &c. will increaſe in their intrinſic durations, though they muſt always preſerve the ſame proportions relatively one to another. He ſhould never be habituated to take a piece of muſic either from the ſound of a voice or an inſtrument. His companion ought to read the muſic by the names and values of its characters, with the ſame exactneſs as the words in any other language. When he becomes a conſiderable adept in the art, tangible ſigns may be invented, by which he may not only be enabled to read, but even to ſet, muſic for himſelf. Such exerciſes will render him infinitely more accurate, both in his principles and practice, than he would otherwiſe be.

There is a hint of ſuch tangible ſigns given in Tanſure's Muſical Grammar, p. 93. and which, though (like the reſt of the book) obſcure and indigeſted, may be improved and applied with advantage: we ſhall here quote the paſſage at length.—"As it is the pleaſure of the Almighty, that ſome perſons are deſtitute of *eye-ſight*; in like manner it is his infinite goodneſs to make them a double amends another way, by giving them a greater ſhare of memory, &c. whereby they become very dexterous in playing on muſical inſtruments, mathematies, &c. as we may obſerve by Dr. Stanley organiſt of St. Andrew's Holborn in London, the blind profeſſor of mathematics in the univerſity of Cambridge, and many others too tedious here to mention, who were born *blind*, and never ſaw the leaſt glance of light; yet God gave them ſuch a light in *knowledge*, that they became the wonder of all ſuch as had the benefit of ſeeing, &c.

"And as *blind perſons*, at firſt, cannot poſſibly have ſo clear an idea of *notes* and *muſical characters* as they that ſee them, until they are taught by a maſter or tutor; I have (for the good-will I bear to ſuch unfortunate perſons) contrived the following table; that, by *feeling*, they may underſtand notes, and learn any tune that ſhall be ſet them, in their maſter's abſence.

A New Music-Table *for ſuch as are* Blind.



Explanation.

"Let A—B be a ſmooth board, 3 or 4 feet long, 1 inch thick, and 9 inches wide, with 5 ſquare ledges glued thereon, each being half an inch aſunder, half an inch wide, and half an inch high; which riſing ledges repreſent our five lines of muſic, and their ſpaces: and the two outward lines, being made a little lower, may ſerve as leger lines, on occaſion. The cyphers repreſent ſo many holes bored into every line and ſpace, half an inch aſunder; wherein *pegs* of different ſhapes are to be ſet, to repreſent the ſeveral ſorts of notes and characters of the tune: which pegs the blind perſon may know by feeling, as well as he does his keys of the organ or harpſichord: ſo that, by keeping his fingers on the 5 lines, he feels the ſeveral pegs as they come on, and are ſet to repreſent the ſeveral ſorts of notes, on both line and ſpace; whilſt his right hand ſtrikes the reſpective key, &c. he firſt knowing the names of all his keys, his lines, ſpaces, and the mark of every peg. Let each peg be about half an inch high, when ſet in very faſt. [N. B. The blind perſon muſt firſt be taught the names of the above lines and ſpaces in both the treble and baſs cliffs; and that he muſt feel his treble with his right hand, and his baſs with the left hand; each being contrary, as you may ſee by the letters of the above table, A and B; and muſt learn each part ſeparate.]

"Of pegs, he muſt have a great number of every ſort, to ſet his tune with, which he may mark as follows:

For a *Semibreve*, 4 top-notches.—*Minim*, 2 top-notches.—*Crotchet*, 1 top-notch.—*Quaver*, one corner cut off.—*Semiquaver*, 2 corners cut off.—*Demiſemiquaver*, all 4 corners cut off.—For *Reſts*, a notch in the corner.—For a *Flat*, 1 notch on the ſide.—*Sharp*, 2 notches on the ſide.—*Point*, 3 notches on the ſide.—*Bar*, a flat thin top.—*Repeat*, a ſharp-pointed top, &c. &c.

"But it is beſt for every performer to make and mark his own pegs; and deliver them one by one as they are called for by the perſon that ſets his *tune*."

Of Tanſure's Muſical Notation, we have already ſaid, that it is imperfect; and perhaps every table or inſtrument of the ſame kind may be liable to the ſame cenſure, as not being comprehenſive of all the characters in the written language of muſic, ſo that the blind reader may find no deficiency in acquiring any leſſon. The cuſhion of Mr. Cheeſe indeed appears to have more powers than any other inſtrument for the ſame purpoſe that has hitherto occurred, and though not without many objections, we ſhall here deſcribe it. It may poſſibly,

however, be beſt for every blind adept in the muſical art, after being ſufficiently inſtructed in its theoretical and practical principles, to invent for himſelf a table, by which may be expreſſed all the various phenomena of muſic, in which, by varying the forms and poſitions of his pegs, he may habitually aſſociate them with ſounds, durations, reſts, intervals, chords, cadences, da capos, repeats, and all the various graces which give animation and expreſſion to muſical ſounds: for thus, being the immediate creatures of his own imagination, they will more eaſily become familiar to his memory, and be more ſtrongly and readily aſſociated with the phenomena which they are intended to ſignify, than if he had aſſumed the inventions of any other perſon.

The following then is Mr. Cheeſe's deſcription of a machine for teaching muſic to people deprived of ſight, and to enable them to preſerve their compoſitions, in the act of compoſing, without the aſſiſtance of a copyiſt.—"That part of the machine which repreſents the book, or paper, is a ſmall cuſhion ſtuffed, on a little frame; along which, is ſewed a number of packthread ſtrings at equal diſtances from each other; theſe repreſent the lines in a muſic book: the five which compoſe the ſtave, are made of large twine; and thoſe which repreſent the leger or occaſional lines, drawn through the heads of the notes, where the muſic exceeds the compaſs of the eſtabliſhed ſtave, are made of ſmall twine, and are on this machine of the ſame length as the others. See the Plate.

"If the practitioner only wiſhes to write harpſichord muſic, the cuſhion may be what length he pleaſes, and about five or ſix inches wide: the ſtrings muſt be ſewed in the following order; beginning with the firſt or loweſt, near the edge of the cuſhion; four ſmall ones, which correſpond with the notes in the baſe of the inſtrument ff, rr, cc, ee: Next five large ones, for the ſtave which correſpond with the lines in the book, or notes in the inſtrument, g, b, d, f, r; one ſmall one, which repreſents the occaſional line between the baſe and treble, or middle c; five large ones for the treble ſtave, which make the notes e, g, b, d, f; three ſmall ones, which repreſent the leger lines when the muſic goes in alt. Theſe provide for the note a in alt, c in alt, and e in alt; in the ſpace above which, next the edge of the cuſhion, the f in alt is wrote, when it is wanting, which completes the compaſs of the inſtrument.

"Thoſe who only ſing or play on ſingle inſtruments, ſuch as violins, &c. ſhould have their cuſhions not above half the width of thoſe before mentioned, upon which there ſhould be but one ſtave, and that in the following order:—Two ſmall lines at bottom, five large ones in the middle, and three ſmall ones at top. Neither of the outſide lines of theſe ſmall cuſhions ſhould be ſewed cloſe to the edge, as there are notes ſuppoſed above and below. At either end of theſe ſmall cuſhions, there ſhould be a ſmall wire ſtaple, in order that any number of them may be combined together at pleaſure, by running a rod through the ſtaples: this will enable the practitioner to write what muſicians call SCORE, in any number of parts he pleaſes; and by this means a thorough knowledge of the great works of Handel, and all other claſſical authors, may be acquired as well without ſight as with it.

"The characters uſed to write on this machine are pins; ſome with two, three, or more heads; others bent in different forms—ſome, the heads taken off and the top beat flat; ſome of theſe are ſplit; others the heads taken off, and placed near the middle. The bars are pieces of wire crooked at each end; a double bar is made by placing two ſingle ones cloſe together; a double ſharp and double flat in the ſame manner.

"The characters are kept in a box in the ſame ſtyle as the printer keeps his types; each different compartment of which muſt be marked with a character in writing, ſignifying what each, contained in the ſeveral compartments, is intended to repreſent. That the maſter may be acquainted with them, the ſtudent muſt be taught to diſtinguiſh each of the characters contained in the box by the feel, as well as the names of each line and ſpace upon the cuſhion. When he can do this readily, ſome muſic ſhould be read to him, which it will be well for him to copy on the cuſhion: and when that is filled, let it be laid on the deſk of the harpſichord before him; and then by feeling over a paſſage or ſentence at a time, and afterwards playing it, his playing always commencing with the beginning of the piece, or at ſome particular part of it, this will ſoon enable him to recollect the whole, when the hands are taken off the cuſhion, to play what has been laſt felt. One of thoſe characters, called a direct, muſt be placed againſt the note to be next felt: this will enable the ſtudent to go on again, after playing, without any difficulty. The perſon who reads the muſic, muſt be inſtructed not to call the lines or ſpaces by the letters which diſtinguiſh them, leſt confuſion may enſue, every eighth being the ſame; but muſt read in the following manner: firſt the name of the character muſt be mentioned, whether minim, crotchet, or quaver, &c. then the line or ſpace; as for example, minim on the firſt line, crotchet on the firſt ſpace, quaver on the ſecond, &c. &c. When the muſic exceeds the compaſs of the ſtave, it muſt be particularly mentioned whether above or below, firſt calling the character, then the leger line or ſpace.

"The technical term at the beginning of each piece, is better remembered than wrote down on the machine: the accidental terms, which are beſt marked by placing ſome character, not much uſed, either above or below the note on which it happens, the ingenious mind will find out a method of doing for itſelf.

"This machine will not only teach muſic; but, calling the characters letters, any one will be enabled to ſpell, read, or write down his ſentiments on any ſubject, and even convey them to his friend without the aſſiſtance of a ſecretary. Arithmetic may be alſo taught upon this machine; as by calling the dot 1, and the pauſe 10, a complete ſet of figures will be formed.

"*Explanation of the figures.* Fig. 9. ſhews the form of the cuſhion, which in its full ſize is about three feet long, and five inches and three quarters wide, having thereon a repreſentation of muſical notes, ſhown by different pins ſtuck on it. The 5 uppermoſt lines are of large packthread; and the reſt are of ſmall twine.

"Pins, N° 1. A ſemibreve. 2. A ſemibreve reſt. 3. A minim. 4. A minim reſt. 5. Dots. 6. A crotchet. 7. A crotchet reſt. 8. A quaver. 9. A quaver reſt. 10. A ſharp. 11. A ſemiquaver. 12. A ſemiquaver reſt. 13. A demiquaver. 14. A demiquaver reſt. 15. A flat. 16. A demiſemiquaver. 17. A demiſemiquaver reſt. 18. A ſemidemiquaver. 19. A ſemidemiquaver reſt. 20. A natural. 21. Bars. 22. A direct. 23. A tye. 24. Baſs. 25. Tenor cliff. 26. Treble cliff. 27. A repeat. 28. Pauſe. 29. This character placed on any line or ſpace, ſignifies as many notes on that line or ſpace as there are doubles on the pins; if turned upwards, it implies the ſame number aſcending; if downward, that number deſcending. 30. A beat or inverted ſhake. 31. A ſhake; and where there is a dot placed over it, ſignifies a turned ſhake. Two dots placed over each other, above the notes, without this character, ſignify a turn only. 32. This character is uſed over the note to ſignify *forte;* and if a dot is placed above it, *fortiſſimo:* if the dot is placed above the note and below the character, it implies *creſcendo;* if the character is placed below the note, it ſignifies *piano;* and if a dot is placed under it, *pianiſſimo;* but if the dot is above the cha-

racter, and below the note, it ſignifies *diminuendo*. In concertos, the inventor uſes the ſame character placed above the note in the ſame manner, with two dots over it to ſignify *toote*; and below the notes, with two dots under it to ſignify *ſolo:* in vocal muſic, the ſame character above the notes, with three dots over it, ſignifies *ſymphony*; and below the notes, with three dots under it, ſignifies *ſong*."

It is certain, that when playing concertos, or, if you pleaſe, when performing in *ſcore*, the blind muſt depend upon memory, and upon memory alone: but happily their retentive powers are remarkably ſtrong; and there are few pieces in muſic which will be found either too intricate to be acquired, or too long to be remembered, by a perſon deprived of ſight. Mr. Stanley, the gentleman formerly mentioned by Tanſure, performed what is ſtill more aſtoniſhing: for it is ſaid, he accompanied any leſſon with a thorough baſs, though he never had heard it before.

When the pupil becomes a more profound theoriſt, if he has adopted the notion that muſic and geometry are congenial and inſeparable, he may peruſe Malcolm's Eſſay on Muſic, and Treydell's Theory and Practice of Muſic. But if he chooſes to hear the ſame principles delivered without that unneceſſary parade and oſtentation of profundity, let him be inſtructed by D'Alembert; by Rameau, in his principles of compoſition; and by Rouſſeau's Muſical Dictionary. It is true, that the forms and proportions of inſtruments, the thickneſs, length, and tenſion of muſical ſtrings, may be mathematically adjuſted; their relations one to another may be determined by the coincidence of their vibrations, or by the number and velocity of theſe vibrations when diſſonant; but experience and a good ear are amply ſufficient for theſe purpoſes. Yet, if the neceſſity of geometry in muſic ſhould ſtill remain an indelible article in his creed, he may peruſe Dr. Smith's Philoſophical Principles of Harmony. There has alſo been publiſhed an explication of Tartini's theory, intitled, *The Principles and Power of Harmony*; which, after he has made conſiderable progreſs, may be read to him with ſenſible advantage.

In this article we have endeavoured to form an eſtimate of the inconveniences ſuffered, and the advantages poſſeſſed, by the blind; we have attempted to ſhow, of what kind of culture their remaining faculties are ſuſceptible, and what appeared to us the eaſieſt and propereſt means of their improvement. We have illuſtrated not only its poſſibility, but its certainty, by inconteſtable facts, which demonſtrate, even in the eyes of ſcepticiſm and incredulity, to what degrees of eminence, both in the mechanical and liberal arts, the blind may be carried. It now remains to demand from ſociety, Whether it is more humane and eligible, that ſuch unhappy perſons ſhould be ſuffered to languiſh out their lives in torpid and miſerable obſcurity, wretched in themſelves and burdenſome to others; or to cultivate and improve their powers in ſuch a manner, as that they may be qualified for internal enjoyment and public utility? Surely there is not a human being, who does not diſgrace the works of God, that can be at any loſs in anſwering this queſtion. Have we not then a right to call the world to an account? Have we not a right to demand, why rational beings ſuſceptible of felicity in themſelves, and capable of tranſuſing happineſs through that ſociety with which they are connected, ſhould be abandoned to a ſtate of inſignificance and miſery? Is it poſſible that men who are every moment ſubjected to the ſame contingencies with which they behold their fellow-creatures afflicted, ſhou'd not with all their ſouls endeavour to alleviate the miſfortunes of their ſuffering brethren? Is the native and hereditary portion of human woe ſo light and ſupportable in itſelf, that we ſhould neglect and deſpiſe thoſe to whom it is embittered by accidental circumſtances of horror and diſtreſs? You who are parents, who feel the ſtrong and powerful pleadings of nature, do not, by a brutal negligence and inſenſibility, render the exiſtence which you have given a curſe to its poſſeſſors. Do not give them reaſon to upbraid your memory; and to anſwer thoſe who aſk what patrimony you have left them, that their ſole inheritance was ignorance, incapacity, and indigence. You, men of wealth, and eminence, you whom Providence has rendered conſpicuous on the theatre of nature, to whom it has given the nobleſt opportunities of participating the divine beatitude by the exerciſe of univerſal benevolence and genuine patriotiſm; yours is the glorious province of bringing neglected merit from obſcurity, of healing the wounds inflicted by adverſe fortune, and of cultivating thoſe talents which may be exerted for your own advantage and the honour of your ſpecies!

Pore-Blind, or *Pur-blind*. A perſon who is very-ſhort-ſighted is ſaid to be *pur-blind*.

Moon-Blind: horſes that loſe their ſight at certain times of the moon are ſaid to be *moon-blind*. It is however nothing more than an inflammation of the eyes which recurs ſomewhat periodically; though at laſt it uſually ends in the total loſs of ſight. See Farriery.

Blind-*Harry*. See Henry *the Minſtrel*.

Blind-*Worm*. See Anguis.

BLINDE, among mineraliſts, a ſpecies of lead-marcaſite, by our miners called mock-ore, mock-lead, and wild lead, &c. The German mineraliſts call it *blende*, whence our denomination *blinde*. It anſwers to what in Agricola is called *Galenæ inanis*. It uſually lies immediately over the veins of lead-ore, in thoſe mines which produce it, for it is not found in all. When the miners ſee this, they know the vein of ore is very near at hand.

BLINDES, or Blinds, in the art of war, a ſort of defence commonly made of oziers, or branches interwoven, and laid acroſs between two rows of ſtakes, about the height of a man, and four or five feet aſunder, uſed particularly at the heads of trenches, when they are extended in front towards the glacis; ſerving to ſhelter the workmen, and prevent their being overlooked by the enemy.

BLINDING, a ſpecies of corporal puniſhment anciently inflicted on thieves, adulterers, perjurers, and others; and from which the ancient Chriſtians were not exempt. Sometimes lime and vinegar, or barely ſcalding vinegar, was poured into the eyes till their balls were conſumed; ſometimes a rope was twiſted round the head till the eyes ſtarted out. In the middle age, they changed total blindneſs for a great darkneſs or diminution of ſight; which they produced by holding a red-hot iron diſh or baſon before the eyes till their humours were dried and their coats ſhrivelled up.—The inhabitants of the city Apollonia executed it on their watch whom they found aſleep.—Democritus (according to Plutarch, Cicero, and A. Gellius) put out his own eyes, that he might be leſs diſturbed in his mental contemplations, when thus freed from the diſtraction of the objects of ſight.

BLINDNESS, a privation of the ſenſe of ſight, ariſing from a total deprivation of its organs, or an involuntary obſtruction of their functions. See the article Blind.

Total Blindness, is that wherein all ſight or perception, even of light, is wanting, as is the caſe of thoſe who are ſaid to be *ſtone-blind*. A blind man, by the civil law, cannot make a teſtament except under certain modifications; but in every caſe he is diſabled from being a witneſs to a teſtament, on account of his blindneſs. There are various other degrees and circumſtances of blindneſs, as partial, diurnal, periodical, and perpetual blindneſs.

Tranſient BLINDNESS, is that which gives way of itſelf in due time, as that of whelps, which continues for ſeveral days, ſometimes nine, rarely twelve, after they are littered. The Nogais Tartars, according to father Du Ban the Jeſuit, who lived among them, are born blind, and do not open their eyes till after ſeveral days.

Nocturnal BLINDNESS, called alſo *nyctalopia*, is that which enſues on the ſetting of the ſun in perſons who ſee perfectly in the day, but become quite blind as ſoon as night comes on. See Phil. Tranſ. N° clix. p. 560, where an inſtance of it is given; alſo a ſingular caſe of this kind related by Dr. Pye, in the Medic. Obſerv. and Inquir. Vol. I. p. 111.

The cauſes of blindneſs are either loſs of power in the optic nerve, or elſe an opacity in ſome of the tranſparent parts of the eye, as of the cryſtalline humour in the caſe of a cataract, &c. The author of the Embaſſy of D. Gareias de Sylva Figueroa into Perſia tells us, that in ſeveral parts of that kingdom are found vaſt numbers of blind people of all ages, ſexes, and conditions; by reaſon of a ſpecies of little flies which prick the eyes and lips, and enter the noſtrils, producing certain blindneſs whenever they light on the eyes.

BLINDNESS, *in horſes*, may be diſcovered by the walk or ſtep, which in a blind horſe is always uncertain and unequal, becauſe he dares not ſet down his feet boldly when led; though if the ſame horſe be mounted by an expert horſeman, and the horſe of himſelf be mettled, the fear of the ſpur will make him go more freely; ſo that his blindneſs can hardly be perceived. Another mark whereby a horſe may be known to have loſt his ſight is, that upon hearing any body enter the ſtable, he will prick up his ears, and move them backwards and forwards, as miſtruſting every thing, and being in continual alarm by the leaſt noiſe. See FARRIERY.

BLINKS, among ancient ſportſmen, denoted boughs broken down from trees, and thrown in the way where deer are likely to paſs, to hinder their running, or rather to mark which way a deer runs, in order to guide the hunter.

BLINKING OF BEER, in Lincolnſhire, ſignifies letting the wort ſtand for ſome time in the vat, till it has acquired ſome degree of acidity, in order to diſpoſe it to fine, and be the ſooner ready for drinking.

BLISSOM, among huſbandmen, corruptly called *bloſſom*, is the act of a ram when coupling with an ewe.

BLISTER, in medicine, a thin bladder containing a watery humour, whether occaſioned by burns and the like accidents, or veſicatories applied to different parts of the body for that purpoſe.—Cantharides, or Spaniſh flies, applied in the form of a plaſter, are chiefly uſed with this intention. See CANTHARIDES and PHARMACY.

BLITE, in botany. See BLITUM.

BLITH, a town of Nottinghamſhire, in England, ſeated in W. long. 0. 55. N. lat. 53. 25.

BLITUM, BLITE, or *Strawberry Spinach*: a genus of the digynia order belonging to the monandria claſs of plants; and in the natural method ranking in the 12th order, *Holoraceæ*. The calyx is trifid; no petals; the ſeed is one, included in a berry-ſhaped calyx.

The *Species* are, 1. The capitatum, with flowers in cluſtered heads at the joints and crown of the ſtalks, is a native of Spain and Portugal, but has been long preſerved in the Britiſh gardens on account of the beauty of its fruit. It is an annual plant, with leaves ſomewhat like thoſe of ſpinach; the ſtalk riſes two feet and an half high; the upper part of the ſtalk hath flowers coming out in ſmall heads at every joint, and is terminated by a little cluſter of the ſame: after the flowers are paſt, the heads ſwell to the ſize of wood ſtrawberries, and when ripe have the ſame appearance, but are not eatable; they are full of a purple juice, which ſtains the hands of thoſe who bruiſe them, of a deep purple colour. 2. The virgatum, with ſmall heads growing from the ſides of the ſtalks, is a native of the ſouth of France and Italy. This ſeldom grows more than a foot high: the leaves are ſmaller than the firſt, but of the ſame ſhape: the flowers are produced at the wings of the leaves, almoſt the length of the ſtalk; they are ſmaller, and not ſo deeply coloured as the firſt. 3. The tartaricum, triangular, acutely indented leaves, is a native of the country from which it takes its name. Mr. Miller received the ſeeds from Peterſburg. It riſes to very near three feet high; the flowers come out from the ſides of the ſtalks, but are ſmaller than thoſe of the firſt, as is alſo the fruit.

All theſe plants, being annuals, muſt be propagated by ſeeds; and, as they are very hardy, will ſucceed in the common borders, if ſown in March or April, covering the ſeed about half an inch deep with earth, and leaving the plants five or ſix inches aſunder. When they come up, each muſt be ſupported with a ſmall ſtick, or they will be borne down by the weight of the berries.

BLOATING, a puffing up or inflation of the adipoſe membrane of the body; the ſame with what is called an *emphyſema*.

BLOCK is uſed for a piece of marble as it comes out of the quarry, before it has aſſumed any form from the hand of a workman. In the mechanic arts, it ſignifies a large piece of ſolid wood whereon to faſten work or to faſhion it; ſtrength and ſtability being the requiſite properties. In this ſenſe, we ſay, a *chopping block*; a *ſugar-finer's block*; a *ſmith's block*, on which his anvil is faſtened; an *executioner's block*, on which the criminal's head is laid to be ſtruck off.

BLOCK, among cutters in wood, is a form made of pear-tree, box, or other hard and cloſe-grained wood, free from knots, on which they cut their figures in relievo with knives, chiſſels, &c.

BLOCK, in falconry, denotes the perch whereon a bird of prey is kept. This is to be covered with cloth.

BLOCKS, in ſea-language, are pieces of wood belonging to ſhips, in which pulleys are placed, and wherein the running-ropes go. Of theſe ſome are ſingle, ſome double; and ſome have three, four or five, ſhivers in them. They are named and diſtinguiſhed by the ropes they carry, and the particular uſes they ſerve for. See a repreſentation of all the different kinds in Plate 47.

Spring BLOCK, an invention of Mr. Hopkinſon of Philadelphia, calculated to aſſiſt a veſſel in ſailing. The principles of his invention are thus explained in his paper on the ſubject, publiſhed in the Tranſactions of the American Philoſophical Society. "The maſts, yards, and rigging, of a ſhip receive the firſt impulſes of the wind. All theſe are in ſome degree elaſtic. Every twiſted rope is a ſpiral ſpring, and every ſpar capable of being a little bent. But let us ſuppoſe that the ropes were all compoſed of ſtraight ſtrands, that the maſts and yards were inflexible, and the ſails made of thin light wood: in ſuch caſe, I ſuppoſe that the veſſel, in ſailing by the wind, would make but little head-way, whatever the ſhape of her bottom might be, but would expend the force of the wind in heeling, and ſlipping to leeward. If this is true, her ſailing muſt be conſiderably aſſiſted by any means that ſhall increaſe the acting ſpring of her rigging. For this purpoſe I have contrived what I call a *ſpring-block*, to be applied to all ſuch parts of the rigging as will admit of it with ſafety and convenience, and where its operation will be moſt advantageous; but particularly to the ſheet-ropes, and, if practicable, to the dead eyes, in lieu of what are called the chains.

"In 2d Plate 48, A. fig 1. is a block made in the uſual manner, having a ring or eye B, at one end. C, is a ſpiral ſpring, linked at one end to the hook D E, and at the other to the ring F, which is to be annexed by a ſtaple to the timber-head,

or, by ſome other means, to the place where it is to be applied. The ſpring C muſt be of well-tempered ſteel, and proportioned in ſtrength to the ſervice it is to perform. Within the cavity or pipe, formed by the ſpiral ſpring, there muſt be a chain of ſuitable ſtrength, called a *check-chain* (repreſented ſeparate at G), connected by links to the hook D E and ring F. When the ſpring is not in action, this chain is ſlack; but when the ſpiral ſpring is extended by the force of the wind, as far as it can be without danger of injury, the check-chain muſt then begin to bear, to prevent its farther extenſion, and, if ſtrong enough, will be an effectual ſecurity againſt failure.

"Fig 2. repreſents part of the gun-wale of a ſloop, with the ſpring-blocks in action, one of them hooked to a ſtaple in the timber-head, and the other to the corner of the jib.

"My expectation is, that a veſſel thus furniſhed will be leſs liable to heel, that ſhe will receive the impulſes of the wind to better advantage, and ſail with a more lively and equable motion than if rigged in the common way."

Mounting Block, an eminence uſually of ſtone, cut in ſteps or notches, ſerving as a help to mount on horſeback. Theſe were much in uſe among the ancients, who were unacquainted with ſtirrups. The Romans erected them at proper ſtations along all their great roads.

BLOCK (Daniel), portrait painter, was born at Stettin in Pomerania in 1580, and gave early proofs of a good genius; which induced his parents to place him as a diſciple with Jacob Scherer, a maſter capable of giving him the beſt directions, to qualify him for proceeding ſucceſsfully in his profeſſion. He chiefly painted portraits, in which (according to Sandrart) he was very eminent, and had the honour to paint the portraits of Chriſtian IV. king of Denmark, and of Guſtavus Adolphus king of Sweden. The extraordinary merit of this maſter recommended him to the eſteem of the Prince of Mecklenburg, who retained him in his ſervice 44 years; and by order of that Prince, he painted the portraits of his whole family at full length, as large as life, and in the antique habit; by which works his reputation was eſtabliſhed effectually. By the agreeable manner of his colouring, and the eaſy attitudes of his figures, his paintings became ſo acceptable to all perſons of rank, that before the decline of life, he had acquired a very large fortune; but unfortunately he loſt it all, in the compaſs of a few hours, by the ſudden irruption of a plundering party, and with great difficulty his own life was preſerved. He died in 1661.

BLOCKADE, in the art of war, the blocking up a place, by poſting troops at all the avenues leading to it, to keep ſupplies of men and proviſions from getting into it; and by theſe means propoſing to ſtarve it out, without making any regular attacks. To *raiſe a blockade*, is to force the troops that keep the place blocked up from their poſts.

BLOCKLAND (Anthony de Montfort), hiſtory and portrait painter, was born of a noble family at Montfort in 1532. He learned the art of painting in the ſchool of Francis Floris, whoſe manner he always followed; and became an artiſt of great diſtinction, by endeavouring principally to imitate the taſte of the Roman ſchool in deſign and compoſition. His genius was beſt adapted to grand compoſitions, of which he deſigned many; ſome at Delft, but more at Utrecht. His deſigns had grandeur, the airs of his heads were noble, and the profiles of his female figures approached near to the taſte of Parmigiano. Several of his works are in ſo good a guſto, and particularly a Venus, and the hiſtory of Joſeph and his Brethren, that they ſeem to have been painted by a maſter educated in the ſchool of Florence. He died in 1583.

BLOCZIL, a fortreſs of Over yſſel in the United Provinces, ſeated on the river Aa, at the place where it falls into the Zuyder Zee. It has a port ſufficient to contain 200 veſ-

ſels, and ſerves to defend thoſe ſhips that croſs the ſea. It has ſix good baſtions, and ſeveral other regular fortifications. E. long. 6. 0. N. lat. 52. 44.

BLOEMART (Abraham), painter of landſcape, cattle, hiſtory, and portrait, was born at Gorcum in 1564, according to Houbraken; but according to Sandrart, whoſe authority ſeems to claim the preference, he was born in 1567, and lived moſtly at Utrecht. In his youth he applied himſelf diligently to deſign after the works of Francis Floris, and afterwards received inſtructions from ſeveral artiſts of no great repute; but the power of his own genius proved his principal director in the art of painting. He formed a manner peculiar to himſelf, making nature his model for many of the objects he painted, particularly his cattle, in which he excelled. He died in 1647. He left four ſons who were all of them artiſts; but the moſt famous was Cornelius, the ſubject of the following article.

Bloemart (Cornelius), the youngeſt ſon of Abraham, was born in 1603 at Utrecht. The firſt principles of drawing and painting he learned from his father; but his natural inclination for the art of engraving was ſo powerful, that he applied himſelf wholly to the purſuit of it. He firſt ſtudied under Criſpin de Paſs, an engraver much more famous for the neatneſs than the good taſte of his works. Not ſatisfied with what he learned from this artiſt, he went to Rome, in order to perfect himſelf from the works of the greateſt maſters: and in that city (where the far greater part of his engravings were made) he died in a very advanced age. "The manner of engraving, adopted by this excellent artiſt, appears to me (ſays Mr. Strutt) to be not only quite original, but the ſource from which we may trace that ſtyle in which the greateſt and beſt French maſters excelled; thoſe I mean who worked with the graver only. He covered the lights upon his diſtances, and the other parts of his plates which required tinting, with great care. The lights, whether on the diſtant hills, trees, buildings, or figures, in the engravings prior to his time, had been left quite clear, and by ſo many white ſpots ſcattered in various parts of the ſame deſign, the harmony was deſtroyed, the ſubject confuſed, and the principal figures prevented from relieving with any ſtriking effect. By this judicious improvement, Bloemart gave to his prints a more clear and finiſhed appearance, than all the laboured neatneſs even of Jerom Wierix had been able to produce. He drew correctly; but from his ſtyle of engraving, which was executed entirely with the graver, the extremities of his figures are heavy, and his heads are not always equally beautiful or expreſſive. With reſpect to the mechanical part of the work, few indeed have excelled him, either in clearneſs or freedom of execution. His great fault, however, is want of variety. The naked parts of his figures, the draperies, and the back-ground, are equally neat, and engraved preciſely in the ſame manner. Hence the effect is flat; and the fleſh, for want of ſufficient diſtinction, appears cold and ſilvery. His works are juſtly held in high eſtimation. They are very numerous, and many of them difficult to be procured."

BLOEMEN (Peter Van), a celebrated painter, born at Antwerp, was brother to John-Francis Van Bloemen, called by the Italians Orizonti, and lived for ſeveral years at Rome along with his brother. As ſoon as he found himſelf competently ſkilled in colouring and pencilling, as well as in deſigning, he returned to his native city, where, in the year 1699, he was appointed director of the academy. The compoſition of this maſter is rich, and his pictures are generally filled with a number of figures. His ſubjects are, the marchings of ſquadrons of cavalry, encampments, artillery, battles, Italian fairs, markets, and feſtivals; in which he ſhowed great correctneſs in his deſign and in his drawing; and an elegance in the manner of

dreſſing his figures, whom he frequently repreſented in Oriental habits. He deſigned horſes in an admirable ſtyle; and in his battles gave them abundance of ſpirit, graceful attitudes, and an expreſſion that was full of life and nature. His landſcapes are enriched with elegant architecture, with baſſo-relievos, and mutilated ſtatues, in a noble taſte; and rendered ſtill more pleaſing by a good tone of colour, by animals of different kinds, and excellent figures. His beſt works are admired in all parts of Europe, and afford large prices: but it is to be obſerved, that ſome of his pictures ſeem rather to be too much laboured or ſtiff, and (according to the artiſt's phraſe) ſmell of the pallet; and thoſe are proportionably leſs eſtimable.

Bloemen (John Francis Van). See Orizonti.

Bloemen (Norbert Van), brother of the preceding, was a painter of portraits and converſations; but in merit was very inferior to his brothers, although he had a good deal of employment.

BLOIS, an ancient and handſome commercial city of France, in the department of Loire and Cher, and late province of Blaiſois. It is ſeated on the Loire, in a delightful ſituation. The ſpectator is ſtruck with the idea of an amphitheatre, in ſeeing the manner in which the houſes are diſpoſed, like rows of ſeats above each other. The cathedral is a large ſtructure, although inferior to what it appears to be at a diſtance. It is ſeated at one extremity of the city, on an eminence whoſe declivity, toward the centre of the city, joins that of another eminence at the other end, on which is built a magnificent caſtle; ſo that both theſe ſtructures form, as it were, the two horns of a creſcent. In this caſtle was born the good Lewis XII. and here, in 1588, Henry III. at a meeting of the States General, which he had convoked, cauſed the Duke of Guiſe, and his brother the cardinal, to be aſſaſſinated. Here are ſome fine fountains, and a new bridge, one of the beſt in France. Blois is ſtill an epiſcopal ſee, and the terrace of the biſhop's palace affords a charming walk. This city has deſervedly the reputation of being one of thoſe in which the French language is ſpoken with the greateſt purity; but this muſt be underſtood of perſons who have received a liberal education; for, whatever ſome geographers may aſſert, the common people expreſs themſelves as badly here as in other places. Blois is 47 miles W. of Tours, and 100 S. W. of Paris. Long. 1. 25. E. lat. 47. 35. N.

BLOMARY, or Bloomary, in metallurgy, the firſt forge through which iron paſſes, after it is melted out of the ore.

BLOND (Chriſtopher le), painter of portraits in miniature and all kinds of ſubjects on paper, was born in 1670. Very few circumſtances relative to his education or life are mentioned by any writers till he was known at Rome in the year 1716, being at that time painter to the Count Martinetz, ambaſſador at the court of Rome. By the ſolicitation of Overbeke he was induced to go to Amſterdam, and in that city was employed to paint ſmall portraits for bracelets, rings, and ſnuff-boxes; of which, although they were painted in water-colours, yet the colouring was as lively and natural as if they had been painted in oil. However, as he found his ſight much impaired by the minuteneſs of his work, he diſcontinued water-colour painting, and attempted the uſe of oil with a reaſonable degree of ſucceſs. After he had reſided for ſome years in the Low Countries, he went to England, and ſet up a new method of printing mezzotinto plates in colours ſo as to imitate the pictures of which they were copies. In this manner he executed in England ſeveral large plates, from pictures of the greateſt maſters, and diſpoſed of the prints by lottery. But thoſe who obtained the prizes (Mr. Strutt ſays) appear not to have held them in any very great eſtimation. "The prints (he adds) certainly poſſeſs ſome merit, excluſive of their novelty; but, in general, the colours are flat and dirty; the effect is neither ſtriking nor judiciouſly managed; and the drawing is frequently very incorrect, eſpecially in the extremities of his figures." Mr. Pilkington ſpeaks of them with greater approbation. "The artiſt (he ſays) imitated his models with ſo much ſkill, ſuch exact reſemblance, ſuch correctneſs of outline, ſuch ſimilarity of colour and expreſſion, that at firſt they amazed every beholder who viewed them at a proper diſtance; and many of thoſe prints are ſtill extant, which are much eſteemed by perſons of good taſte." And Mr. Walpole obſerves, that ſome heads, coloured progreſſively, according to their ſeveral gradations, bear witneſs to the ſucceſs and beauty of his invention. He had another merit to the public, with which few inventors begin; for he communicated his ſecret in a thin quarto, intitled *Coloritto*, or "The harmony of colouring in painting reduced to mechanical practice, under eaſy precepts and infallible rules." His method was performed by ſeveral mezzotinto plates for one piece, each expreſſing different ſhades and parts of the piece in different colours. He was not, however, it is ſaid, the original inventor of that manner of managing colours, but took it from Laſtman and others, who, with much greater regularity of morals, equal capacities, and more diſcreet conduct, had before undertaken it without ſucceſs. Le Blond, whoſe head was continually full of ſchemes, next ſet on foot a project for copying the cartoons of Raphael in tapeſtry, and made drawings from the pictures for that purpoſe. Houſes were built and looms erected at the Mulberry Ground at Chelſea; but the expences being too great, or the contributions not equal to the firſt expectations, the ſcheme was ſuddenly defeated, and Le Blond diſappeared, to the no ſmall diſſatisfaction of thoſe who were engaged with him. From hence he went to Paris, where, Baſan informs us, he was in the year 1737; and in that city he died, 1740, in an hoſpital. Le Blond was alſo author of a treatiſe, in French, on ideal beauty. It was publiſhed in 1732, and has ſince been tranſlated into Engliſh.

BLONDEL (David), a proteſtant miniſter, diſtinguiſhed by his ſkill in eccleſiaſtical and civil hiſtory, was born at Chalons ſur Marne, and was admitted miniſter at a ſynod of the iſle of France, in 1614. He wrote, 1. A Defence of the Reformed Churches of France. 2. A Work againſt the Decretal Epiſtles. 3. *De Epiſcopis et Preſbyteris*; and other pieces. Bayle informs us that he had a very ſingular way of ſtudying; he lay on the ground, and had round about him the books which he wanted for the work he was about. He died in 1655, aged 64.

Blondel (Francis), regius profeſſor of mathematics and architecture, was employed in ſeveral negotiations, arrived at the dignity of marſhal de camp and counſellor of ſtate, and had the honour of being choſen to teach the dauphin the mathematics; he was alſo made member of the Academy of Sciences at Paris, and director of the Academy of Architecture. He died at Paris in 1688, aged 68. He wrote, 1. Notes on the Architecture of Savot. 2. A Courſe of Architecture and Mathematics. 3. The Art of throwing Bombs. 4. A New Manner of fortifying Places. 5. A Compariſon between Pindar and Horace; and other works.

BLONDUS (Flavius), an hiſtorian born at Forli, in Italy, in 1388, was ſecretary to Eugenius IV. and other popes. He compoſed a great many books; and, among others, a Hiſtory from the year 400 to 1440. He died in 1463.

BLONIEZ, a town of Poland, in the province of Warſovia. E. long. 20. 35. N. lat. 52. 0.

BLOOD, a red liquor circulating through the veſſels of the human body and the bodies of the larger animals, which appears immediately and eſſentially neceſſary to the preſervation of life.

Although the fluid which circulates through the veſſels of all animals is not of a red colour, yet it is certain that the functions of animal life cannot be performed without the circulation of ſomething equivalent to blood. The common appearance of the blood when drawn from a vein in the human body is well known. It firſt ſeems an homogeneous red liquor; then it conſolidates into one uniform maſs; in a little time, a yellowiſh watery liquor begins to ſeparate from it, which is more or leſs in quantity according to the ſtate in which the blood happens to be; the red maſs, in the mean time, contracts greatly in its dimenſions, and increaſes in ſolidity. But this increaſe of ſolidity is likewiſe proportional to the ſtate of the blood at the time: in ſtrong people, if attacked with a violent inflammatory diſeaſe, the ſolid part is exceedingly tough, inſomuch that Dr. Huxham ſays he has ſometimes found it almoſt like a piece of fleſh itſelf; whereas, in other diſeaſes, the ſolid part is very ſoft and tender, breaking in pieces with the ſlighteſt touch. The ſpontaneous ſeparation of the blood into craſſamentum, ſerum, and coagulable lymph, has been already taken notice of under ANATOMY.

In Dr. Lewis's notes on Newman's Chemiſtry we have the following account of the blood, and the parts into which it may be reſolved. "Recent blood is equally fluid, and in taſte ſomewhat ſaline. Viewed by a microſcope, it appears compoſed of numerous red globules ſwimming in a tranſparent fluid. On ſtanding for a little time, it ſeparates into a thick craſſamentum and fluid ſerum. By agitation, it continues fluid: a conſiſtent polypous matter adheres to the ſtirrer, which, by repeated ablution with water, becomes white. Received from the vein in warm water, it depoſits a quantity of tranſparent filamentous matter, the red portion continuing diſſolved in the water. On evaporating the fluid, a red powdery ſubſtance is left. It congeals by froſt, and becomes fluid again by warmth; after liquefaction, it quickly putrefies. Fluid and florid blood expoſed to a temperate air, putrefies ſooner than ſuch as is more denſe. Inſpiſſated to dryneſs, it leaves a dark-coloured maſs, amounting, at a medium, to about one-fourth of the weight of the blood, of a bitter ſaline taſte, eaſily inflammable, burning with a blueiſh flame. The exſiccated blood is not ſoluble in acid or alkaline liquors; but gives ſome tincture to water and to ſpirit of wine, and is more powerfully acted upon by dulcified ſpirit of nitre. Recent blood is coagulated by the mineral acids, and by moſt of the combinations of them with earthy and metallic bodies. With vegetable acids, and with ſolutions of neutral ſalts, it mingles equably without coagulation. Alkalis, both fixed and volatile, render it more fluid, and preſerve it from coagulating.

"The ſerum of blood is more ſaline than the craſſamentum, and does not ſo ſpeedily putrefy. It freezes ſomewhat more difficultly than pure water; and its aqueous part evaporates, by a gentle warmth, ſomewhat more readily, leaving about one-twelfth of the weight of the ſerum of a ſolid yellowiſh pellucid matter. Expoſed to heat a little greater than that of the human body, it coagulates into a ſolid maſs, without any conſiderable evaporation. Both this coagulum and the inſpiſſated ſerum are readily inflammable in the fire, not diſſoluble in water, or in ſpirit of wine, in acid or in alkaline liquors."

But the texture of the blood diſcoverable by a microſcope, has engaged the attention of the learned much more than the chemical analyſis ever did. Lewenhoeck fancied he diſcovered, that the blood conſiſts of red globular particles ſwimming in a quantity of tranſparent liquor, each globule compoſed of ſix ſmaller ones packed together. While the ſix continued to adhere, their colour was red; but when ſeparated, they became yellow, and thus formed what is called the *ſerum*. He even imagined he had diſcovered that each of the ſerous globules conſiſted of ſix ſmaller ones, and that theſe when broken down conſtituted ſome more ſubtile and penetrating liquor than the ſerum, &c. and this was for a long time received as an undoubted fact; and many theories were built upon it, and elaborate calculations made. Father de Torre alſo, with microſcopes which he alleged were capable of magnifying to an incredible degree, found that the red particles of the blood were of an annular figure, with a perforation in the middle; and that the ring itſelf was formed of ſeveral joints. Of this opinion indeed is Dr. Duncan of Edinburgh. Mr. Hewſon however has ſince contended, that "the red particles of the blood, improperly called *globules*, are *flat* in all animals, and of very different ſizes in different animals. In man they are ſmall, as flat as a ſhilling, and appear to have a dark ſpot in the middle. In order to ſee them diſtinctly (ſays Mr. Hewſon), I dilute the blood with freſh ſerum. My predeceſſors, not having thought of this, could not ſee them diſtinctly. And Lewenhoeck in particular, imagining a round figure fitteſt for motion, concluded they muſt be round in the human body; though he and others allowed that in frogs, &c. where they viewed them diſtinctly from the blood being thinner, they were flat. Now I prove that they are flat in all animals. In the human blood, where theſe particles are ſmall, it is difficult to determine what that black ſpot is which appears in the centre of each. Some have concluded that it was a perforation: but in a frog, where it is ſix times as large as in a man, it is eaſy to ſhow that it is not a perforation, but on the contrary is a little ſolid, which is contained in the middle of a veſicle. Inſtead, therefore, of calling this part of the blood red *globules*, I ſhould call it red *veſicles*; for each particle is a flat veſicle, with a little ſolid ſphere in its centre.

"I find that the blood of all animals contains veſicles of this ſort. In human blood there are millions of them; and they give it the red colour. But in inſects they are white, and leſs numerous in proportion than in man and quadrupeds. As they are flat in all animals, I ſuſpect that ſhape is a circumſtance of importance, but can be altered by a mixture with different fluids. And I find that it is by a determinate quantity of neutral ſalt contained in the ſerum, that this fluid is adapted to preſerving theſe veſicles in their flat ſhape: for, if they be mixed with water, they become round, and diſſolve perfectly; but add a little of any neutral ſalt to the water, and they remain in it, without any alteration in their ſhape, and without diſſolving.

"Now, when it is conſidered, that the blood of all animals is filled with theſe particles, we muſt believe that they ſerve ſome very important purpoſe in the animal œconomy; and ſince they are ſo complicated in their ſtructure, it is improbable they ſhould be made by mechanical agitation in the lungs or blood-veſſels, as has been ſuſpected, but probably have ſome organs ſet apart for their formation. This I ſhall endeavour to prove, when I have explained their ſtructure a little more particularly, and mentioned the manner in which I exhibit it. I take the blood of a toad or frog, in which they are very large; I mix it with the ſerum of human blood to dilute it; I find them appear all flat; ſo they do in the blood-veſſels of this animal, as I have diſtinctly ſeen in the web between its toes, whilſt the animal was alive and fixed in the microſcope. Their appearance in theſe animals is not unlike ſlices of cucumber. I next mix a little of the blood with water, which immediately makes them all round, and then begins to diſſolve them whilſt they are round. I incline the ſtage of the microſcope, ſo as to make them roll down it; and then I can diſtinctly ſee the ſolid in the middle fall from ſide to ſide like a pea in a bladder. A neutral ſalt added to them at this time brings them back to their flat ſhape: but if the ſalt be not added, the water gradually diſſolves away the veſicle; and then the little ſphere is left naked. Such is the compoſition of theſe particles. I have

exhibited theſe experiments to a conſiderable number of my acquaintance, who all agree in their being ſatisfactory. The microſcope I uſe is a ſingle lens, and therefore as little likely to deceive us as a pair of ſpectacles, which, as is allowed by all who uſe them, do not diſfigure objects, but only repreſent them larger.

"From farther experiments, I am convinced, that the uſe of the thymus and lymphatic glands is to make the middle ſolid pieces: and I can prove it in as ſatisfactory a manner as you can do the uſe of any viſcus in the human body; that is, by opening theſe glands, and examining the fluid contained in their cells, which I find to be full of theſe little ſolids. I moreover find, that the lymphatic veſſels take them up from thoſe glands, and convey them into the blood-veſſels which carry them to the ſpleen, in whoſe cells they have the veſicles laid over them; ſo that the thymus and lymphatic glands make the central particles, and the ſpleen makes the veſicles that ſurround them. That this is the uſe of the ſpleen appears from examining the lymph which is returned from its lymphatic veſſels; for that lymph, contrary to what is obſerved in other parts of the body, is extremely red.

"But beſides having theſe glands ſet apart for making the red veſicles of the blood, I find that they are alſo made in the lymphatic veſſels in different parts of the body, whoſe coats have blood-veſſels properly conſtructed for this ſecretion. So that the thymus and lymphatic glands are no more than appendages of the lymphatic ſyſtem, for making the middle particles; and the ſpleen an appendage to the lymphatic veſſels, for making the veſicles which contain theſe middle particles.

"I conjecture that it is the coagulable lymph which is converted into this red part of the blood, from a curious fact that has long been known; namely, that the blood in the ſplenic vein does not coagulate when expoſed to the air, as the blood of other veins does; ſo that it ſeems to be robbed of its coagulable lymph in paſſing through the ſpleen.

"It is very remarkable, that the ſpleen can be cut out of an animal, and the animal do well without it. I made the experiment on a dog, and kept him a year and a half without obſerving his health to be in the leaſt impaired. From this ſome have concluded the ſpleen to be an uſeleſs weight; which is abſurd, when we conſider that all animals with red blood have it. Therefore it is more conſiſtent with what we know of the animal œconomy, to conclude, that ſince an animal can do well without it, there is probably ſome part of the body that can ſupply its place.

"Inſects have veſicles conſtructed in a ſimilar way to ours, but differing in colour. But inſects have neither ſpleen, thymus, nor lymphatic glands; and therefore in them probably theſe veſicles are entirely fabricated in the lymphatic veſſels. But to us, and other of the more perfect animals, beſides the lymphatic veſſels, nature has given thoſe glands, that a proper quantity of thoſe important veſicles might be the better ſecured to us; juſt as ſhe has given us two ears, the better to ſecure us hearing through life, though we can hear perfectly well with one."

On this hypotheſis we ſhall only remark, that if the red globules are prepared in the manner above mentioned, and the lymphatic veſſels are excretories of thoſe glands where the red particles are formed; then if there is any veſſel where all theſe excretories unite, in that veſſel the lymph ought to appear very red, on account of the accumulated quantity of red globules brought thither from all parts of the body. But no ſuch redneſs ſeems ever to have been taken notice of by any anatomiſt; and this forms an objection perhaps, which will not be eaſily removed.

Many other hypotheſes have been invented concerning the formation of the blood, and various opinions delivered concerning its red colour. In a lecture delivered at Newcaſtle in 1773, by Dr. Wilſon of that place, he aſſerts "that it is ſelf-evidently the office of the veins to elaborate the fluids into that form and compoſition which we know by the name of *red blood*." The ſelf-evidence here, however, is by no means apparent to us; nor doth he at all point it out in an intelligible manner. Dr. Cullen, in his phyſiological part of The Inſtitutions of Medicine, acknowledges that we know but little of the formation of any of the animal fluids; and concerning the microſcopical obſervations, &c. on the blood, gives his opinion in the following words, § cclix. "The red globules have been conſidered as an oily matter, and from thence their diſtinct and globular appearance has been accounted for: but there is no direct proof of their oily nature; and their ready union with, and diffuſibility in, water, renders it very improbable. As being microſcopical objects only, they have been repreſented by different perſons very differently. Some have thought them ſpherical bodies, but diviſible into ſix parts, each of which in their ſeparate ſtate were alſo ſpherical; but other perſons have not obſerved them to be thus diviſible. To many obſervers they have appeared as perfectly ſpherical; while others judge them to be oblate ſpheroids, or lenticular. To ſome they have appeared as annular, and to others as containing a hollow veſicle. All this, with ſeveral other circumſtances relating to them, very variouſly repreſented, ſhow ſome uncertainty in microſcopical obſervations; and it leaves me, who am not converſant in ſuch obſervations, altogether uncertain with reſpect to the preciſe nature of this part of the blood. The chemical hiſtory of it is equally precarious; and therefore what has been hitherto ſaid of the production and changes happening to theſe red globules, we chooſe to leave untouched. We ſuppoſe that the red globules, when viewed ſingly, have very little colour; and that it is only when a certain number of them are laid upon one another, that the colour appears of a bright red: but this alſo has its limits; ſo that when the number of globules laid on one another is conſiderable, the colour becomes of a darker red. Upon this ſuppoſition, the colour of the maſs of blood will be brighter or darker as the colouring part is more or leſs diffuſed among the other parts of the maſs; and we think this appears to be truly the caſe from every circumſtance that attends the changes which have been at any time obſerved in the colour of the blood."

Concerning the uncertainty of microſcopical, as well as chemical experiments, we ſhall not diſpute; though the concluſion againſt them ſeems carried too far. But with regard to the colour of the blood, we apprehend it has been known, almoſt, if not altogether, ſince the diſcovery of the circulation, that the florid or dark colour depends on the preſence or abſence of oxygene, and not upon any number of globules.—Thus the blood returning from the veins is of a dark colour. Though diluted with the freſh chyle from the ſubclavian vein, it continues of the ſame dark colour till it paſſes through the lungs, upon which it inſtantly aſſumes a very florid red; but it can never be proved that the globules in the pulmonary vein are at all leſs numerous than in the pulmonary artery.—That this change of colour may be effected by the air through membranes much thicker than we can ſuppoſe the veſſels of the lungs to be, has been demonſtrated by Dr. Prieſtley's experiments mentioned under the article DEPHLOGISTICATED *Air*; but whether the change is occaſioned by the mere ſeparation of phlogiſton from the blood, or by the abſorption of ſome other principle in its ſtead, is a queſtion to be ſpoken of under the article *Pneumatic* MEDICINE, the advantages of applying factitious airs to the lungs by a ſuitable apparatus, having of late been much inſiſted on by Dr. Beddoes and ſome other writers.

With regard to the uſes to which the blood is ſubſervient

in the animal œconomy, they are ſo various, and of ſuch an important nature, that ſome have not ſcrupled to affirm the blood to be actually poſſeſſed of a living principle, and that the life of the whole body is derived from it. This opinion it is ſaid was firſt hinted by the celebrated Harvey, but the hypotheſis more properly belongs to the late Mr. John Hunter, who ſupports his opinion by the following arguments: 1. The blood unites living parts, in ſome circumſtances, as certainly as the yet recent juices of the branch of one tree unite it with that of another. Were either of theſe fluids to be conſidered as extraneous or dead matters, he thinks they would act as ſtimuli, and no union would take place in the animal or vegetable kingdom. This argument, Mr. Hunter imagines, is ſtill farther eſtabliſhed by the following experiment. Having taken off the teſticle from a living cock, he introduced it into the belly of a living hen. Many weeks afterwards, upon injecting the liver of the hen, he injected the teſticle of the cock; which had come in contact with the liver and adhered to it. He alleges, that in the nature of things, there is not a more intimate connection between life and a ſolid, than between life and a fluid. For, although we are more accuſtomed to connect it with the one than the other, yet the only real difference which can be ſhown between a ſolid and a fluid is, that the particles of the one are leſs moveable among themſelves than thoſe of the other. Beſides, we often ſee the ſame body fluid in one caſe and ſolid in another. 2. The blood becomes vaſcular like other living parts. Mr. Hunter affirms, that, after amputations, the coagula in the extremities of arteries may be injected by injecting theſe arteries; and he has a preparation in which he thinks he can demonſtrate veſſels riſing from the centre of what had been a coagulum of blood, and opening into the ſtream of the circulating blood. 3. Blood taken from the arm in the moſt intenſe cold which the human body can bear, raiſes the thermometer to the ſame height as blood taken in the moſt ſultry heat. This he conſiders as a ſtrong proof of the blood's being alive; as living bodies alone have the power of reſiſting great degrees both of heat and cold, and of maintaining in almoſt every ſituation, while in health, that temperature which we diſtinguiſh by the name of *animal heat*. 4. Blood is capable of being acted upon by a ſtimulus. In proof of this, he obſerves, that it coagulates from expoſure, as certainly as the cavities of the abdomen and thorax inflame from the ſame cauſe. The more it is alive, that is, the more the animal is in health, it coagulates the ſooner on expoſure; and the more it has loſt of its living principle, as in the caſe of violent inflammations, the leſs is it ſenſible to the ſtimulus produced from its being expoſed, and it coagulates the later. 5. The blood preſerves life in different parts of the body. When the nerves going to a part are tied or cut, the part becomes paralytic, and loſes all power of motion; but it does not mortify. If the artery be cut, the part dies, and mortification enſues. What keeps it alive in the firſt caſe? Mr. Hunter believes it is the living principle which alone can keep it alive; and he thinks that this phenomenon is inexplicable on any other ſuppoſition, than that life is ſupported by the blood. 6. Another argument he draws from the caſe of a fractured os-humeri he had occaſion to obſerve. A man was brought into St. George's hoſpital for a ſimple fracture of the os humeri, and died about a month after the accident. As the bones had not united, Mr. Hunter injected the arm after death. He found that the cavity between the extremities of the bones was filled up with blood which had coagulated. This blood was become vaſcular. In ſome places it was very much ſo. He does not maintain that all coagulated blood becomes vaſcular: and indeed the reaſon is obvious; for it is often thrown out and coagulated in parts where its becoming vaſcular could anſwer no end in the ſyſtem: as, for example, in the cavities of aneuriſmal ſacs. If it be ſuppoſed, that, in ſuch caſes as that juſt now mentioned, the veſſels are not formed in the coagulum, but come from the neighbouring arteries, he thinks it equally an argument that the blood is alive; for the ſubſtance into which veſſels ſhoot muſt be ſo. The very idea, that ſuch a quantity of dead matter as the whole maſs of blood, circulates in a living body, appears to him abſurd.

The ſyſtem which at preſent ſtands oppoſed to that of Mr. Hunter, conſiders the brain and nervous ſyſtem as the fountain of life; and that, ſo far from receiving its life from the blood, the nervous ſyſtem is capable of inſtantaneouſly changing the craſis of the blood, or any other animal fluid; and though the nervous ſyſtem cannot continue its actions for any length of time if the action of the blood-veſſels is ſuſpended, yet the heart and blood-veſſels cannot act for a ſingle moment without the influence of the nervous fluid. Hence, ſay they, it is plain we muſt ſuppoſe the nervous ſyſtem, and not the blood, to contain properly the life of the animal, and conſequently to be the principal vital organ. The ſecretion of the vital fluid from the blood by means of the brain, is, by the ſupporters of this hypotheſis, denied. They ſay, that any fluid ſecreted from the blood muſt be aqueous, inelaſtic, and inactive; whereas the nervous fluid is full of vigour, elaſtic, and volatile in the higheſt degree. The great neceſſity for the circulation of the blood through all parts of the body, notwithſtanding the preſence of the nervous fluid in the ſame parts, they ſay is, becauſe ſome degree of tenſion is neceſſary to be given to the fibres, in order to fit them for the influx of the nervous fluid; and this tenſion they receive from the repletion of the blood-veſſels, which are every where diſperſed along with the nerves.

To follow this diſpute through every argument that hath been, or that may be uſed by both parties, would prove tedious, and to us appears in a great meaſure unneceſſary, as the following ſhort conſiderations ſeem to decide the matter abſolutely againſt the patrons of the nervous ſyſtem. In the firſt place, then, if we can prove the life of the human body to have exiſted in, or to have been communicated from a fluid to the nervous ſyſtem, the analogical argument will be very ſtrongly in favour of the ſuppoſition that the caſe is ſo ſtill. Now, that the caſe once was ſo, is moſt evident; for the human body, as well as the body of every other living creature, in its firſt ſtate, is well known to be a gelatinous maſs, without muſcles, nerves, or blood-veſſels. Nevertheleſs, this gelatinous matter, even at that time, contained the nervous fluid. Of this there can be no doubt, becauſe the nerves were formed out of it, and had their power originally from it; and what is remarkable, the brain is obſerved to be that part of the animal which is firſt formed. Of this gelatinous fluid we can give no other account, than that it was the nutritious matter from which the whole body appears to be formed. At the original formation of man, and other animals, therefore, the nutritious matter was the ſubſtratum of the whole body, conſiſting of muſcles, nerves, blood-veſſels, &c. nay more, it was the immediate efficient cauſe of the nervous power itſelf. Why ſhould it not be ſo now as well as then? Again, in the formation of the embryo, we ſee a vital principle exiſting as it were at large, and forming to itſelf a kind of regulator to its own motions, or a habitation in which it chooſes to reſide, rather than to act at random in the fluid. This habitation, or regulator, was undoubtedly the nervous ſyſtem, and continues ſo to this moment; but at the ſame time, it is no leſs evident that a nutritious fluid was the immediate origin of theſe ſame nerves, and of that very nervous fluid. Now we know, that the fluid which in the womb nouriſhes the bodies of all embryo animals, is neceſſarily equivalent to the blood which nouriſhes the bodies of adult ones; and conſequently, as ſoon as

the blood became the only nutritious juice of the body, at that ſame time the vital or nervous fluid took up its reſidence there, and from the blood diffuſed itſelf along the nerves, where it was regulated exactly according to the model originally formed in the embryo. Perhaps it may be ſaid, that the vital power, when once it hath taken poſſeſſion of the human or any other body, requires no addition or ſupply, but continues there in the ſame quantity from firſt to laſt. If we ſuppoſe the nervous power to be immaterial, this will indeed be the caſe, and there is an end of reaſoning upon the ſubject; but if we call this power a volatile and elaſtic fluid, it is plain that there will be more occaſion for recruits to ſuch a power than to any other fluid of the body, as its volatility and elaſticity will promote its eſcape in great quantities through every part of the body. It may alſo be objected, that it is abſurd to ſuppoſe any fluid, or mechanical cauſe, capable of putting matter in ſuch a form as to direct its own motions in a particular way: but even of this we have a poſitive proof in the caſe of the electric fluid. For if any quantity of this matter has a tendency to go from one place to another where it meets with difficulty, through the air for inſtance, it will throw ſmall conducting ſubſtances before it, in order to facilitate its progreſs. Alſo, if a number of ſmall and light conducting ſubſtances are laid between two metallic bodies, ſo as to form a circle, for example; a ſhock of electricity will deſtroy that circle, and place the ſmall conducting ſubſtances nearer to a ſtraight line between the two metals, as if the fluid knew there was a ſhorter paſſage, and reſolved to take that, if it ſhould have occaſion to return. Laſtly, it is univerſally allowed, that the brain is a ſecretory organ, made up of an infinite number of ſmall glands, which have no other excretories than the medullary fibres and nerves. As a conſiderable quantity of blood is carried to the brain, and the minute arteries end in theſe ſmall glands, it follows, that the fluid, whatever it is, muſt come from the blood. Now, there is no gland whatever, in the human, or any other body, but will diſcharge the fluid it is appointed to ſecrete, in very conſiderable quantity, if its excretory is cut. Upon the cutting of a nerve, therefore, the fluid ſecreted by the brain ought to be diſcharged; but no ſuch diſcharge is viſible. A ſmall quantity of glairy matter is indeed diſcharged from the large nerves; but this can be no other than the nutritious juice neceſſary for their ſupport. This makes it plain, even to demonſtration, that the fluid ſecreted in the brain is *inviſible* in its nature; and as we know the nervous fluid hath its reſidence in the brain, it is very probable, to uſe no ſtronger expreſſion, that it is the peculiar province of the brain to ſecrete this fluid from the blood, and conſequently that the blood originally contains the vital principle.

After it is allowed that the blood contains the vital principle, it becomes another queſtion not very eaſily ſolved, Whence is this vital principle derived?—For this we can only diſcover two ſources; namely, the chyle or aliment from which the blood is prepared, and reſpiration. The latter has been commonly held as the principal ſource of the vital principle; and, for a long time, it was generally thought that there was a kind of vivifying ſpirit in the air, which being abſorbed by the blood at each inſpiration, communicated to that fluid the quality neceſſary for preſerving animal life. As a proof of this it was urged, that life cannot be ſupported without reſpiration, and that air which hath been often breathed ceaſes to be capable of ſupporting life; becauſe when once it has been totally deprived of its vivifying ſpirit, it can communicate none to the blood in any ſubſequent reſpirations.—This doctrine, however, has been denied, and generally thought to be exploded by modern diſcoveries. Dr. Hales indeed brings ſeveral apparently deciſive experiments againſt it. They will not, however, bear the teſt of a nice examination; and the more eſpecially when thoſe experiments of Dr. Prieſtley which apply to this ſubject are taken into the account. As this compariſon, however, would lead us into too wide a field of diſcuſſion, we refer our readers to the writings of both thoſe philoſophers, and proceed to give ſome account of the means by which the circulation of the blood is carried on.

From the time of Harvey till very lately, this was ſuppoſed to depend chiefly on the muſcular power of the heart and arteries, which by ſome phyſiologiſts have been thought to be prodigiouſly great. Accordingly many calculations, requiring no ſmall degree of mathematical knowledge to underſtand them, have been made of the forces requiſite to perform this circulation. Other phyſiologiſts, however, have thought proper to take in ſeveral auxiliary helps, as the motion of the muſcles, reſpiration, &c. and Dr. Hales's experiments render it evident, that reſpiration has a conſiderable influence. It cannot, however, be the ſole cauſe, ſeeing the circulation is carried on in animals which do not reſpire.—In 1773, Dr. Wilſon, in the lecture already quoted, ſuggeſted a new principle of motion, which we believe was never uſed before to account for the circulation of animal fluids. It is ſhortly this: "As the fluids of the human body do all of them ſuffer a continual waſte, and conſequently require a conſtant ſupply in proportion, we muſt look upon their going out of the body to be the end of their motion, and their entering into the body to be the beginning of it; and hence we are to look for the origin of all the motion of the fluids in that part of the ſyſtem where the new ſupplies are taken in. This is the primæ viæ, where the lacteals abſorb a fluid from the digeſted aliment, and convey it into the blood. The power by which this is accompliſhed, is neceſſarily independent of the heart, as having not the leaſt connection with it. It has been ſaid to be the ſame with that which cauſes fluids to riſe in capillary tubes; but though very probably the powers in both caſes may be the ſame, there is this remarkable difference between them, that in capillary tubes the fluids only riſe to a certain height, and will not riſe at all unleſs the tubes are empty. In the lacteals they riſe in veſſels already full, and continue to do ſo. Neither is the force whereby this abſorption is performed to be accounted little; ſeeing the ſupply by the chyle muſt conſtantly be equal to the waſte which is continually taking place in the fluids already contained in the veſſels. We ſee alſo, with what force an abſorption of this kind ſometimes takes place in other caſes; thus ropes will abſorb water with ſuch ſtrength as to raiſe immenſe weights faſtened to them, and which no mechanical injection of water into ſmall tubes could poſſibly accompliſh. What is already ſaid of the lacteals applies alſo to the lymphatics; and from thence we are almoſt tempted to conclude, that the caſe is the ſame with the ſanguiferous veins alſo; that though there may be a continuation of ſome arteries into the veins correſponding with them, yet that for the moſt part theſe veſſels extravaſate the blood into ſmall cavities, which is then taken up by the abſorbent power of the veins, and returned to the heart.

"If, however, the veſſels continued abſolutely full, it would be impoſſible that any motion could be carried on in them; and to continue and regulate the circulation, the heart with its cavities is provided. Let us ſuppoſe, that by the above-mentioned power the veins are all full, and the auricles or chambers into which the veins empty themſelves are full alſo: where is the collected ſtream in the veins to go next? There is no room for more in the auricle. What muſt be done? The auricle contracts and empties itſelf. The conſequence is a ſudden vacuum equal to what the auricle could contain; the turgid veins, urged by the abſorbing power above mentioned, ruſh their contents into the auricle to fill up the vacuum again, and

all behind moving in the venous direction advances forward with ſo much force, that the veins near the heart ſuſtain a pulſation from the regurgitation of this impetuous ſtream, when the auricle ſhuts upon it to empty itſelf. In ſhort, the full auricle occupies a determinate quantity of ſpace in the breaſt: when it is emptied, there is a non-reſiſting vacuum of ſo much ſpace as was full before, and thither there is a mechanical niſus from the remoteſt filament of a vein over the whole body, which becomes conſpicuous in the torrent that ruſhes every other moment from the mouth of the vena cava into this vacuum."

This is a ſhort abſtract of Dr. Wilſon's new theory of the circulation. According to him, this abſorbing power of the veins is the principal agent, while the heart and arteries do no more than empty themſelves of the blood with which they are filled by the veins. Even this cauſe, however, he ſays, would not be ſufficient to carry on the circulation for a ſingle moment, without the preſence of another which he calls *life*, and does not conſider as abſolutely unmechanical, though we cannot reduce it either to mechanical rules or ideas. But as we apprehend all ſpeculations concerning ſuch cauſes muſt be arbitrary and without foundation, we forbear to give any account of the Doctor's opinions on this ſubject.

It hath been a general opinion, that blood, as it exiſts in the bodies of animals, contains a conſiderable quantity of common air; and indeed it is certain, that blood, after it has been drawn from the veins of any animal, and afterwards placed under the receiver of an air-pump, yields a very conſiderable quantity of air upon exhauſting the receiver: but if a portion of any blood-veſſel is tied up ſo as to prevent the eſcape of its contents, and then cut out of the body and placed under a receiver, it will not ſwell, or ſhow the leaſt ſign of its containing any quantity of air whatever. Of this and every other part of the ſubject a very comprehenſive view is taken in Mr. Hunter's work, publiſhed ſince his death, intitled "A Treatiſe on Inflammation," &c.

Blood was formerly held in great eſteem as a medicine for ſome particular diſeaſes. Baths of the blood of infants have been recommended as an infallible remedy for the elephantiaſis, &c.; and the blood of goats and ſome other animals was uſed by the Galeniſts, and is recommended even by Dr. Mead in pleuriſies: but the firſt abominable medicine, as well as the other, is now deſervedly exploded. The principal uſe of blood in the arts is for making Pruſſian blue, or ſometimes for clarifying certain liquors; it is alſo recommended in agriculture as an excellent manure for fruit-trees. A mixture of blood with lime makes an exceedingly ſtrong cement; and hence it is of uſe in the preparation of ſome chemical lutes, in making floors, &c.—As a food, it has been diſputed whether blood really affords any nouriſhment or not. The beſt judges now, however, are generally agreed, that it is very nutritious; and though out of the body, like the white of an egg, it is very inſoluble, yet, like that too, *in* the body it is commonly of eaſy digeſtion. It is, however, highly alkaleſcent in hot climates; on which account the prohibition of it to the Iſraelites was very proper. Even in this country, when blood was uſed as food in great quantity, the ſcurvy was more frequent than at other times; but to a moderate uſe of it here no ſuch objection takes place.—In ſome countries we are told, that the barbarians were accuſtomed to intoxicate themſelves by drinking the warm blood of animals; and as it has been ſhown that this fluid is the immediate reſervoir of the vital principle, it ſeems by no means improbable that it may be poſſeſſed of an inebriating quality. Some expreſſions in Scripture ſeem to countenance this hypotheſis.

Religious uſes of Blood. Among the ancients blood was uſed for the ſealing and ratifying covenants and alliances, which was done by the contracting parties drinking a little of each other's blood; and for appeaſing the manes of the dead, in order to which, blood was offered on their tombs as part of the funeral ceremony.—The blood of victims was anciently the portion of the gods; and accordingly was poured or ſprinkled on the altars in oblation to them.—The prieſts made another uſe of blood, *viz*, for divination: the ſtreaming of blood from the earth, fire, and the like, being held a prodigy or omen of evil.—The Roman Catholic prieſts were not unacquainted with the uſe of blood in miracles: they had their fluxes of blood from images, ready to ſerve a turn; witneſs that ſaid to have ſtreamed from the ſtatue of Minerva at Modena, before the battle at that place. But we know not whether in this their ſucceſſors have not gone beyond them. How often we read in eccleſiaſtical writers, of Madonas, crucifixes, and wafers, bleeding? At leaſt the liquefaction of the blood of St. Januarius at Naples, repeated annually for ſo many ages, ſeems to tranſcend by far all the frauds of the Grecian or Roman prieſthood. But the chemiſts at laſt got into the ſecret: and we find M. Neumann at Berlin to have performed the miracle of the liquefaction of dried blood, with all the circumſtances of the Neapolitan experiment.

Avenger of Blood, among the Jews, was the next of kin to the perſon murdered, who was entitled to purſue the murderer. Eccleſiaſtical judges retire, when judgment is to be given in *caſes of blood*, by reaſon the church is ſuppoſed to abhor blood: it condemns no perſon to death; and its members become irregular, or diſabled from their functions, by the effuſion of blood.

Field of Blood, in Syriac *aceldama*, was a field purchaſed by the Jews with the thirty pieces of ſilver which had been given to Judas for betraying his Maſter, and which he had reſtored. It ſtill ſerves for a burial-ground, in which all pilgrims who die in their pilgrimage at Jeruſalem are interred.

Blood-*Hound*, in zoology, the *canis ſagax* of Linnæus (ſee Canis), *le chien courant* of Buffon, the *Sleuthounde* of the Scots: the hound or dog, with long, ſmooth, and pendulous ears.—It was a dog of great uſe, and formerly in great eſteem: its employ was to recover any game that had eſcaped wounded from the hunter, or been killed and ſtolen out of the foreſt. It was remarkable for the acuteneſs of its ſmell, tracing the loſt beaſt by the blood it had ſpilt; from whence the name is derived. It is ſaid this ſpecies could, with the utmoſt certainty, diſcover a murderer by following his footſteps, let the diſtance of his flight be ever ſo great. Theſe dogs were likewiſe uſed by Wallace and Bruce during the civil wars. The poetical hiſtorians of the two heroes frequently relate very curious paſſages on this ſubject, of the ſervice theſe dogs were of to their maſters, and the eſcapes they had from thoſe of the enemy. The blood-hound was in great requeſt on the confines of England and Scotland; where the borderers were continually preying on the herds and flocks of their neighbours. The true blood-hound was large, ſtrong, muſcular, broad breaſted, of a ſtern countenance, of a deep tan-colour, and generally marked with a black ſpot above each eye.

Blood-*Shotten*, a term chiefly uſed in ſpeaking of the eye, when it appears red from inflammation. See Ophthalmia.

Blood *Spavin*. See Farriery.

Spitting of Blood, or *Hæmoptöe*. See Medicine.

Whole and Half Blood; a kinſman of the *whole blood* is he that is derived from the ſame couple of anceſtors; whereas a perſon of *half blood* deſcends from either of them ſingly, by a ſecond marriage.

Blood *of Chriſt*, the name of a military order inſtituted at Mantua in 1608. The number of knights was reſtricted to

...besides the grand master. Their device was, *Domine, probasti me*: or, *Nihil hoc triste, recepti*: "Lord, thou hast proved me:" or, "Fortified by this, no evil can prevail."

Precious Blood, a denomination given to a reformed congregation of Benedictine nuns at Paris, first established under that name in 1661.

Dragon's Blood. See DRAGON.

Dutch Blue. See HEMATITES.

Blood-Heat. See ANATOMY, page 195.

Blood-Wite, in ancient law writers, [*Saxon*] *blod*, and a compound amercement paid as a compolition for the fhedding or drawing of blood. The word is alfo written *Wlodwite*, *Bloodwita*, *Bludwita*, *Bloodwit*, *Bludwit*, *Bludwyt*, and *Bludwyte*. It is formed from the ancient Saxon *blod*, "blood," and *wite* or *wita*, "a fine or penalty." The word alfo denotes an exemption from this penalty granted by the king to certain perfons and communities as a fpecial favour. King Henry II. granted to all tenants within the honour of Wallingford—*Ut quieti fint de Hidagio et Bludwite et Frodertie*.

Blood-Wort, in botany. See RUBIA.

BLOOD (Thomas), generally known by the appellation of *Colonel Blood*, was a difbanded officer of Oliver Cromwell's, famous for his daring crimes and his good fortune. He was firft diftinguifhed by engaging in a confpiracy to furprife the caftle of Dublin: which was defeated by the vigilance of the Duke of Ormond: and fome of his accomplices were executed. Efcaping to England, he meditated revenge againft Ormond: and actually feized him one night in his coach in St. James's-ftreet, where he might have finifhed his purpofe if he had not ftudied refinements in his vengeance. He bound him on horfeback behind one of his affociates, refolving to hang him at Tyburn, with a paper pinned to his breaft: but when they got into the fields, the duke, in his efforts for liberty, threw himfelf and the affaffin, to whom he was faftened, to the ground: and while they were ftruggling in the mire, he was refcued by his fervants; but the authors of this attempt were not then difcovered. A little after, in 1671, Blood formed a defign of carrying off the crown and regalia from the tower: a defign, to which he was prompted, as well by the furprifing boldnefs of the enterprize, as by the views of profit. He was very near fucceeding. He had bound and wounded Edwards the keeper of the jewel-office, and had got out of the tower with his prey: but was overtaken and feized, with fome of his affociates. One of them was known to have been concerned in the attempt upon Ormond: and Blood was immediately concluded to be the ringleader. When queftioned, he frankly avowed the enterprize: but refufed to difcover his accomplices. "The fear of death (he faid) fhould never induce him either to deny a guilt or betray a friend." All thefe extraordinary circumftances made him the general fubject of converfation; and the king was moved with an idle curiofity to fee and fpeak with a perfon fo noted for his courage and his crimes. Blood might now efteem himfelf fecure of pardon; and he wanted not addrefs to improve the opportunity. He told Charles, that he had been engaged with others, in a defign to kill him with a carabine above Batterfea, where his majefty often went to bathe: that the caufe of this refolution was the fevere fyftem eftablifhed over the confciences of the godly, in reftraining the liberty of their religious aflemblies: that when he had taken his ftand among the reeds, full of thefe bloody refolutions, he found his heart checked with an awe of majefty; and he not only relented himfelf, but diverted his affociates from their purpofe: that he had long ago brought himfelf to an entire indifference about life, which he now gave for loft; yet he could not forbear warning the king of the danger which might attend his execution: that his affociates had bound themfelves by the ftricteft oaths to revenge the death of any of their confederacy: and that no precaution nor power could fecure any one from the effects of their defperate refolutions. Whether thefe confiderations excited fear or admiration in the king, they confirmed his refolution of granting a pardon to Blood: and what is yet more extraordinary, Charles carried his kindnefs fo far as to grant him an eftate of £. 500 a-year. He alfo fhowed him great countenance; and while old Edwards, who had been wounded, in defending the crown and regalia, was neglected, this man, who deferved only to be ftared at and detefted as a monfter, became a kind of favourite.—Blood enjoyed his penfion about ten years, till being charged with fixing an imputation of a fcandalous nature on the Duke of Buckingham, he was thrown into prifon, where he died Auguft 24, 1680.

BLOODY-Flux, or Dyfentery. See MEDICINE.

Bloody-Hand, is when a trefpaffer is apprehended in a foreft with his hands or other parts bloody: which is a circumftance in proof of his having killed the deer, though he be not found chafing or hunting them.

Bloody-Rain. See RAIN.

Bloody-Sweat. Many inftances of this are recorded, in which it has been owing to bodily diforder, or extreme mental agitation and agony. See particularly Ariftotle's Hift. Animal. lib. iii. cap. 19. apud Oper. tom. i. Thuanus Hift. Temp. &c. lib. ii. apud Oper. tom. i. Melanges d'Hiftoire et de Literature &c. par M. V. Marville. tom. iii. p. 119. Acta Phyfico-Med. Norimbergæ, vol. i. p. 81. and vol. iii. p. 426.

Bloody-Urine. See MEDICINE.

BLOOM, a mafs of iron after having undergone the firft hammering called *fhingling*. It has yet to undergo many hammerings before it become iron fit for the fmith's ufe, and be firft made what they call the *anvil*. See ANCONY.

BLOOT (Peter), a Flemifh painter, whofe works are not frequently feen in thefe kingdoms: nor are they eafily purchafed in Holland, being carefully preferved in private collections, and very highly efteemed. The fubjects he chofe to paint were always taken from the loweft life; fuch as boors drinking, feafting, dancing, or quarrelling; fhepherds piping, and fometimes the marriages of villagers. He was a faithful and indeed too fervile an imitator of nature; never departing from the actions, attitudes, or draperies of his models. He fhowed a good knowledge of the chiaro-fcuro, and perfpective; he had a delicate manner of pencilling, and his colouring was mellow: but he had no idea of elegance: yet his pictures had in many refpects great merit, and his defects feem rather imputable to the tafte of his country than to his own genius; fome of his works being, for the lightnefs of the touch, the neatnefs of handling, and tranfparence of colour, equal to the beft of his time. He died in 1667.

BLOSSOM, in a general fenfe, denotes the flower of any plant. See the article FLOWER.

BLOSSOM, in a more proper fenfe, is reftrained to the flowers of trees, which they put forth in the fpring as the forerunners of their fruit, otherwife called their *bloom*. The office of the bloffom is partly to protect and partly to draw nourifhment to, the embryo, fruit, or feed.

BLOSSOM, or *Peach-coloured*, in the manege, a term applied to a horfe that has his hair white, but intermixed all over with forrel and bay hairs. Such horfes are fo infenfible and hard both in the mouth and flanks, that they are fcarce of any value; befides which they are apt to turn blind.

BLOSSOMING of PLANTS, the act of blowing, or putting forth flowers or bloffoms, called alfo *flowering*. The bloffoming of the Glaftonbury thorn piouſly on Chriſtmas-day morning, is a vulgar error; owing to this, that the plant, befides its ufual bloffoming in the fpring, fometimes puts forth a few white

tranſient bloſſoms in the middle of winter. For the bloſſoming of the roſe of Jericho on the ſame day, as it is commonly held in England, or in the time of midnight maſs, as it is held in France, is ſomewhat more than an error, being really a fraud on one ſide and a ſuperſtition on the other. This roſe, whoſe leaves are only cloſed and ſhrivelled up in winter, will, at any time, upon ſetting its pedicle in water, expand and bloſſom a-new; becauſe the pedicle being ſpongy imbibes the fluid apace, and thus fills and ſwells out the ſhrivelled leaves: which property ſome monks have turned to good account.

BLOTELING or Blootling (Abraham), an engraver who flouriſhed about the year 1672. He was a native of Amſterdam, and deſigned as well as engraved. From the ſtyle of his etchings, which have great merit, he is ſuppoſed to have frequented the ſchool of the Viſſchers. He came into England about the year 1672 or 1673, at the time the French invaded Holland; but he did not reſide here long. He not only etched, but alſo ſcraped ſeveral mezzotintos, which were much eſteemed. Vertue informs us, that while he was in England, he received 30 guineas for an etching of the duke of Norfolk. From hence he returned to Amſterdam, where, in all probability, he died. In the year 1685 he publiſhed at Amſterdam the *gems* of Leonardo Auguſtino, and etched the plates himſelf.

BLOUNT (Sir Thomas Pope), an eminent Engliſh writer, born at Upper Holloway in Middleſex, Sept. 12, 1649. Charles II. conferred upon him the degree of a baronet in 1670. He was a man of great learning, and well verſed in the beſt writers; of which he gave a proof in his famous work, "*Cenſura celebriorum authorum*," &c. He wrote alſo a work on poetry, "*De re Poetica*, or *Remarks upon Poetry*; with characters and cenſures of the moſt conſiderable poets, whether ancient or modern, extracted out of the beſt and choiceſt critics." He died in 1697.

Blount (Charles), brother of the preceding, and an eminent writer alſo, was born April 27, 1654; died Auguſt 1693.

BLOW (Dr. John), a famous muſician and compoſer, was a native of North Collingham in the county of Nottingham; and was one of the firſt ſet of chapel boys after the Reſtoration, being bred up under Captain Henry Cook. He was alſo a pupil of Hingeſton, and after that of Dr. Chriſtopher Gibbons. Upon the deceaſe of Purcell in 1695, he became organiſt of Weſtminſter-Abbey, and in the year 1699 compoſer to his majeſty. Dr. Blow was a compoſer of anthems while a chapel-boy, and on the ſcore of his merit was diſtinguiſhed by Charles II. He ſet to muſic an ode for St. Cecilia's Day, in 1684, the words by Mr. Oldham, publiſhed together with one of Purcell. He alſo publiſhed a collection of leſſons for the harpſichord, and Mr. Dryden's ode on the death of Purcell. There are alſo extant of his compoſition ſundry hymns printed in the *Harmonia Sacra*, and a great number of catches in the latter editions of the *Muſical Companion*. This great muſician died in the year 1708, and lies buried in the north aile of Weſtminſter-Abbey.

Blow, in a general ſenſe, denotes a ſtroke given either with the hand, a weapon, or inſtrument. In fencing, blows differ from thruſts, as the former are given by ſtriking, the latter by puſhing.

Military Blow, *alapa militaris*, that given with a ſword on the neck or ſhoulder of a candidate for knighthood, in the ceremony of dubbing him. The cuſtom ſeems to have taken its riſe from the ancient ceremony of manumiſſion. In giving the blow, the prince uſed the formula *Eſto bonus miles*, "Be a valiant ſoldier;" upon which the party roſe a complete knight, and qualified to bear arms in his own right.

Blow, in law. See Battery.

Fly-Blows, the ova of flies depoſited on fleſh, or other ſubſtances proper for hatching them.

Blow-*Pipe*, in chemiſtry and mineralogy, an inſtrument by which the blaſt of the breath may be directed upon the flame of a lamp or candle, in ſuch a manner as to vitrify any ſmall portion of mineral ſubſtance; and thus the proceſs of aſſaying in the dry way may be performed in a very ſhort time, where either want of inſtruments or opportunity prevents other methods from being uſed. See Plate 49.

Mr. Bergman obſerves, that this inſtrument is extremely uſeful to chemiſts. It was firſt introduced into the chemical apparatus about 50 years ago by the celebrated Swediſh metallargiſt Dr. Andreas Swab, and the inſtrument was afterwards greatly improved by Meſſrs. Cronſtedt, Rinman, &c. and Dr. Engeſtroem has an expreſs treatiſe upon the ſubject. Mr. Bergman propoſes that the tube ſhould be made of pure ſilver, to prevent it from being injured by ruſt; with the addition of a ſmall quantity of platina, to give a neceſſary hardneſs. It conſiſts of three parts, which may be occaſionally joined: an handle fig. 3. terminating in a truncated conical apex *a a*, which may by twiſting be ſo adapted to the aperture *b* fig. 4. as to ſhut it more cloſely than can be done by a ſcrew. It was an improvement of former chemiſts to have a hollow ball on the tube to collect the moiſture of the breath, which if ſuffered to accumulate would greatly diminiſh the intenſity of the flame. Inſtead of this Mr. Bergman made uſe of the little box fig. 4. formed of an elliptical plate, ſo bended through the centre that the oppoſite ſides become parallel, and are joined round by a plate equal in breadth to *c c*. Such a box collects the moiſture of the breath as well as the ſphere, and is beſides attended with the advantage of a compreſſed figure and ſmaller circumference. The aperture *b* is ſomewhat conical, and hollowed out of the ſolid piece; and has no margin turned inward, leſt the efflux of the fluid collected after long blowing, or the cleanſing of the internal parts, ſhould in any degree be prevented. The tube fig. 5. is very ſmall, and its ſhorter conical end *e e* exactly fitted to the aperture *f*, ſo that no air can eſcape except through the orifice *g*. Many of thoſe tubes ſhould be provided with orifices of different diameters, to be applied on different occaſions: the orifice *g* itſelf ought to be ſmooth and circular, otherwiſe the cone of flame hereafter to be mentioned will be divided. The bands *h h*, *i i*, prevent the conical apices *a a*, *e e* from being thruſt in too far, and alſo ſerve another purpoſe; for when theſe apices are, by repeated attrition, at laſt ſo much diminiſhed as to fall out ſpontaneouſly, by filing away a little of the bands they may again be made tight. The figures of the apparatus are about half the proper ſize.

The greateſt difficulty attending the uſe of the blow-pipe is the ſupplying it with a conſtant ſtream of air by means of the breath; for to ſuch as are unaccuſtomed to it, it appears a contradiction to think of blowing a ſtream of air out by the mouth, at the ſame time that we are drawing it in by the noſtrils to ſupply the neceſſary functions of reſpiration. An uninterrupted ſtream of air, however, is abſolutely neceſſary; and, "to ſucceed in this operation (ſays Mr. Bergman) without inconvenience, ſome labour and practice are neceſſary. The whole artifice, however, conſiſts in this, that while the air is inſpired through the noſtrils, that which is contained in the mouth be forced out through the tube by the compreſſion of the cheeks. To ſome perſons this is extremely difficult; but frequent trials will eſtabliſh the habit; ſo that a continual ſtream of air can be ſupplied for a quarter of an hour or more, without any other inconvenience than the laſſitude of the lips compreſſing the tube." A very great and obvious improvement, however, is ſtill ſuggeſted by Dr. Berkenhout, viz. to apply the tube to the wind-bag of a bagpipe; which being firſt

blown full, may eaſily be kept ſo; and being compreſſed by the arm, will produce a blaſt either ſtrong or weak as we have a mind. It will be a ſtill farther improvement to ſupply this bag by means of a ſmall bellows inſtead of blowing into it with the mouth: for thus the air will be more free from moiſture, and alſo fitter for the ſupport of flame, in other reſpects; as there is always a conſiderable quantity of fixed air produced at every reſpiration, which, according to that quantity, muſt unfit the air for keeping up the flame, and conſequently render the heat leſs intenſe.

With regard to the flame proper to be choſen, Mr. Bergman directs a ſlender candle, either of wax or tallow, fig. 6. with a cotton wick. The burned top muſt be cut at ſuch a length, that the remainder may be bent a little downwards. The orifice *g* is to be held above and near to this arch, and the air equably preſſed forth. The flame being forced to one ſide by the violence of the blaſt, exhibits two diſtinct figures. The internal figure *l*, *n*, is conical, blue, and well defined; and at the apex of this, *n*, the moſt violent heat is excited. The external flame *l*, *o*, is browniſh, vague, and indetermined; and being ſpoiled of its phlogiſton by the ſurrounding atmoſphere, occaſions much leſs heat at its extremity *o*, than the interior flame does.

All eminent chemiſts, and Dr. Black among the number, greatly recommend the uſe of the blow-pipe for chemical experiments on minerals. The conſtruction recommended by him differs not from that already deſcribed; only he ſays, that it may be made of tin, a cheaper material than ſilver; though formerly they were made of glaſs. The ſmall ſtream of air iſſuing from the extremity of the tube, being more intimately mixed with the flame, and agitated with it, occaſions a more complete conſumption of the vapour ariſing from the candle, and makes it produce much more heat; ſo that any ſmall body expoſed to the extremity of the flame is heated to a ſurpriſing degree. Several artiſts who work in metals, as the goldſmiths, &c. find this inſtrument uſeful in ſoldering ſmall pieces of metal together; and it is alſo uſed by the chemiſts in examining the effects of violent heat upon ſmall bodies. Some of the artiſts who uſe it much, ſupply the ſtream of air with a pair of bellows placed under the table, with a pipe riſing up through it, and to which the blow-pipe is fixed. In the examination of ores, the more ſimple inſtrument is preferred; and by a little practice it is eaſy to blow a continued ſtream of air with the mouth, by keeping it always full, and drawing in the air by the noſtrils, which anſwers the ſame purpoſe as the upper part of a double bellows. Mr. Cronſtedt uſed the blow-pipe much in making the experiments on which his ſyſtem of mineralogy is founded, blowing air through a bit of charcoal: and though the ſpecimens are ſmall, we can ſee the changes they undergo as well as if they were larger; and the eye can be aſſiſted by a magnifying glaſs.

The reaſon of the intenſe heat produced by the blow-pipe is, that in the ordinary way of burning, the air acts only upon the external ſurface of the fuel, ſo that it is not ſo completely inflamed.

The blow-pipe uſed by Mr. Cronſtedt is compoſed of two parts; and this for the facility both of making, carrying it along, and cleanſing it in the inſide when neceſſary. The two parts are repreſented ſeparate, and of half the ſize; the figure of the inſtrument, when theſe are put together, may be eaſily conceived. The globe *a* fig. 2. is hollow, and made on purpoſe to condenſe the vapours, which always happen to be in the blow-pipe when it has been uſed ſome time: if this globe was not there, the vapours would go directly with the wind out into the flame, and thereby cool the aſſay. The hole in the ſmall end *b*, through which the wind comes out, ought not to be larger than the ſize of the fineſt wire. This hole may now and then happen to be ſtopped up by ſomething coming into it, ſo as to hinder the force of the wind: one ought therefore to have a piece of the fineſt wire, to clear it with when required; and, in order to have this wire the better at hand, it may be faſtened round the blow-pipe, in ſuch a manner as is repreſented in fig. 1.: *c* is the wire faſtened round the blow-pipe, and afterwards drawn through a ſmall hole at *e*, made in the ring *f*, to keep it more ſteady. That blow-pipe is to be reckoned the beſt, through which can be formed the longeſt and moſt pointed flame from off a common-ſized candle. Theſe blow-pipes are commonly made of braſs or ſilver.

There are two different kinds of matter made uſe of for the ſupport of thoſe ſubſtances uſually examined by the blow-pipe: the one is charcoal of fir, or beech, cut into the form of a parallelopiped; the other a ſilver, or, which is better, a golden ſpoon, fitted with a wooden handle. The former is generally uſed, excepting where phlogiſton is to be avoided, or the ſubject of examination is apt to be abſorbed by the charcoal. The golden ſpoon ſhould not be much larger than that repreſented at figure 7. as the bulk of the ſupport prevents the heat from being raiſed to a proper degree. To prevent the fine light particles from being carried off by the blaſt, a ſmall cavity ſhould be hollowed out in the charcoal; in which, being partly protected by another ſmaller piece of charcoal, they may be expoſed to the apex of the flame. By means of a ſufficient quantity of dephlogiſticated air, experiments with the blow-pipe could be rendered ſtill more important than they are, as we might by this means be able to fuſe and vitrify ſubſtances *per ſe*, which we are now ſcarce able to do with the moſt powerful fluxes. As dephlogiſticated air, however, has not yet come into uſe, we can only expect ſuch effects as may be produced by a violent blaſt of common atmoſpheric air; and for this purpoſe we muſt accommodate ourſelves with proper fluxes: but for an account of theſe and of the ſubjects proper be examined by the blow-pipe, ſee the article FLUX.

BLOWING, in a general ſenſe, denotes an agitation of the air, whether performed with a pair of bellows, the mouth, a tube, &c. BLOWING *of Glaſs*, is one of the methods of forming various kinds of works in the glaſs manufacture. It is performed by dipping the point of an iron blowing pipe into melted glaſs, and blowing through it with the mouth, according to the circumſtances of the glaſs to be blown. See GLASS.

BLOWING *of Tin*, denotes the melting its ore, after being firſt burnt to deſtroy the mundic.

BLOWING *the Air into Furnaces*. See FURNACE.

BLOWING, among gardeners, denotes the action of flowers, whereby they open and diſplay their leaves. In which ſenſe, blowing amounts to much the ſame with flowering or bloſſoming. The regular blowing ſeaſon is in the ſpring; though ſome plants have other extraordinary times and manners of blowing, as the Glaſtenbury thorn. Some flowers alſo, as the tulip, cloſe every evening, and blow again in the morning. Annual plants blow ſooner or later as their ſeeds are put in the ground; whence the curious in gardening ſow ſome every month in ſummer, and have a conſtant ſucceſſion of flowers. The blowing of roſes may be retarded by ſhearing off the buds as they put forth.

BLUBBER, denotes the fat of whales and other large ſea-animals, whereof is made train-oil. It is properly the *adeps* of the animal: it lies immediately under the ſkin, and over the muſcular fleſh. In the porpoiſe it is firm and full of fibres, and inveſts the body about an inch thick. In the whale, its thickneſs is ordinarily ſix inches; but about the under lip, it is found two or three feet thick. The whole quantity yielded by one of theſe animals ordinarily amounts to 40 or 50, ſome-

times to 80 or more, hundred weight. The uſe of blubber is to furniſh train-oil, which it does by boiling down. Formerly this was performed aſhore, in the country where the whales were caught: but of late the fiſhers have brought the blubber home in caſks. See BALÆNA.

Sea-BLUBBER. See MEDUSA.

BLUE, one of the ſeven colours into which the rays of light divide themſelves when refracted through a glaſs priſm. For an account of the particular ſtructure of bodies by which they appear of a blue colour, ſee the article CHROMATICS. The principal blues uſed in painting are Pruſſian blue, bice, Saunders blue, azure, or ſmalt, verditer, &c. For the preparation of theſe, ſee COLOUR-*Making*. In dyeing, the principal ingredients for giving a blue colour, are indigo and woad. See DYEING.

BLUE-*Bird*. See MOTACILLA.

BLUE-*Fiſh*. See CORYPHENA.

BLUE-*John*, among miners, a kind of mineral which has lately been fabricated into vaſes and other ornamental figures. It is of the ſame quality with the cubical ſpar, with reſpect to its fuſibility in the fire. It loſes its colour, and becomes white in a moderate heat: the weight of a cubic foot of the blueſt kind is 3180 ounces, and that of the leaſt blue is 3140 ounces. This ſubſtance began firſt to be applied to uſe about 18 years ago at one of the oldeſt mines in Derbyſhire, called *Odin mine*, probably from its being dedicated to Odin the great god of the northern nations, at the foot of a high mountain called *Mam-Tor* in Caſtleton. Here the greateſt quantities are ſtill found; the largeſt pieces are ſold for 9l. a ton, the middle-ſized for 6l. and the leaſt for 50s.

Pruſſian BLUE. See CHEMISTRY.

BLUEING, the act or art of communicating a blue colour to bodies otherwiſe deſtitute of it. Laundreſſes blue their linen with ſmalt; dyers their ſtuffs and wools with woad or indigo.

BLUEING *of Metals* is performed by heating them in the fire, till they aſſume a blue colour; particularly practiſed by gilders, who blue their metals before they apply the gold and ſilver leaf.

BLUEING *of Iron*, a method of beautifying that metal ſometimes practiſed; as for mourning buckles, ſwords and the like. The manner is thus: Take a piece of grind-ſtone or whet-ſtone, and rub on the work, ſo as to poliſh off the black ſcurf from it: then heat it in the fire; and as it grows hot, the colour changes by degrees, coming firſt to light, then to a darker gold colour, and laſtly to a blue.

BLUFF-HEAD, among ſailors. A ſhip is ſaid to be bluff-headed that has an upright ſtern.

BLUNDERBUSS, a ſhort fire-arm with a wide bore, capable of holding a number of bullets at once.

BLUSHING, a ſuffuſion or redneſs of the cheeks, excited by a ſenſe of ſhame, on account of conſciouſneſs of ſome failing or imperfection.

Bluſhing is ſuppoſed to be produced from the nervous ſympathy which exiſts between the ſeveral parts of the body; the firſt impreſſion being excited in the mind by ſome unexpected occurrence.

BOA, in zoology, a genus of ſerpents, belonging to the order of amphibia. The characters of this genus are, that the belly and tail are both furniſhed with ſcuta. The ſpecies are ten, *viz.* 1. The contortrix, has 150 ſcuta on the belly, and 40 on the tail: the head is broad, very convex, and has poiſon bags in the mouth, but no fang, for which reaſon its bite is not reckoned poiſonous: the body is aſh-coloured, interſperſed with large duſky ſpots; and the tail is about a third of the length of the body. This ſerpent is found in Carolina. 2. The canina, has 203 ſcuta on the belly, and 77 on the tail; it is greeniſh, and variegated with white belts. It is a native of America, and lodges in the hollow trunks of trees, and is about two feet long. The bite of the canina is not poiſonous. 3. The hipnale is of a dull yellow colour, and is found in Aſia. It has 179 ſcuta on the belly, and 120 on the tail. 4. The conſtrictor, has 240 ſcuta on the belly, and 60 on the tail. This is an immenſe animal: it often exceeds 36 feet in length; the body is very thick, of a duſky white colour, and its back is interſperſed with 24 large pale irregular ſpots; the tail is of a darker colour; and the ſides are beautifully variegated with pale ſpots. Beſides, the whole body is interſperſed with ſmall brown ſpots. The head is covered with ſmall ſcales, and has no broad laminæ betwixt the eyes, but has a black belt behind the eyes. It wants the large dog-fangs, and of courſe its bite is not poiſonous. The tongue is fleſhy, and very little forked. Above the eyes, on each ſide, the head riſes high. The ſcales of this ſerpent are all very ſmall, roundiſh, and ſmooth. The tail does not exceed one eighth of the whole length of the animal. The Indians, who adore this monſtrous animal, uſe the ſkin for clothes, on account of its ſmoothneſs and beauty. There are ſeveral of theſe ſkins of the above dimenſions preſerved and to be ſeen in the different muſeums of Europe, particularly in the library and botanic garden of Upſal in Sweden, which has of late been greatly enriched by count Grillinborg. The fleſh of this ſerpent is eat by the Indians and the negroes of Africa. Piſo, Margraave, and Kempfer, give the following account of its method of living and catching its prey. It frequents caves and thick foreſts, where it conceals itſelf, and ſuddenly darts out upon ſtrangers, wild beaſts, &c. When it chooſes a tree for its watching place, it ſupports itſelf by twiſting its tail round the trunk or a branch, and darts down upon ſheep, goats, tigers, or any animal that comes within its reach. When it lays hold of animals, eſpecially any of the larger kinds, it twiſts itſelf ſeveral times round their body, and by the vaſt force of its circular muſcles bruiſes and breaks all their bones. After the bones are broke, it licks the ſkin of the animal all over, beſmearing it with a glutinous kind of ſaliva. This operation is intended to facilitate deglutition, and is a preparation for ſwallowing the whole animal. If it be a ſtag, or any horned animal, it begins to ſwallow the feet firſt, and gradually ſucks in the body, and laſt of all the head. When the horns happen to be large, this ſerpent has been obſerved to go about for a long time with the horns of a ſtag ſticking out from its mouth. As the animal digeſts, the horns putrefy and fall off. After this ſerpent has ſwallowed a ſtag or a tiger, it is unable for ſome days to move; the hunters, who are well acquainted with this circumſtance, always take this opportunity of deſtroying it. When irritated, it makes a loud hiſſing noiſe. This ſerpent is ſaid to cover itſelf over with leaves in ſuch places as ſtags or other animals frequent, in order to conceal itſelf from their ſight, and that it may the more eaſily lay hold of them. 5. The murina, has 254 ſcuta on the belly, and 65 on the tail. The colour of it is a light blue, with round ſpots on the back. It is a native of America, and its bite is not poiſonous. 6. The ſcytale, has 250 ſcuta on the belly, and 70 on the tail. The body is aſh-coloured and blueiſh, with round black ſpots on the back, and black lateral rings edged with white. This ſerpent is a native of America; and, like the conſtrictor, though not ſo long, twiſts itſelf about ſheep, goats, &c. and ſwallows them whole. 7. The cenchria, has 265 ſcuta on the belly, and 57 on the tail. It is of a yellow colour, with white eye-like ſpots. It is a native of Surinam, and its bite is not poiſonous. 8. The ophrias, has 281 ſcuta on the belly, and 64 on the tail; the colour is nearly the ſame with that of the conſtrictor, but browner. The place where this ſerpent is to be found is not known; but its bite is not

venomous. 9. The enydris, has 270 ſcuta on the belly, and 105 on the tail. The colour is a duſky white, and the teeth of the lower jaw are very long; but its bite is not poiſonous. It is a native of America. 10. The hortulana, has 290 ſcuta on the belly, and 128 on the tail. It is of a pale colour, interſperſed with livid wedge-like ſpots. It is a native of America, and its bite is not poiſonous.

BOADADA BASHET, in the Turkiſh military orders, an officer of the janizaries, whoſe buſineſs it is to walk every day about the principal parts of the city, with a number of janizaries to attend him, to keep order, and ſee that all things are regular, even to the dreſs. This office is for three months, and from this the perſon is uſually advanced to be a ſerach.

BOADICEA, a valiant Britiſh queen in the time of Nero the emperor, wife to Praſutagus king of the Iceni in Britain, who by his will left the emperor and his own daughters co-heirs to his great treaſures, in expectation of procuring by that means Nero's protection for his family and people: but he was no ſooner dead, than the emperor's officers ſeized all. Boadicea oppoſed theſe unjuſt proceedings; which was reſented to ſuch a pitch of brutality, that they ordered the lady to be publicly whipped, and her daughters to be raviſhed by the ſoldiers. The Britons taking arms, with Boadicea at their head, to ſhake off the Roman yoke, made a general and bloody maſſacre of the Romans in all parts; and the whole province of Britain would have been loſt, if Suetonius Paulinus had not haſtened from the iſle of Mona to London, and with 10,000 men engaged the Britons. The battle was fought for a long time with great vigour and doubtful ſucceſs, till at laſt victory inclined to the Romans. Boadicca, who had behaved with all the bravery imaginable, diſpatched herſelf by poiſon.

BOAR, in the manege. A horſe is ſaid to boar when he ſhoots out his noſe as high as his ears, and toſſes his noſe in the wind.

BOAR, a male ſwine. See SUS.

Wild BOAR, among huntſmen, has ſeveral names, according to its different ages: the firſt year, it is called *a pig of the ſaunder*; the ſecond it is called *a hog*; the third, *a hog-ſteer*; and the fourth, *a boar*; when leaving the ſaunder, he is called *a ſingler* or *ſangler*. The boar generally lives to 25 or 30 years, if he eſcapes accidents. The time of going to rut is in December, and laſts about three weeks. Boars feed on all ſorts of fruits, and on the roots of many plants; the root of fern in particular ſeems a great favourite with them: and when they frequent places near the ſea-coaſts, they will deſcend to the ſhores and demoliſh the tenderer ſhell-fiſh in very great numbers. Their general places of reſt are among the thickeſt buſhes that can be found; and they are not eaſily driven out of them, but will ſtand at bay a long time. In April and May they ſleep more ſound than at any other time of the year, and this is therefore the ſucceſsful time for taking them in the toils. For the manner of hunting this formidable animal, ſee the article HUNTING.

The hinder claws of a boar are called *guards*. In the corn, he is ſaid to *feed*; in the meadows or fallow fields, to *rout*, *worm*, or *fern*; in a cloſe, to *graze*. The boar is farrowed with as many teeth as he will ever have; his teeth increaſing only in ſize, not in number: among theſe there are four called *tuſhes* or *tuſks*; the two largeſt of which do not hurt when he ſtrikes, but ſerve only to whet the other two loweſt, with which the beaſt defends himſelf, and frequently kills, as being greater and longer than the reſt.

It is very remarkable, that theſe creatures in the Weſt Indies are ſubject to the ſtone: few of them are abſolutely free from it, yet ſcarce any have the ſtones of any conſiderable ſize. It is common to find a great number in the ſame bladder; and they are uſually of about a ſcruple weight, and are angular; and that with great regularity, each having five angles.—Among the ancient Romans, boar's fleſh was a delicacy; a boar ſerved up whole was a diſh of ſtate. The boar was ſometimes alſo the military enſign borne by the Roman armies, in lieu of the eagle.

BOARD, a long piece of timber, ſawed thin for building and ſeveral other purpoſes. See TIMBER. Deal-boards are generally imported into England, ready ſawed, becauſe done cheaper abroad, in regard we want ſaw-mills. Cap-boards are imported from Sweden and Dantzic. Oak-boards chiefly from Sweden and Holland; ſome from Dantzic. We alſo import white boards for ſhoemakers; mill and ſcale-boards, &c. for divers artificers. Scale-board, which is a thinner ſort, uſed for the covers of primers, thin boxes, &c. is made with large planes, but might probably be ſawed with mills to advantage.

BOARD is alſo uſed for a kind of table or bench, whereon artificers perform their work. In this ſenſe, we ſay a *work-board*, *ſhop-board*, taylor's-*board*, &c. It alſo ſignifies a flat machine, or *frame*, uſed in certain games, and the like. In this ſenſe, we ſay a draught-*board*, a cheſs-*board*, a ſhovel-*board*, &c.

BOARD, *Bureau*, is alſo an office where accounts are taken, payments ordered, and the like. In this ſenſe, we ſay the *board* of works, *board* of ordnance, *board* of treaſury, *board* of trade, &c.

BOARD, among ſeamen. *To go aboard*, ſignifies to go into the ſhip. *To ſlip by the board*, is to ſlip down by the ſhip's ſide. *Board and board*, is when two ſhips come ſo near as to touch one another, or when they lie ſide by ſide. *To make a board*, is to turn to windward; and the longer your boards are, the more you work into the wind. *To board it up*, is to beat it up, ſometimes upon one tack and ſometimes upon another. *She makes a good board*, that is, the ſhip advances much at one tack. *The weather-board*, is that ſide of the ſhip which is to windward.

BOARDING, in a naval engagement, a deſperate and furious aſſault made by one ſhip on another, after having found every other method to reduce her ineffectual: it may be performed in different places of the ſhip, according to their circumſtances and ſituation, by the aſſailant detaching a number of men armed with piſtols and cutlaſſes on the decks of his antagoniſt, who ſtands in the ſame predicament with a city ſtormed by the beſiegers.

BOAT, a ſmall open veſſel, conducted on the water by rowing or ſailing. The conſtruction, machinery, and even the names of boats, are very different, according to the various purpoſes for which they are calculated. The largeſt boat belonging to a ſhip is the *long-boat*, which is generally furniſhed with a maſt and ſails. The *barges* are next in order, which are longer, ſlighter, and narrower: they are employed to carry the principal ſea-officers, as admirals, and captains of ſhips of war, and are very unfit for ſea. *Pinnaces* exactly reſemble barges, only that they are ſomewhat ſmaller, and never row more than eight oars; whereas a barge has ten. Theſe are for the lieutenants, &c. *Cutters* of a ſhip, are broader, deeper, and ſhorter, than the barges and pinnaces; they are fitter for ſailing, and are commonly employed in carrying ſtores, proviſions, paſſengers, &c. to and from the ſhip. In the ſtructure of this ſort of boats, the lower edge of every plank in the ſide overlays the upper edge of the plank below, which is called by ſhip wrights *clinch-work*. *Yawls* are ſomething leſs than cutters, nearly of the ſame form, and uſed for ſimilar ſervices; they are generally rowed with ſix oars.

The above boats more particularly belong to men of war;

for merchant-ſhips ſeldom have more than two, viz. a long-boat and yawl. Merchant-ſhips employed in the Mediterranean find it more convenient to uſe a *launch*, which is longer, more flat-bottomed, and better adapted to the harbours of that ſea, than a long-boat. A *wherry* is a light ſharp boat, uſed in a river or harbour for carrying paſſengers from place to place. *Punts* are a ſort of oblong flat-bottomed boats, nearly reſembling floating ſtages; they are uſed by ſhip-wrights and caulkers, for breaming, caulking, or repairing a ſhip's bottom. A *moſes* is a very flat broad boat, uſed by merchant-ſhips amongſt the Caribbee-iſlands, to bring hogſheads of ſugar off from the ſea-beach to the ſhipping which are anchored in the roads. A *felucca* is a ſtrong paſſage-boat uſed in the Mediterranean, with from 10 to 16 banks of oars. The natives of Barbary often employ boats of this ſort as cruiſers. Of all the ſmall boats, a *Norway yawl* ſeems to be the beſt calculated for a high ſea, as it will often venture out to a great diſtance from the coaſt of that country, when a ſtout ſhip can hardly carry any ſail. For the larger ſort of boats, ſee the articles Craft, Cutter, Shallop, &c.

Boat-*Bill*. See Cancroma.

Boat-*Inſect*. See Notonecta.

BOATING, a horrid kind of puniſhment uſed among the ancient Perſians for capital offenders. The manner of boating was thus: the perſon condemned to it being laid on his back in a boat, and having his hands ſtretched out, and tied faſt on each ſide of it, had another boat put over him, his head being left out through a place fit for it. In this poſture they fed him, till the worms, which were bred in the excrements he voided as he thus lay, gradually deſtroyed him.

BOATSWAIN, the officer who has the boats, ſails, rigging, colours, anchors, and cables, committed to his charge. It is the duty of the boatſwain particularly to direct whatever relates to the rigging of a ſhip, after ſhe is equipped from a royal dock-yard. It is likewiſe his office to ſummon the crew to their duty; to aſſiſt with his mates in the neceſſary buſineſs of the ſhip; and to relieve the watch when it expires. He ought frequently to examine the condition of the maſts, ſails, and rigging; and remove whatever may be judged unfit for ſervice, or ſupply what is deficient; and he is ordered by his inſtructions to perform this duty with as little noiſe as poſſible. The *Boatſwain's-Mate* has the peculiar command of the long boat, for the ſetting forth of anchors, weighing or fetching home an anchor, warping, towing, or mooring; and is to give an account of his ſtore.

BOB, a term uſed for the ball of a ſhort pendulum.

BOBARTIA, in botany, a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx is imbricated; and the corolla is a bivalved glume, above the receptacle of the fruit. Of this genus there is only one ſpecies known, which is a native of the Indies, and has no remarkable property.

BOBBIN, a ſmall piece of wood turned in the form of a cylinder, with a little border jutting out at each end, bored through to receive a ſmall iron pivot. It ſerves to ſpin with the ſpinning-wheel, or to wind thread, worſted, hair, cotton, ſilk, gold, and ſilver.

BOBBING, among fiſhermen, a particular manner of catching eels, different from ſniggling. Bobbing for eels is thus performed: they ſcour well ſome large worms, and with a needle run a twiſted ſilk through them from end to end, taking ſo many as that they may wrap them about a board a dozen times at leaſt: then they tie them faſt with the two ends of the ſilk, that they may hang in ſo many hanks; which done, they faſten all to a ſtrong cord, and, about an handful and an half above the worms, fix a plummet three-quarters of a pound weight, and make the cord faſt to a ſtrong pole. With this apparatus fiſhing in muddy water, they feel the eels tug luſtily at the bait; when they think they have ſwallowed it ſufficiently, they gently draw up the rope to the top, and bring them aſhore.

BOBIO, an epiſcopal town of Italy in the Milaneſe and territory of Pavia, ſeated on the river Treba, in E. long. 9. 30. N. lat. 44. 48.

BOCA-chica, the ſtrait or entrance into the harbour of Carthagena in South America. It is defended by ſeveral forts belonging to the Spaniards, all which were taken by the Engliſh in 1741; they were nevertheleſs obliged to raiſe the ſiege of Carthagena in a ſhort time after.

Boca-*del-Drago*, a ſtrait ſo called, between the iſland of Trinidad and Andaluſia, in the province of Terra Firma in South America.

BOCCA, in glaſs-making, the round hole in the working furnace, by which the metal is taken out of the great pots, and by which the pots are put into the furnace. This is to be ſtopped with a cover made of earth and brick, and removable at pleaſure, to preſerve the eyes of the workmen from the violence of the heat.

BOCCACE (John), one of the moſt polite and learned writers of his age, was born in Tuſcany in 1313. His father firſt placed him with a merchant; but as he gave ſigns of genius, he was put afterward to ſtudy the canon law: he loſt almoſt as much time at this as at the laſt occupation; and thought of nothing but poetry. He came under the inſtruction of Petrarch; but did not ſo entirely devote himſelf to poetry, as to forget other ſtudies. In the proſecution of theſe, however, as he ſought every where for the beſt maſters, and had not an income ſufficient for his expences, he was reduced to ſuch circumſtances as to ſtand in need of the bounty of others: he was particularly obliged to Petrarch, who furniſhed him with money as well as books, and aſſiſted him in many other reſpects. Boccace was a great admirer of the Greek language: he found means to get Homer tranſlated into Latin for his own uſe; and procured a profeſſor's chair at Florence for Leontius Pylatus, in order to explain this poet. The republic of Florence honoured Boccace with the freedom of that city; and employed him in public affairs, particularly to negotiate the return of Petrarch; but this poet not only refuſed to return to Florence, but perſuaded Boccace alſo to retire from thence, on account of the factions which prevailed in that republic. Having quitted Florence, he went to ſeveral places in Italy, and ſtopped at laſt at the court of Naples, where King Robert gave him a very kind reception. He conceived a violent affection for the natural daughter of that prince, which made him remain a conſiderable time at Naples. He alſo made a long ſtay in Sicily, where he was in high favour with Queen Joan. He returned to Florence when the troubles were a little appeaſed: but not liking the courſe of life he muſt have followed there, he retired to Certaldo; and, far from the noiſe of buſineſs, he ſpent his time in ſtudy agreeably to his own humour. His great application brought on him an indiſpoſition, of which he died in the year 1376. He wrote ſeveral books, ſome learned and ſerious, others of gallantry and full of ſtories. It is by his *Decameron* chiefly that he has immortalized himſelf. Petrarch found ſo many charms in this compoſition, that he was at the pains to tranſlate it into Latin for his own ſatisfaction.

BOCCALE, or Bocal, a liquid meaſure uſed at Rome, anſwering to what among us is called a bottle, being equivalent to about an Engliſh quart. Seven boccales and an half make the rubbia.

BOCCALINI (Trajan), a celebrated ſatirical writer, born at Rome, who, in the beginning of the 17th century,

obtained the admiration of all Italy by his refined and delicate criticiſms.

BOCCARELLA, in the glaſs-manufacture, a ſmall hole or aperture of the furnace, one of which is placed on each ſide the bocca, almoſt horizontally with it. Out of them the ſervitors take coloured or finer metal from the piling pot.

BOCCIARDI (Clemente), called *Clementone*, hiſtory and portrait painter, was born at Genoa in 1620, and was the diſciple of Bernardo Strozzi, an artiſt of good reputation; but he found in himſelf ſo ſtrong an ambition to arrive at excellence in his profeſſion, that he left Genoa, and went to Rome; there to explore that true ſublimity of ſtyle, which can only be obtained by a judicious obſervation of the ancient ſculptures and the works of the celebrated modern artiſts. By the guidance of an excellent genius, and alſo by a moſt induſtrious application to deſign, he diſcovered the art of uniting and blending the antique and modern guſto in a ſtyle that at once exhibited both graceſulneſs and ſtrength. Moſt of the works of this maſter (except his portraits, which were lively, natural, and graceful) are in the chapels of Genoa, Piſa, and other cities of Italy; of which places they are, at this day, accounted the greateſt ornaments, and are moſt exceedingly eſteemed.

BOCCONI (Sylvio), a celebrated natural hiſtorian, born at Palermo in Sicily. After he had gone through the uſual courſe of ſtudies, he applied himſelf chiefly to natural hiſtory, in which he made a moſt ſurpriſing progreſs. He was afterwards ordained prieſt, and entered into the Ciſtercian order, at which time he changed his chriſtian name *Paul* into that of *Sylvio*. This new way of life did not in the leaſt divert him from his favourite ſtudy: for he purſued it with greater vigour than ever, and travelled not only over Sicily, but likewiſe viſited the iſle of Malta, Italy, the Low Countries, England, France, Germany, Poland, and ſeveral other nations; and, in 1696, was admitted a member of the academy of the virtuoſi in Germany. Upon his return to Sicily, he retired to a convent of his own order near Palermo; where he died in 1704, being 71 years of age. He left many curious works.

BOCCONIA, GREATER TREE CELANDINE; a genus of the monogynia order, belonging to the dodecandria claſs of plants, and in the natural method ranking under the 27th order, *Rhœadeæ*. The calyx is diphyllous; there is no corolla; the ſtylus is bifid; the berry is dry and monoſpermous. Of this genus there is but one known ſpecies, viz. the fruteſcens, which is eſteemed for the beauty of its large foliage. It is very common in Jamaica and other warm parts of America, where it grows to the height of 10 or 12 feet, having a ſtraight trunk as large as a man's arm, and covered with a white ſmooth bark. At the top it divides into ſeveral branches, on which the leaves are placed alternately. Theſe leaves are eight or nine inches long, and five or ſix broad; are deeply ſinuated, ſometimes almoſt to the mid-rib; and are of a fine glaucous colour. The whole plant abounds with a yellow juice of an acrid nature; ſo that it is uſed by the inhabitants of America to take off warts and ſpots from the eyes. The ſingular beauty of this plant renders it worthy of a place in every curious collection: and it ſeems the Indians are very fond of it; for Hernandez tells us, their kings uſed to plant it in their gardens. It is propagated by ſeeds from America, ſowing them in ſpring, in pots of light earth, which muſt be plunged in a hot-bed. When the plants come up, they are to be put in ſeparate pots, which muſt always be kept in a ſtove.

BOCHART (Samuel), one of the moſt learned men in the 17th century, was born at Roan in Normandy. He made a very early progreſs in learning, and became a great proficient in the oriental languages. He was many years paſtor of a proteſtant church at Caen; where he was tutor to Wentworth Dillon earl of Roſcommon, author of the Eſſay on Tranſlated Verſe. Here he particularly diſtinguiſhed himſelf by his public diſputations with father Veron, a very famous controverſiſt. The diſpute was held in the caſtle of Caen, in the preſence of a great number of Catholics and Proteſtants. Bochart came off with great honour and reputation; which were not a little increaſed in the year 1646, upon the publication of his *Phaleg* and *Canaan*, which are the titles of the two parts of his *Geographia Sacra*. He acquired alſo great fame by his *Hierozoicon*, printed in London in 1675. This treats *de animalibus ſacræ ſcripturæ*. The great learning he diſplayed in his works rendered him eſteemed not only amongſt thoſe of his own profeſſion, but amongſt all lovers of knowledge of whatever denomination. In 1652 the queen of Sweden invited him to Stockholm, where ſhe gave him many proofs of her regard and eſteem. At his return to Caen, he reſumed the functions of the miniſtry, and was received into the academy of that city. His learning was not his principal qualification, he had a modeſty equal to it; and hence enjoyed his great reputation in tranquillity, ſheltered from thoſe unhappy quarrels which ſo many other learned men draw upon themſelves. He died ſuddenly, while he was ſpeaking in the above academy, on the 16th of May 1667, aged 78. A complete edition of his works was publiſhed in Holland, in two volumes folio, 1712.

BOCHIUS, or BOCQUI (John), a Latin poet, was born at Bruſſels in 1555, and died in 1609. The critics of the Netherlands ſet ſo great a value on his poetry, that they gave him the name of the *Belgic Virgil*.

BOCHETTA, a place of Italy, famous in the war of 1746 and 1747. It is a chain of mountains over which the great road lies from Lombardy to Genoa; and on the very peak of the higheſt mountain is a narrow paſs, which will hardly admit three men to go abreaſt. This paſs is properly called the *Bochetta*; for the defence of which there are three forts. It is the key of the city of Genoa; and was taken in 1746 by the Imperialiſts, by which means they opened a way into that city.

BOCKHOLT, a town of Germany in the circle of Weſtphalia and dioceſe of Munſter, capital of a ſmall diſtrict, and ſubject to the biſhop of Munſter. E. long. 6. 20. N. lat. 51. 40.

BOCKING, a very large village of Eſſex in England, adjoining to Brain-tree, from which it is ſeparated only by a ſmall ſtream. It is 42 miles north-eaſt of London.

BOCK-LAND, in the Saxon times, is what we now call *freehold land*, held by the better ſort of perſons by charter or deed in writing; by which name it was diſtinguiſhed from *folkland*, or copy-hold land, holden by the common people without writing.

BODERIA, or BODOTRIA, the ancient name for the Frith of Forth in Scotland.

BODIN (John), native of Angers, one of the ableſt men in France in the 16th century, famous for his *Method of Hiſtory*, his *Republic*, and other works. He was in great favour with Henry III. who impriſoned John de Serre for writing an injurious piece againſt Bodin, and forbad him upon pain of death to publiſh it. But his favour was not of long continuance. The duke of Alençon, however, gave him ſeveral employments; and carried him to England with him as one of his counſellors, where he had the pleaſure and glory to ſee his books *de Republica* read publicly in the univerſity of Cambridge, having been tranſlated into Latin by the Engliſh. He had written them in French. In the Ragguagli of Boccalini he is condemned as an atheiſt to the fire, for having ſaid in his books that liberty of conſcience ought to be granted to ſectaries. He

declared himself pretty freely against those who asserted that the authority of monarchs is unlimited; but yet he displeased the republicans. Upon the death of the duke of Alençon, Bodin retired to Laon, where he married. He had an office in the presidial of this city; and in Charles IX.'s time he was the king's solicitor, with a commission for the forests of Normandy. He died of the plague at Laon, in 1596.

BODKIN, a small instrument made of steel, bone, ivory, &c. used for making holes, &c.

BODLEY (Sir Thomas), founder of the Bodleian library at Oxford, was born at Exeter in Devonshire, in 1544. When he was about 12 years of age, his father, Mr. John Bodley, being a Protestant, was obliged to leave the kingdom. He settled at Geneva with his family, and continued there till the death of Queen Mary. In that university, then in its infancy, young Bodley studied the learned languages, &c. under several eminent professors. On the accession of Queen Elizabeth, he returned with his father to England; and was soon after entered of Magdalen college in Oxford. After taking his degrees and going through various offices there, he made the tour of Europe, and on his return in 1583 became gentleman-usher to Queen Elizabeth, by whom he was employed in the character of ambassador to the king of Denmark, and other German princes; and in 1588 he went ambassador to the United Provinces, where he continued till the year 1597. On his return to England, finding his preferment obstructed by the jarring interests of Burleigh and Essex, he retired from court, and could never afterwards be prevailed on to accept of any employment. He now began the foundation of the Bodleian library, which was completed in 1599. Soon after the accession of King James I. he received the honour of knighthood, and died in the year 1612. He was buried in the choir of Merton college, where his monument is to be seen. Bodley was a polite scholar, an able statesman, and a worthy man. Mr. Granger observes, that he merited much as a man of letters; but incomparably more in the ample provision he made for literature, in which he stands unrivalled; and that his library is a mausoleum which will perpetuate his memory as long as books themselves endure. Sir Thomas wrote his own Life to the year 1609; which, together with the first draught of the Statutes, and his Letters, have been published from the originals in the Bodleian library, by Mr. Thomas Hearne, in the year 1703.

BODMIN, a town of Cornwall in England. W. long. 4. 5. N. lat. 50. 32.

BODON, a fortified town of Bulgaria in Turkey in Europe, with an archbishop's see. It is seated on the Danube, in E. long. 45. 24. N. lat. 45. 10.

BODROCH, a town of Hungary, seated on the north-east shore of the river Danube, in E. long. 20. 20. N. lat. 46. 15.

BODRUN. See Teos.

BODY, in physics, an extended solid substance, of itself utterly passive and inactive, indifferent either to motion or rest.

Colour of Bodies. See Chromatics.

Body, with regard to animals, is used in opposition to soul, in which sense it makes the subject of anatomy. The height of the human body is said to be different in different parts of the day; ordinarily it is near an inch more in the morning than at night. The body ceases to grow in height after the age of puberty.

Body, among painters, as to *bear a body*, a term signifying that the colours are of such a nature, as to be capable of being ground so fine, and mixing with the oil so entirely, as to seem only a very thick oil of the same colour.

Body, in the manege. A horse is chiefly said to have a *good body*, when he is full in the flank. If the last of the short ribs be at a considerable distance from the haunch-bone, although such horses may for a time have pretty good bodies, yet, if they are much worked, they will lose them; and these are properly the horses that have no flank. It is also a general rule, that a man should not buy a light-bodied horse, and one that is fiery, because he will soon destroy himself.

Body, in the art of war, a number of forces, horse and foot, united and marching under one commander. The main body of an army, denotes the troops encamped in the centre between the two wings, and generally infantry; the other two bodies are the van-guard and the rear-guard; these being the three into which an army, ranged in order of battle, is divided.

Body, in matters of literature, denotes much the same with system, being a collection of every thing belonging to a particular science or art, disposed in proper order: thus we say, a *body* of divinity, law, physic, &c.

Body-*Corporate*. See Corporation.

BOECE, or Boethius (Hector), the historian, was born at Dundee about the year 1470, and studied with applause in the university of Paris. It was there he became acquainted with Erasmus, and laid the foundation of a friendship which was so honourable to him. Boece died about the year 1550. He has been compared, and not without reason, to Geoffroy of Monmouth. He had a propensity to fable and exaggeration; a fault which the elegance of his expression does not compensate. His judgment was not equal to his genius; and his fictions as an historian are a contrast to his probity as a man. John Ballenden, archdeacon of Moray, translated his history into the Scottish language at the desire of James V. and this translation was by Harrison converted into English, though with many imperfections.

BOEDROMIA, in antiquity, solemn feasts held at Athens in memory of the succour brought by Ion to the Athenians, when invaded by Eumolpus son of Neptune, in the reign of Erectheus. Plutarch gives another account of the boedromia; which, according to him, were celebrated in memory of the victory obtained by Theseus over the Amazons, in the month Boedromion

BOEDROMION, in chronology, the third month of the Athenian year, answering to the latter part of our August and beginning of September.

BOEHMEN (Jacob), called the *Teutonic Philosopher*, was a noted visionary of the 17th century, born in a village of Germany near Gorlitz, in 1575. He was bred a shoemaker; and, marrying, supported a large family by this occupation; until, after amusing himself with chemistry, a visionary turn of mind, heated by sermons and German divinity, got the upper hand of his common sense; and produced raptures and notions of divine illumination. A great number of persons have been inveigled by the visions of this fanatic, notwithstanding his very obvious talent of involving the plainest things in mystery and ænigmatical jargon. Law, one of his most sanguine admirers, and author of *Christian Perfection*, &c. published an English edition of Jacob Bochmen's works in 2 vols. 4to.

BŒOTIA, the name of two ancient kingdoms, one of which was founded or rather restored by Cadmus, and named by him *Bœotia*, from the ox which is said to have directed him to the place where he built the capital of his new kingdom, better known afterwards by the name of *Thebes*. Indeed the inhabitants were scarce ever distinguished as a nation by the name of *Bœotians*, but of *Thebans*. The other Bœotia was in Thessaly, and is said to have been founded by Bœotus the son of Neptune and brother of Æolus, by Arne the daughter of Æolus king of Æolis.

BOERHAAVE (Herman), one of the greatest physicians,

as well as beſt men, that this or perhaps any age has ever produced, was born in 1668 at Vorhout, a village near Leyden. At the age of 16 he found himſelf without parents, protection, advice, or fortune. He had already ſtudied theology and the other eccleſiaſtical ſciences, with the deſign of devoting himſelf to a clerical life; but the ſcience of nature, which equally engaged his attention, ſoon engroſſed his whole time. This illuſtrious perſon, whoſe name afterwards ſpread throughout the world, and who left at his death above 200,000l. could at that time barely live by his labours, and was compelled to teach the mathematics to obtain neceſſaries. But in 1693, being received doctor in the ſcience of phyſic, he began practice; and his merit being at length diſcovered, many powerful friends patronized him, and procured him three valuable employments: the firſt was that of Profeſſor of Medicine in the univerſity of Leyden; the ſecond, that of Profeſſor of Chemiſtry; and thirdly, that of Profeſſor of Botany. The Academy of Sciences at Paris, and the Royal Society at London, invited him to become one of their members. He communicated to each his diſcoveries in chemiſtry. The city of Leyden became in his time the ſchool of Europe for this ſcience, as well as medicine and botany. All the princes of Europe ſent him diſciples, who found in this ſkilful profeſſor, not only an indefatigable teacher, but a true friend. The city of Leyden has raiſed a monument in the church of St. Peter, to the *ſalutary genius* of Boerhaave. Upon the ſurface of the pedeſtal, is the medallion of Boerhaave; and at the extremity of the frame, a ribband diſplays the favourite motto of this learned man; *Simplex ſigillum veri*, "Truth unarrayed."

From the time of the learned Hippocrates, no phyſician has more juſtly merited the eſteem of his cotemporaries, and the thanks of poſterity, than Boerhaave. He united to an uncommon genius, and extraordinary talents, the qualities of the heart, which gave them ſo great a value to ſociety. He made a decent, ſimple, and venerable appearance, particularly when age had changed the colour of his hair. He was an eloquent orator, and declaimed with dignity and grace. He taught very methodically, and with great preciſion; he never tired his auditors, but they always regretted that his diſcourſes were finiſhed. He would ſometimes give them a lively turn with raillery; but his raillery was refined and ingenious, and it enlivened the ſubject he treated of, without carrying with it any thing ſevere or ſatirical. A declared foe to all exceſs, he conſidered decent mirth as the ſalt of life. It was the daily practice of this eminent perſon, through his whole life, as ſoon as he roſe in the morning, which was generally very early, to retire for an hour to private prayer, and meditation on ſome part of the Scriptures. He often told his friends, when they aſked him how it was poſſible for him to go through ſo much fatigue? that it was *this* which gave him ſpirit and vigour in the buſineſs of the day. *This* he therefore recommended as *the beſt rule* he could give: for nothing, he ſaid, could tend more to the health of the body than the tranquillity of the mind; and that he knew nothing which could ſupport himſelf, or his fellow-creatures, amidſt the various diſtreſſes of life, but a well-grounded confidence in the Supreme Being upon the principles of Chriſtianity. Of his ſagacity and the wonderful penetration with which he often diſcovered and deſcribed, at the firſt ſight of a patient, ſuch diſtempers as betray themſelves by no ſymptoms diſcernible to common eyes, ſuch ſurpriſing accounts have been given, as ſcarcely can be credited, though atteſted beyond all doubt. Yet this great maſter of medical knowledge was ſo far from a preſumptuous confidence in his abilities, or from being puffed up by his riches, that he was condeſcending to all, and remarkably diligent in his profeſſion; and he often uſed to ſay, that the life of a patient (if trifled with or neglected) would one day be required at the hand of the phyſician. He always called the poor his *beſt patients*; for "God (ſaid he) is their paymaſter." He never regarded calumny nor detraction, nor ever attempted to confute them. "They are ſparks (ſaid he) which, if you do not blow, will go out of themſelves. The ſureſt remedy againſt ſcandal, is to *live it down* by a perſeverance in well-doing." Being once aſked by a friend, who had often admired his patience under great provocations, whether he knew what it was to be angry, and by what means he had ſo entirely ſuppreſſed that impetuous and ungovernable paſſion? he anſwered, with the utmoſt frankneſs and ſincerity, that he was naturally quick of reſentment; but that he had, by daily prayer and meditation, at length attained to this maſtery over himſelf.

About the middle of the year 1737, he felt the firſt approaches of that fatal illneſs which brought him to the grave, *viz.* a diſorder in his breaſt, which was at times very painful, often threatened him with immediate ſuffocation, and terminated in an univerſal dropſy. As death approached, he was ſo far from ſhewing terror, that he ſeemed leſs ſenſible of pain, and more cheerful under his torments, which continued till the 23d day of September 1738, on which he died, being then in the 70th year of his age. He wrote, 1. *Inſtitutiones Medicæ.* 2. *Aphoriſmi de Cognoſcendis & Curandis Morbis.* 3. *Inſtitutiones & Experimenta Chemiæ.* 4. *Libellus de Materia Medica, et Remediorum formulis quæ ſerviunt Aphoriſmis.*

BOERHAAVIA; a genus of the monogynia order, belonging to the monandria claſs of plants. There is no calyx; the corolla is monopetalous, campanulated, and plaited; and the ſeed is one, naked, and below. There are ſix ſpecies, all natives of the Indies. Some of theſe plants riſe five or ſix feet high, but moſt of them only 18 inches or two feet. They carry flowers of a yellow or red colour, but are by no means ſo remarkable as to merit any particular deſcription.

BOESCHOT, a town of the Auſtrian Netherlands, in the province of Brabant, ſeated on the river Nethe, in E. long. 4. 45. N. lat. 51. 5.

BOETHIUS, or Boetius (Flavius Anicius Manlius Torquatus Severinus), a proſe as well as poetical writer of the ſixth century, was born of one of the nobleſt families in Rome. His father dying when he was an infant, he was ſent to Athens, where he not only attained to a perfect knowledge of the Greek tongue, but alſo of philoſophy, and all other kinds of ſcience. Returning to Rome, he ſoon became univerſally eſteemed, and was advanced to the chief dignities of his country. In 1523, having remonſtrated with great ſpirit againſt the conduct of Theodoric, who began every day to exert new inſtances of tyranny, he fell under his reſentment, and ſoon after was accuſed of having carried on a conſpiracy with the Emperor Juſtin againſt the Goths. Theodoric brought the cauſe before the ſenate; where the accuſers producing ſuborned evidence, who exhibited forged letters to Juſtin in the name of Boethius, though abſent, unheard, undefended, he was condemned to death; but the king, fearing the conſequence of ſuch injuſtice and inhumanity, changed his ſentence from death to baniſhment. He was baniſhed to Milan, or (as others ſay) confined to Ticinum, now Pavia; and all his friends forbidden to accompany him on his way, or to follow him thither. During his exile, he wrote his books of "The Conſolation of Philoſophy," and that upon "The Trinity." The year following, or ſomewhat later, according to ſome writers, he was beheaded in priſon, by the command of Theodoric. Boethius wrote many philoſophical works, the greater part in the logical way; but his ethic piece, "De Conſolatione Philoſophiæ," is his chief performance, and has always been juſtly admired both for the matter and for the ſtyle. It is a ſuppoſed conference between the author and philoſophy, who, as a perſon, endeavours to comfort him; and is partly proſe, and partly verſe,

It was engliſhed by our Chaucer; and Camden tells us, that Queen Elizabeth, after having read it to mitigate grief, tranſlated it alſo into very elegant Engliſh.

BOG properly ſignifies a quagmire, covered with graſs, but not ſolid enough to ſupport the weight of the body; in which ſenſe it differs only from marſhes or fens, as a part from the whole. To drain boggy lands, a good method is, to make trenches of a ſufficient depth to carry off the moiſture; and if theſe are partly filled up with rough ſtones, and then covered with thorn-buſhes and ſtraw, to keep the earth from filling up the interſtices, a ſtratum of good earth and turf may be laid over all; the cavities among the ſtones will give paſſage to the water, and the turf will grow at top as at firſt.

Bog, or *Bog of Gight*, a ſmall town of Scotland, ſeated near the mouth of the river Spey, in W. long. 2. 23. N. lat. 57. 48.

Bog-*Spavin*. See Farriery.

BOGARMITÆ. See Bogomili.

BOGHO, or Bueil, a town in the county of Nice in Piedmont. E. long. 6. 45. N. lat. 44. 12.

BOGLIO, a diſtrict in the territories of the duke of Savoy, lying on the river Tinca, on the frontiers of Provence.

Boglio, a town of Piedmont, and county of Nice, being the capital of a territory of the ſame name. E. long. 4. 50. N. lat. 44. 12.

BOGOMILI, or Bogarmitæ, in church hiſtory, a ſect of heretics, which ſprung up about the year 1179. They held, that the uſe of churches, of the ſacrament of the Lord's Supper, and all prayer, except the Lord's Prayer, ought to be aboliſhed; that the baptiſm of Catholics is imperfect; that the Perſons of the Trinity are unequal; and that they oftentimes made themſelves viſible to thoſe of their ſect. They ſaid, that devils dwelt in the churches, and that Satan had reſided in the temple of Solomon from the deſtruction of Jeruſalem to their own time.

BOGOTO, the capital of New Granada in Terra Firma in South America, near which are gold mines. It is ſubject to Spain. W. long. 73. 55. N. lat. 4 0.

BOHEA, in commerce, one of the coarſeſt kinds of tea that come from China. See Thea.

BOHEMIA, a kingdom of Europe, bounded on the N. by Miſnia and Luſatia, on the E. by Sileſia and Moravia, on the S. by Auſtria, and on the W. by Bavaria. It is 200 miles in length, and 150 in breadth, and is fertile in corn, ſaffron, hops, and paſture. In the mountains are mines of gold and ſilver, and in ſome places are fine diamonds, granites, copper, and lead. The Roman Catholic religion is the principal, though there are many Proteſtants. The chief rivers are the Muldaw, Elbe, and Oder. Their language is the Sclavonian, with a mixture of the German. The capital is Prague. It is ſubject to the houſe of Auſtria.

BOHEMIAN bole. See Bole.

Bohemian *Brethren*, a ſect of Chriſtian reformers which ſprung up in Bohemia in the year 1467. They treated the pope and cardinals as antichriſt, and the church of Rome as the whore ſpoken of in the Revelation. They rejected the ſacraments of the Romiſh church, and choſe laymen for their miniſters. They held the Scriptures to be the only rule of faith, and rejected the Popiſh ceremonies in the celebration of the maſs, nor did they make uſe of any other prayer than the Lord's Prayer. They conſecrated leavened bread. They allowed no adoration but of Jeſus Chriſt, in the communion. They rebaptized all ſuch as joined themſelves to their congregation. They abhorred the worſhip of ſaints and images, prayers for the dead, celibacy, vows, and faſts; and kept none of the feſtivals but Chriſtmas, Eaſter, and Whitſuntide. This ſect publiſhed another confeſſion of faith in 1535, in which they renounced anabaptiſm, which they at firſt practiſed: upon which a union was concluded with the Lutherans, and afterwards with the Zuinglians, whoſe opinions from thenceforth they continued to follow.

BOHOL, one of the Philippine iſlands in Aſia, lying to the northward of Mindanoa, in E. long. 122. 5. N. lat. 10. 0.

BOIANO, a town of Italy, in the kingdom of Naples, and county of Molcſe, with a biſhop's ſee. It is ſeated at the foot of the Apennines, near the river Tilerno, in E. long. 14. 38. N. lat. 41. 30.

BOIARDO (Matteo Maria of Ferrara), count of Scandiano, celebrated for his Italian poems, lived in the 15th century. His principal work is his *Orlando Inamorato*. His Latin eclogues and ſonnets are alſo much admired.

BOJARS denote Ruſſian noblemen. See Russia.

BOII, the name of the original Bohemians.

BOIGUACU, in zoology, a ſynonime of the boa conſtrictor. See Boa.

BOIL, or Furuncle. See Surgery.

BOILEAU Sieur Despereaux (Nicholas), the celebrated French poet, was born at Paris in 1636. After he had gone through his courſe of polite literature and philoſophy, his relations engaged him in the ſtudy of the law, and he was admitted advocate. But though he had all the talents neceſſary for the bar, yet he could not adapt himſelf to a ſcience which turns upon continual equivocations, and often obliges thoſe who follow it to clothe falſehood in the garb of truth. He therefore determined to ſtudy theology; but he could not long endure the thorns of ſchool divinity. He imagined, that, to allure him more cunningly, chicanery, which he thought to avoid, had only changed her habit; and ſo he renounced the Sorbonne, betook himſelf entirely to the Belles Lettres, and took poſſeſſion of one of the foremoſt places in Parnaſſus. The public gave his works the encomium they deſerved; and Lewis XIV. ſettled a yearly penſion of 2000 livres upon him. This great man, who was as remarkable for his integrity, his innocence, and diffuſive benevolence, as for the keenneſs of his ſatires, died of a dropſy on the 2d of March 1711, in the 75th year of his age. The Lutrin of Boileau, ſtill conſidered by ſome French critics of the preſent time as the beſt poem to which France has given birth, was firſt publiſhed in 1647. It is with great reaſon and juſtice that Voltaire confeſſes the Lutrin inferior to the Rape of the Lock. Few poets can be ſo properly compared as Pope and Boileau; and, wherever their writings will admit of compariſon, we may, without any national partiality, adjudge the ſuperiority to the Engliſh bard. There are many actions recorded of Boileau, which ſufficiently prove that the inexorable ſatiriſt had a moſt generous and friendly heart: of theſe, however, it will be ſufficient to ſtate the following: When it was rumoured at court that the king intended to retrench the penſion of Corneille, Boileau haſtened to Madam de Monteſpan, and ſaid, that his ſovereign, equitable as he was, could not, without injuſtice, grant a penſion to an author like himſelf, juſt aſcending Parnaſſus, and take it from Corneille, who had ſo long been ſeated on the ſummit; that he entreated her, for the honour of the king, to prevail on his majeſty rather to ſtrike off *his* penſion, than to withdraw that reward from a man whoſe title to it was incomparably greater; and that he ſhould more eaſily conſole himſelf under the loſs of that diſtinction, than under the affliction of ſeeing it taken away from ſuch a poet as Corneille. This magnanimous application had the ſucceſs which it deſerved, and it appears the more noble, when we recollect that the rival of Corneille was the intimate friend of Boileau. The long unreſerved intercourſe which ſubſiſted between our poet and Racine was highly beneficial and honourable to both. The dying

farewell of the latter is the moſt expreſſive eulogy on the private character of Boileau: "Je regarde comme un bonheur pour moi de mourir avant vous," ſaid the tender Racine, in taking a final leave of his faithful and generous friend.

BOILING, or EBULLITION, the bubbling up of any fluid. The term is moſt commonly applied to that bubbling which happens by the application of fire, though that which enſues on the mixture of an acid and alkali is ſometimes alſo diſtinguiſhed by the ſame name. Boiling, in general, is occaſioned by the diſcharge of an elaſtic fluid through that which is ſaid to boil; and the appearance is the ſame, whether it is common air, fixed air, or ſteam, that makes its way through the fluid. The boiling of water is occaſioned by the lowermoſt particles being rarefied into vapour by reaſon of the vicinity of the bottom of the containing veſſel. In conſequence of this, being greatly inferior in ſpecific gravity to the ſurrounding fluid, they aſcend with great velocity, and, agitating the body of water in their aſcent, give it the tumultuous motion called *boiling*. That this is evidently occaſioned by ſteam, and not by particles of air or fire, as ſome have imagined, ſee the article EVAPORATION.

BOILING, an operation uſed in ſome manufactures. Thus we ſpeak of the boiling of ſalt, boiling of ſugar, of ſoap, &c.

BOILING, in the culinary art, is a method of dreſſing meats by coction in hot water, intended to ſoften them, and diſpoſe them for eaſier digeſtion. The effects of boiling are different according to the kinds and qualities of the water. Pulſe boiled in ſea-water grow harder; mutton boiled in the ſame becomes ſofter and tenderer than in freſh water, but taſtes ſaltiſh and bitter.

BOILING *to Death* (*caldariis decoquere*), in the middle age; a kind of puniſhment inflicted on thieves, falſe coiners, and ſome other criminals.

BOILING is alſo a method of trying or eſſaying the goodneſs of a colour or dye. The ſtuff is boiled in water with certain drugs, different according to the kind or quality of the colour, to try whether or no it will diſcharge, and give a tincture to the water. With this view crimſon ſilks are boiled with alum, and ſcarlets with ſoap, in quantity equal to the weight of the ſilk.

BOILING *Wells*, in natural hiſtory. See BURNING *Springs*.

BOINITZ, a town of Upper Hungary, in the county of Zell, remarkable for its baths and the quantity of ſaffron that grows about it. E. long. 19. 10. N. lat. 48. 42.

BOIOBI, in zoology, the name of a ſpecies of ſerpent found in America, and called by the Portugueſe *cobra de verb*. It is about an ell in length, of the thickneſs of a man's thumb, and is all over of a very beautiful and ſhining green. Its mouth is very large, and its tongue black. It loves to be about houſes, and never injures any creature unleſs provoked or hurt; but it will then bite, and its poiſon is very fatal. The natives take as a remedy againſt its poiſon, the root *caa apia* bruiſed and mixed with water. See CAA *Apia*.

BOIQUIRA, the American name for the rattleſnake.

BOIS-LE-DUC, called by the Dutch *Hertogenboſch*, a large, ſtrong, and handſome town of the Netherlands, in Dutch Brabant, ſeated between the rivers Dommel and Aa among moraſſes, in E. long. 6. 16. N. lat. 31. 45.

BOIS *de Soignies*, the foreſt of Soignies, in the Auſtrian Netherlands and province of Brabant, about three miles ſouth-eaſt of Bruſſels.

BOIS *de Coiſſi*, the name given to a South American tree growing about Surinam, held in the higheſt eſtimation by the Indians in that part of the world, and of late years recommended as a cure for intermittents, though its powers have not proved of equal efficacy with thoſe of cinchona.

BOISSARD (John James), a famous antiquarian, born at Beſançon, the capital of the then province of Franche Comté in France. He publiſhed ſeveral collections which are of great uſe to ſuch as are deſirous to underſtand the Roman antiquities. He had a great paſſion for this ſtudy; and drew with his own hand plans of all the ancient monuments of Italy. He died at Metz, October 30th 1602. His principal works are, 1. Four volumes in folio of Roman antiquities, adorned with plates engraved by Theodore de Bey and his two ſons. 2. *Theatrum vitæ humanæ*; which contains the lives of 198 famous perſons, with their portraits. 3. A treatiſe *de divinatione & magicis præſtigiis*. Theſe works are ſcarce, and eſteemed by the antiquarians.

BOIT, an excellent painter in enamel, born in Stockholm, and bred a jeweller. Having changed his religion, he obtained a penſion of 250l. *per annum*, but died ſuddenly at Paris in 1726. There is a large piece done by him at Kenſington, repreſenting Queen Anne ſitting, and Prince George ſtanding by her; and at Bedford houſe is another very large plate of the duke's father and mother.

BOITJAPO, in zoology, the name of a ſpecies of ſerpent found in America; and called by the Portugueſe there, *cobra di apo*. It grows to ſeven or eight feet long, is about the thickneſs of a man's arm, and very ſmall and taper towards the tail. Its back is of an olive colour; its belly yellow, and covered with very regular and elegant triangular ſcales. It feeds on frogs, &c. but is very poiſonous, and its bite extremely fatal.

BOKHARA, a town of Uſbec Tartary, capital of Bockharia. It is a large populous place, ſeated on a riſing ground, with a ſlender wall of earth, and a dry ditch. The houſes are low, and moſtly built of mud; but the caravanſaries and moſques, which are numerous, are all of brick. The bazars, or market-places, have been ſtately buildings; but the greateſt part of them are now in ruins. Here is alſo a ſtately building for the education of the prieſts. Great numbers of Jews and Arabians frequent this place; but the Khan ſeizes on their poſſeſſions at his pleaſure. It is 138 miles W. by S. of Samarcand. Lon. 65. 50. E. Lat. 39. 15. N.

BOKHARIA. See BUKHARIA.

BOL (Hans or John), a painter, born at Mechlin in 1534. He received his firſt inſtructions from a maſter of no great repute, whom he ſoon left; and, going to Heidelberg, employed himſelf in copying ſeveral pictures of the eminent artiſts. His ſubjects are chiefly landſcapes with animals; but he alſo ſometimes painted hiſtory, with no ſmall ſucceſs. We have by him a ſet of landſcapes, views in Holland, ſlightly etched, but in a ſtyle that indicates the hand of a maſter. He died in 1593.

BOL (Ferdinand), a celebrated painter both of hiſtory and portraits, was born at Dort in 1611, and educated at Amſterdam. In the ſchool of the celebrated Rembrandt Gerretz, he received his inſtructions as a painter; and imitated the ſtyle of his maſter with no little ſucceſs, not only in his pictures but in his engravings. Bol's etchings are bold and free. The lights and ſhadows in them are broad and powerful, which renders the effect very ſtriking; but they want that lightneſs of touch and admirable taſte which thoſe of Rembrandt poſſeſs in ſo great a degree. Bol died at Dort, the place of his birth, in 1681, aged 70.

BOLANDUS (John), a famous Jeſuit, born at Tillemont in the Netherlands, in 1596. He diſtinguiſhed himſelf by writing the lives of the ſaints, under the title of *Acta Sanctorum*, of which he publiſhed five volumes in folio; but died while he was labouring at the ſixth, in the 70th year of his age. The continuators of that work are called *Bolandiſts*.

BOLES, are viſcid earths, leſs coherent and more friable than clay; more readily uniting with water, and more freely

ſubſiding from it. They are ſoft and unctuous to the touch; adhere to the tongue; and by degrees melt in the mouth, impreſſing a light ſenſe of aſtringency. There are a great variety of theſe earths; the principal of which are, 1. Armenian bole, when pure, is of a bright red colour with a tinge of yellow: it is one of the hardeſt and moſt compact bodies of this claſs, and not ſmooth and gloſſy like the others, but generally of a rough and deſty ſurface. It does not effervesce with acids, though ſome part of it is diſſolved by all of them. Like moſt other coloured earths, this kind of bole contains a portion of ferruginous matter, to which the colour is owing. It is likewiſe impregnated with vitriolic acid; and hence, when mixed with nitre or ſea-ſalt, it extricates the acids of theſe ſalts in the fire. 2. French bole is of a pale red colour, variegated with irregular ſpecks of white and yellow. It is much ſofter than the Armenian, and ſlightly effervesces with acids. 3. Bole of Blois is yellow, remarkably lighter than moſt of the other yellow earths, and effervesces ſtrongly with acids. 4. Bohemian bole is of a yellow colour, with a caſt of red, and generally of a ſlaky texture. It is not acted on by acids. 5. Lemnian earth is of a pale red colour, and ſlightly effervesces with acids. 6. Sileſian bole is of a pale yellow colour, and acids have no ſenſible effect upon it.—Theſe and other earths, made into little maſſes, and ſtamped with certain impreſſions, are called *terræ ſigillatæ*.

BOLESLAFF, or BUNTZLAU, a town of Sileſia, ſeated on the river Bobar, in E. long. 16. 0. N. lat. 51. 12.

BOLETUS, SPUNK; a genus of the order of fungi, belonging to the cryptogamia claſs of plants; of which botaniſts enumerate 17 ſpecies. The following are the moſt remarkable. 1. The ſuberoſus, or white cork ſpunk, grows commonly on the trunks of birch and willow trees in England and Scotland. It grows ſeſſile and horizontal; its figure is ſemicircular; the upper ſide convex, the under nearly plain; of various ſizes, from that of an aſs's hoof to a peck-meaſure. The upper ſurface is quite white, generally covered with a ſhort ſtrong down, but ſometimes ſmooth. The fleſh or internal ſubſtance is thick, white, tough, light, and ſpongy, like cork; and is ſometimes cut and ſhaped by the country people, and uſed as corks in their bottles: but ſuch corks muſt not be ſuffered to touch the liquid, for moiſture ſoon renders them ſoft and uſeleſs. 2. The igniarius, or touchwood ſpunk, is frequent on the trunks of old trees of all kinds, eſpecially aſh. It conſiſts of a very hard woody ſubſtance, in ſhape like a horſe's hoof, and grows of various ſizes, from a man's fiſt to that of his head, and larger. The upper ſide is ſmooth, but uneven, diſtinguiſhed near the rim by elevated zones of different colours, brown, grey, tawny, &c. The fleſh is of a tawny brown colour, extremely hard and tough. This fungus is made uſe of in Germany and ſome parts of England for tinder. The Germans boil it in ſtrong ley, dry it, and boil it again in ſolution of ſaltpetre. The Laplanders burn it about their habitations, in order to keep off a ſpecies of the gadfly, which is fatal to the young rein-deer. After being beaten ſoft with a hammer, it has been uſed to ſtop the bleeding of the veſſels after amputation, but it is not to be depended on. 3. The bovinus, or cow ſpunk, is frequent in woods and paſtures. It is generally of a brown colour, though ſometimes it is tawny, yellowiſh brown, reddiſh brown, deep red, purple, or greeniſh brown. The fleſh is yellow, white, or reddiſh. The young plants are eaten in Italy, and eſteemed a great delicacy. The Germans alſo account them a dainty, calling them *gombas*, and *bra.-bulz*. Cows, deer, ſheep, and ſwine, will feed upon this and other boleti, and are ſometimes greatly diſordered by them. *Scarabs*, *dermeſtes*, and many other inſects, breed in them in abundance. 4. The pini laricis, or agaric of the ſhops, grows on old larch trees. This fungus is an irregular ſpongy ſubſtance, extremely light, and of an uniform ſnowy whiteneſs, except the cortical part, which is uſually taken off. It cuts freely with a knife, without diſcovering any hardneſs or grittineſs, and readily crumbles betwixt the fingers. It has no remarkable ſmell; its taſte is at firſt ſweetiſh; but on chewing for a ſhort time, it proves acrid, bitter, and nauſeous. Agaric was formerly in great eſteem as a cathartic, but it is now rejected.

BOLEYN (Ann), Queen of Henry VIII. of England; memorable in the Engliſh hiſtory, as the firſt cauſe of the reformation, as the mother of Queen Elizabeth under whom it was completely eſtabliſhed, and alſo on account of her own ſufferings. She was the daughter of Sir Thomas Boleyn, and born in 1507. She was carried into France at ſeven years of age, by Henry VIII's ſiſter, who was wife of Louis XII: nor did ſhe return to England when that queen retired thither after the death of her huſband; but ſtaid in the ſervice of queen Claudia the wife of Francis I. and after the death of that princeſs went to the ducheſs of Alençon. The year of her return is not well known: ſome will have it to have been in 1527, others in 1525. This much is certain, that ſhe was maid of honour to queen Catherine of Spain, Henry VIII's firſt wife; and that the king fell extremely in love with, and at laſt married her privately upon the 14th of November 1532, without waiting for a releaſe from his former marriage, which he had ſolicited from Rome. Anne Boleyn having been declared queen of England on Eaſter-eve 1533, and crowned the firſt of June following, was brought to bed upon the 7th of September of a daughter, who was afterwards queen Elizabeth; and continued to be much beloved by the king, till the charms of Jane Seymour fired that prince's heart in 1536. Then his love for his wife was changed into violent hatred; he pretended ſhe had been unchaſte, and cauſed her to be beheaded on the 19th of May 1536. When ſhe was impriſoned, ſhe is ſaid to have acted very different parts; ſometimes ſeeming devout and ſhedding abundance of tears, then all of a ſudden breaking out into a loud laughter. A few hours before her death, ſhe ſaid, that the executioner was very handy: and beſides, that ſhe had a very ſmall neck; at the ſame time feeling it with her hands, and laughing heartily. However, it is agreed that ſhe died with great reſolution; taking care to ſpread her gown about her feet, that ſhe might fall with decency; as the poets have related of Polyxena, and the hiſtorians of Julius Cæſar.

BOLINGBROKE, or BULLINGBROKE, a town of Lincolnſhire in England, and of great antiquity, but now in a mean condition. It gives title of Viſcount to the St. Johns of Batterſea. E. long. 0. 40. N. lat. 53. 15.

BOLINGBROKE (Henry St. John), lord viſcount, a great ſtateſman and philoſopher, deſcended from an ancient and noble family, was born about the year 1672. He had a regular and liberal education; and, by the time he left the univerſity, was conſidered as a perſon of uncommon qualifications: but with great parts, he had, as it uſually happens, ſtrong paſſions, and theſe hurried him into many indiſcretions and follies. Contrary to the inclinations of his family, he cultivated Tory connections; and gained ſuch an influence in the Houſe of Commons, that in 1704 he was appointed ſecretary at war and of the marines. He was cloſely united in all political meaſures with Mr. Harley: when, therefore, that gentleman was removed from the ſeals in 1707, Mr. St. John reſigned his employment; and in 1710, when Mr. Harley was made chancellor of the exchequer, the poſt of ſecretary of ſtate was given to Mr. St. John. In 1712 he was created Baron St. John of Lediard-Tregoze in Wiltſhire, and Viſcount Bolingbroke. But being over-looked in the beſtowal of vacant ribbands of the order of the garter, he reſented the affront, renounced the

friendſhip of Harley then earl of Oxford, and made his court to the Whigs. Nevertheleſs, on the acceſſion of George I. the ſeals were taken from him; and being informed that a reſolution was taken to purſue him to the ſcaffold, for his conduct regarding the treaty of Utrecht, he withdrew to France. Here he accepted an invitation to enter into the Pretender's ſervice, and accepted the ſeals as his ſecretary: but he was as unfortunate in his new connections as in thoſe he had renounced; for the year 1715 was ſcarcely expired, when at the ſame time that he was attainted of high treaſon at home, the ſeals and papers of his foreign ſecretary's office were taken away; followed by an accuſation from the Pretender and his party, of neglect, incapacity, and treachery. Such a complication of diſtreſsful events threw him into a ſtate of reflection, that produced by way of relief a *conſolatio philoſophica*, which he wrote the ſame year under the title of *Reflections upon exile;* and the following year drew up a vindication of his conduct with reſpect to the Tories, in the form of *A Letter to Sir William Wyndham*. His firſt lady being dead, he about this time eſpouſed a niece of the famous Madam Maintenon, and widow of the marquis de Villette, with whom he had a very large fortune. In 1723 the king was prevailed on to grant him a free pardon, and he returned in conſequence to England; but was by no means ſatisfied within, while he was yet no more than a mere titular lord, and remained excluded from the houſe of peers. This ſtigma operated to fix his diſlike to Sir Robert Walpole, to whoſe ſecret enmity he attributed his not receiving the full extent of the king's clemency. Hence he diſtinguiſhed himſelf by a multitude of political writings, till the year 1735, when being thoroughly convinced that the door was finally ſhut againſt him, he returned once more to France. In this foreign retreat he began his courſe of Letters on the ſtudy and uſe of Hiſtory, for the uſe of Lord Combury, to whom they are addreſſed. Upon the death of his father, who lived to be extremely old, he ſettled at Batterſea, the ancient ſeat of his family, where he paſſed the remainder of his life in philoſophical dignity. Pope and Swift, one the greateſt poet, the other the greateſt wit, of that time, perfectly adored him; and it is well known that the former received from him the materials for his incomparable poem the "Eſſay on Man." —He died in 1751, and left the care and benefit of his MSS. to Mr. Mallet, who publiſhed them together with his former printed works, in 5 vols. 4to: they are alſo printed in 8vo.

BOLISAW, a town of the kingdom of Bohemia in Germany, ſituated in E. long. 14. 35. N. lat. 50. 25.

BOLKOWITZ, a town of Sileſia, in the duchy of Glogow. E. long. 15. 20. N. lat. 51. 27.

BOLLARDS, large poſts ſet into the ground on each ſide of a dock. On docking or undocking ſhips, large blocks are laſhed to them; and through theſe blocks are reeved the tranſporting hawſers to the capſtans.

BOLLITO, a name by which the Italians call a *ſea-green colour* in artificial cryſtal. To prepare this colour, you muſt have in the furnace a pot filled with 40 lb. of good cryſtal, firſt carefully ſkimmed, boiled, and purified, without any manganeſe: then you muſt have twelve ounces of the powder of ſmall leaves of copper thrice calcined, and half an ounce of zaffre in powder; mix them together; and put them at four times into the pot, that they may the better mix with the glaſs; ſtirring them well each time of putting in the powder, leſt the mixture ſhould ſwell and run over.

BOLOGNA, an ancient, large, and very handſome town of Italy, in the territory of the church, and capital of the Bologneſe; an archbiſhop's ſee, and an univerſity. The public buildings are magnificent, as well with regard to the architecture as the ornaments, eſpecially the paintings, which are done by the greateſt maſters. There are a vaſt number of palaces, in one of which the pope's nuncio reſides; the private houſes are alſo well built. Here are 169 churches, and the town is ſaid to contain about 80,000 inhabitants. All the gates and windows are open during the ſummer; inſomuch that one may ſee into their apartments and gardens, where there are vaſt numbers of orange-trees that perfume the air. It is a place of great trade, which is in ſome meaſure owing to a canal that runs from this city to the river Po. The Reno, which runs near Bologna, turns 400 mills that are employed in the ſilk-works; beſides, they deal in wax, ſoap, hams, ſauſages, and even lap-dogs, which are greatly eſteemed. It is ſeated at the foot of the Apennine mountains, in E. long. 11. 30. N. lat. 44. 27.

BOLOGNE, a city of the ci-devant province of Picardy in France, and capital of the Bolonnois, ſeated near the ſea. It is divided into two towns, the Upper and Lower: the firſt is ſtrongly fortified, the other is incloſed by walls only. The port is at the mouth of the river Liane, but the water is ſo ſhallow that no ſhips of burden can enter it. E. long. 9. 17. N. lat. 50. 42.

BOLOGNESE, a ſmall province of Italy, in the territory of the church, bounded on the north by the Ferrareſe, on the weſt by the duchy of Modena, on the ſouth by Tuſcany, on the eaſt by Romani. It is watered by a great number of ſmall rivers, which render its ſoil the moſt fertile of any in Italy. Bologna is the capital, and from the great produce of the land about it, is called *Bologna the fat*.

Bolognese. See Grimaldi.

BOLOGNIAN or Bononian stone, a phoſphoric ſubſtance firſt diſcovered near Bologna in Italy, whence it received its name. It has been ſuppoſed to contain ſome metallic matter, on account of its great ſpecific gravity; but it is now found to be only a compound of ponderous earth and vitriolic acid. Some experiments on a ſtone of this kind from China, have proved that it perfectly agrees with the deſcriptions given in ſeveral books of a ſtone called *petuntſe* by the Chineſe, and which is ſaid to be uſed in their porcelain manufactures.

BOLSANE, a town of Germany, in the territory of Tyrol, and circle of Auſtria. It is very agreeably ſituated in the midſt of a fine large valley, full of villages, and abounding in vineyards. The wines in this valley are the beſt in all Tyrol; but they muſt be drunk the year after that of their growth, otherwiſe they become unfit for uſe. E. long. 11. 11. N. lat. 46. 42.

BOLSENNA, a town of Italy, in the territories of the Pope, ſeated on a lake of the ſame name. E. long. 11. 3. N. lat. 42. 37.

BOLSTER, among ſurgeons, a ſoft yielding kind of cuſhion, commonly laid under broken limbs, &c.

Bolsters *of a Saddle*, thoſe parts of a great ſaddle which are raiſed upon the bows, both before and behind, to hold the rider's thigh, and keep him in a right poſture.

BOLSWAERT, a town of the United Provinces, in Weſt Frieſland, and in the county of Weſtergoe. E. long. 5. 35. N. lat. 53. 6.

BOLSWERT, or Bolswerd, (Boetius Adam à), an engraver of Antwerp, who flouriſhed about the year 1620; but by what maſter he was inſtructed in the art of engraving, does not appear. He imitated the free open ſtyle of the Bloemarts with great ſucceſs; and perhaps perfected himſelf in their ſchool. When he worked from Rubens, he altered that ſtyle; and his plates are neater, fuller of colour, and more highly finiſhed. The two following from this maſter may be here

mentioned. 1. The Reſurrection of Lazarus, a large upright plate. 2. The Laſt Supper, its companion. Baſan, ſpeaking of this print, ſays, that it proves by its beauty, and the knowledge with which it is engraved, that Boetius could ſometimes equal his brother Scheltius.

Bolswert or *Bolſuerd* (Scheltius à), an admirable engraver, was the brother of Boetius Adam à Bolſwert. The time of his birth and of his death, and the name of the maſter he ſtudied under, are equally unknown. Bolſwert, like his brother, worked entirely with the graver. His general character as an artiſt is well drawn by Baſan, who ſays: "We have a large number of prints, which are held in great eſteem, by this artiſt, from various maſters; but eſpecially from Rubens, whoſe pictures he has copied with all poſſible knowledge, taſte, and great effect. The freedom with which this excellent artiſt handled the graver, the pictureſque roughneſs of etching, which he could imitate without any other aſſiſting inſtrument, and the ability he poſſeſſed of diſtinguiſhing the different maſſes of colours, have always been admired by the connoiſſeurs, and give him a place in the number of thoſe celebrated engravers, whoſe prints ought to be conſidered as models by all hiſtorical engravers, who are deſirous of rendering their works as uſeful as they are agreeable, and of acquiring a reputation as laſting as it is juſtly merited." He drew excellently, and without any manner of his own; for his prints are the exact tranſcripts of the pictures he engraved from. His beſt works, though not always equally neat or finiſhed, are always beautiful, and manifeſt the hand of the maſter. Sometimes we find his engravings are in a bold, free, open ſtyle: as the Brazen Serpent, the Marriage of the Virgin, &c. from Rubens. At other times they are very neat, and ſweetly finiſhed: as, the Crowning with Thorns, and the Crucifixion, &c. from Vandyck. Mr. Strutt obſerves, that his boldeſt engravings are from Rubens, and his neateſt from Vandyck and Jordan.—How greatly Bolſwert varied his manner of engraving appears from ſome prints, which, like the greater part of thoſe of his brother Boetius, bear great reſemblance to the free engravings of the Bloemarts, and to thoſe of Frederic Bloemart eſpecially; and form a part of the plates for a large folio volume, intitled, *Academie de l'Eſpée*, by Girard Thibault of Antwerp, where it was publiſhed A. D. 1628; and to theſe he ſigns his name, "Scheltius," and ſometimes "Schelderic Bolſwert," adding the word Bruxelle. His works are pretty numerous, and his name is uſually affixed to his plates in this manner, "S. A. Bolſwert."

BOLT, among builders, an iron faſtening fixed to doors and windows. They are generally diſtinguiſhed into three kinds, viz. plate, round, and ſpring bolts.

Bolts, in gunnery, are of ſeveral ſorts; as, 1. Tranſum-bolts, that go between the cheeks of a gun carriage, to ſtrengthen the tranſums. 2. Priſe bolts; the large knobs of iron on the cheeks of a carriage, which keep the hand-ſpike from ſliding, when it is poizing up the breech of a piece. 3. Traverſe bolts; the two ſhort bolts, that, being put one in each end of a mortar carriage, ſerve to traverſe her. 4. Bracket-bolts; the bolts that go through the cheeks of a mortar, and by the help of quoins keep her fixed at the given elevation. And, 5. Bed-bolts; the four bolts that faſten the brackets of a mortar to the bed.

Bolts, in a ſhip, are iron pins, of which there are ſeveral ſorts, according to their different makes and uſes. Such are drive-bolts, uſed to drive out others. Ray bolts, with jags or barbs on each ſide, to keep them from flying out of their holes. Clench-bolts, which are clenched with riveting hammers. Forelock-bolts, which have at the end a forelock of iron driven in to keep them from ſtarting back. Set-bolts, uſed for forcing the planks, and bringing them cloſe together. Fend or fender bolts, made with long and thick heads, and ſtruck into the uttermoſt bends of the ſhip, to ſave her ſides from bruiſes. And ring-bolts, uſed for bringing to of the planks, and thoſe parts whereto are faſtened the breeches and tackle of the guns.

Bolt *of Canvas*, in commerce, the quantity of 28 ells.

Bolt-*Rope*, in naval affairs, a rope paſſing round the ſail, to which the edges of it are ſewed, to prevent the ſail from tearing: the bottom part of it is called the *foot-rope*; the ſides, *leeches*; and if the ſail be oblong or ſquare, the upper part is called the *head-rope*.

BOLTED flour, that which has paſſed through the bolters. See the following article.

BOLTER, or Boulter, a kind of ſieves for meal, having the bottoms made of woollen, hair, or even wire. The bakers uſe bolters which are worked by the hand; millers have a larger ſort, wrought by the motion of the mill.

BOLTING, a term of art uſed in our inns of court, whereby is intended a private arguing of caſes. The manner of it at Gray's inn is thus: An ancient and two barriſters ſit as judges; three ſtudents bring each a caſe, out of which the judges chooſe one to be argued; which done, the ſtudents firſt argue it, and after them the barriſters. It is inferior to *mooting*; and may be derived from the Saxon word *bolt*, "a houſe," becauſe done privately in the houſe for inſtruction. In Lincoln's inn, Mondays and Wedneſdays are the bolting days in vacation time; and Tueſdays and Thurſdays the moot days.

Bolting, or *Boulting*, the act of ſeparating the flour from the bran, by means of a ſieve or bolter. See Bolter.

Bolting-*Cloth*, or *Bolſter-Cloth*, ſometimes alſo called *bulting-cloth*, denotes a linen or hair cloth for ſifting meal or flour.

Bolting *Mill*, a verſatile engine for ſifting with more eaſe and expedition. The cloth round this is called the *bolter*.

Bolting, or *Boulting*, among ſportſmen, ſignifies rouſing or diſlodging a rabbit from its reſting-place. They ſay, to *bolt* a rabbit, *ſtart* a hare, *rouſe* a buck, &c.

BOLTON or Boulton (Edmund), an ingenious Engliſh antiquarian, who lived in the beginning of the 17th century. His moſt conſiderable work is that intitled *Nero Cæſar*, or *Monarchie depraved*, dedicated to the Duke of Buckingham, lord-admiral, printed at London 1624, folio, and adorned with ſeveral curious and valuable medals. It is divided into 55 chapters, in ſome of which are introduced many curious remarks and obſervations. Beſides this he wrote, 1. An Engliſh tranſlation of Lucius Florus's Roman Hiſtory. 2. Hypercritica, or a rule of judgment for reading or writing our hiſtories. 3. The elements of armories, &c.; and ſome other works.

Bolton, a town of Lancaſhire in England, ſeated on the river Croell, and pretty well built. It has a manufacture for fuſtians, and the market is conſiderable for cloth and proviſions. W. long. 2. 15. N. lat. 53. 55.

BOLUS, in pharmacy, an extemporaneous form of medicine, ſoft, coherent, a little thicker than honey, and the quantity of which is a little morſel or mouthful; for which reaſon it is by ſome called *buccella*.

BOMAL, a town of Luxembourg in the Auſtrian Netherlands, ſituated on the river Ourt, in E. long. 5. 30. N. lat. 50. 20.

BOMB, in military affairs, a large ſhell of caſt iron, having a great vent to receive the fuſee, which is made of wood. The ſhell being filled with gunpowder, the fuſee is driven into the vent or aperture, within an inch of the head, and faſtened with a cement made of quick lime, &c. This tube is filled with a combuſtible matter, made of two ounces of nitre, one of ſul-

phur, and three of gun-powder-duſt, well rammed. To preſerve the fuſee, they pitch it over, but uncaſe it when they put the bomb into the mortar, and cover it with gunpowder-duſt; which having taken fire by the flaſh of the powder in the chamber of the mortar, burns all the time the bomb is in the air; and the compoſition in the fuſee being ſpent, it fires the powder in the bomb, which burſts with great force, blowing up whatever is about it. Bombs came into uſe about the year 1634, and firſt in the Dutch and Spaniſh armies. One Malthus an Engliſh engineer is ſaid to have firſt carried them into France, where they were employed at the ſiege of Collioure. The art of throwing bombs makes a branch of gunnery, founded on the theory of projectiles. See GUNNERY, PROJECTILES, &c.

BOMB-*Cheſt*, is a kind of cheſt filled uſually with bombs, ſometimes only with gunpowder, placed under ground, to tear and blow it up in the air, with thoſe who ſtand on it. Bomb-cheſts were formerly much uſed to drive the enemy from a poſt they had ſeized or were about to take poſſeſſion of: they were ſet on fire by means of a ſauciſſee faſtened at one end, but they are now much diſuſed.

BOMB-*Veſſels*, which are ſmall ſhips formed for throwing bombs into a fortreſs, are ſaid to be the invention of M. Reyneau, and to have been firſt uſed at the bombardment of Algiers. Till then it had been judged impracticable to bombard a place from the ſea. See KETCH.

BOMBARD, a piece of ordnance anciently in uſe, exceedingly ſhort and thick, and with a very large mouth. There have been bombards which have thrown a ball of 300 pound weight. They made uſe of cranes to load them. The bombard is by ſome called *baſiliſk*, and by the Dutch *donderbaſs*.

BOMBARDIER, a ſoldier or inferior non-commiſſioned officer in the Britiſh artillery, employed about a mortar. His buſineſs is to drive the fuſee, fix the ſhell, and load and fire the mortar.

BOMBARDIER, in zoology. See CARABUS.

BOMBARDMENT, the havock committed in throwing bombs into a town or fortreſs.

BOMBARDO, a muſical inſtrument of the wind kind, much the ſame as the baſſoon, and uſed as a baſs to the hautboy.

BOMBASINE, a name given to two ſorts of ſtuffs, the one of ſilk, and the other croſſed with cotton.

BOMBAST, in compoſition, is a ſerious endeavour, by ſtrained deſcription, to raiſe a low or familiar ſubject beyond its rank; which, inſtead of being ſublime, never fails to be ridiculous. The mind in ſome animating paſſions is indeed apt to magnify its objects beyond natural bounds: but ſuch hyperbolical deſcription has its limits; and, when carried beyond theſe, it degenerates into burleſque. A writer who has no natural elevation of genius is extremely apt to deviate into bombaſt. He ſtrains above his genius, and the violent effort he makes carries him generally beyond the bounds of propriety.

BOMBAX, or SILK-COTTON TREE; a genus of the polyandria order, belonging to the monadelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The calyx is quinquefid: the ſtamina are five or many: the capſule is ligneous, quinquelocular, and quinquevalved: the ſeeds are woolly, and the receptacle pentagonous. *The Species are*, 1. The ceiba, with a prickly ſtalk. 2. The pentandrum, with a ſmooth ſtalk. 3. The heptaphyllum, with leaves cut into ſeven parts. The firſt and ſecond ſorts grow naturally in both the Indies, where they arrive at a great magnitude, being ſome of the largeſt trees in thoſe parts; inſomuch that Boſman ſays he has ſeen in Guinea, trees of this kind ſo widely diffuſed that 200 armed men might ſtand under the branches of one. They generally grow with very ſtraight ſtems. Thoſe of the firſt ſort are armed with ſhort ſtrong ſpines; but the ſecond hath very ſmooth ſtems, which in the young plant are of a bright green; but after a few years they are covered with a grey or aſh-coloured bark, which turns brown as they grow older. The branches toward the top are garniſhed with leaves compoſed of five, ſeven, or nine oblong ſmooth little leaves, which are ſpear-ſhaped, and join to one common centre at their baſe, where they adhere to the long footſtalk. The flower buds appear at the end of the branches; and ſoon after the flowers expand, which are compoſed of five oblong purple petals, with a great number of ſtamina in the centre: when theſe fall off, they are ſucceeded by oval fruit as large as a ſwan's egg, having a thick ligneous cover, which when ripe opens in five parts, and is full of a dark ſhort cotton, incloſing many roundiſh ſeeds as large as ſmall peas. The cotton of the third ſort is of a fine purple colour, but the ſize of the tree is not particularly mentioned by botanical writers. Beſides theſe ſpecies, Mr. Miller mentions another which he ſaw in the gardens of the duke of Richmond at Goodwood, and was raiſed from ſeeds which came from the Eaſt Indies. The ſtem was very ſtraight and ſmooth, the leaves were produced round the top upon very long footſtalks, each being compoſed of ſeven or nine narrow ſilky ſmall lobes, joined at their baſe to the footſtalk in the ſame manner as the firſt and ſecond; but they were much longer and reflected backward, ſo that at firſt ſight it appeared very different from either of them. Theſe plants, being natives of warm climates, muſt always be kept in a ſtove. They are raiſed from ſeeds procured in the capſules from the places where they grow naturally. Theſe are to be ſown in the ſpring, in pots of light earth, plunged in a ſubſtantial hot-bed of dung or tan, where the plants will appear in three or four weeks. They muſt then be placed ſeparately in ſmall pots, plunging them in the bark-bed, giving them ſhade and water, and ſhifting them occaſionally into larger pots with freſh earth. They muſt be watered plentifully in ſummer, but moderately in winter. The dark ſhort cotton of the firſt two ſpecies is uſed by the poorer inhabitants of thoſe places where ſuch trees grow, to ſtuff pillows or chairs, but is generally deemed unwholeſome to lie upon. The beautiful purple down of the third is ſpun, wrought into clothes, and worn, without being dyed any other colour, by the inhabitants of the Spaniſh Weſt Indies, where the tree naturally grows. Large pirogues, or canoes fit to carry a ſail, are made both at Senegal, and in America, of the trunk of the ſilk-cotton tree, the wood of which is very light, and found unfit for any other purpoſe.

BOMBAX, in zoology, a ſynonime of a ſpecies of CONUS.—*Bombax* is alſo uſed ſometimes for ſilk or cotton; but the true botanic name of cotton is GOSSYPIUM. It is likewiſe applied by Linnæus to ſignify ſuch inſects as have incumbent wings, and feelers reſembling a comb.

BOMBAY, an iſland of Hindooſtan, on the W. coaſt of the Deccan, ſeven miles in length, and 20 in circumference. It came to the Engliſh by the marriage of Charles II. with Catherine of Portugal. It contains a very ſtrong and capacious fortreſs, a large city, dockyard, and marine arſenal. The ground is barren, and good water ſcarce. It was formerly counted very unhealthy; but, by draining the bogs, and other methods, the air is altered for the better. They have abundance of cocoa-nuts, but ſcarce any corn or cattle. The inhabitants are of ſeveral nations, and very numerous. It is one of the three preſidencies of the Engliſh Eaſt India Company, by which their oriental territories are governed, and is 150 miles S. of Surat. Lon. 72. 38. E. Lat. 18. 58. N.

A very extraordinary circumſtance is related by Mr. Ives

concerning the iſland of Bombay during the rainy ſeaſon, viz. that, ten days after the rains ſet in, every pool and puddle ſwarms with a ſpecies of fiſh about ſix inches long and ſomewhat reſembling a mullet. Such a phenomenon has occaſioned various ſpeculations. Some have imagined that the exhaling power of the ſun is ſo ſtrong in the dry ſeaſons as to be able to raiſe the ſpawn of theſe fiſhes into the atmoſphere, and there ſuſpend and nouriſh it till the rains come on, when it drops down again in the ſtate of living and perfectly formed fiſh. A leſs extravagant ſuppoſition is, that after the ponds become dry, the ſpawn may poſſibly fall into deep fiſſures below the apparent bottom, remaining there during the dry ſeaſon, and being ſupplied with a ſufficient quantity of moiſture to prevent it from corruption.

In Bombay, and indeed in many other places of the Eaſt Indies, oxen are generally uſed inſtead of horſes, not only for drawing carriages but for riding; and, however ridiculous ſuch a practice may ſeem to us, it appears that they are not in this reſpect inferior to ordinary horſes, being capable of going at the rate of ſeven or eight miles an hour. They are commonly of a white colour, with large perpendicular horns, and black noſes. The only inconvenience that attends them, is, that, by being naturally ſubject to a lax habit of body, they ſometimes incommode the rider with filth thrown upon him by the continual motion of their tails. In other reſpects they are far preferable to Indian horſes, and will trot and gallop as naturally as the horſes of this country. Admiral Watſon, while at Bombay, was allowed a chaiſe drawn by two of theſe oxen by the Eaſt India Company. At the end of every ſtage the driver always put the near bullock in the place of the other; he then put his hand into both their mouths, to take out the froth; without which precaution they would be in danger of ſuffocation.

BOMB KETCH, a ſmall veſſel built and ſtrengthened with large beams for the uſe of mortars at ſea.

BOMBUS, in muſic, an artificial motion with the hands, imitating in cadence and harmony the buzzing of bees. The word is originally Greek, and ſignifies the buz or noiſe of bees, gnats, and the like. In this ſenſe, bombus made one of the ſpecies of applauſe uſed by the ancient auditories.

BOMBUS, in medicine, denotes a murmuring noiſe, as of wind breaking out of a narrow into a larger cavity, frequently heard in the large inteſtines. The bombus heard in the ears, in acute diſeaſes, is laid down by Hippocrates as a ſign of death.

BOMBYLIUS, in zoology, a genus of inſects belonging to the order of diptera. The roſtrum is long, briſtly, and bivalved; the briſtles being fixed between the horizontal valves. There are five ſpecies, *viz.* 1. The major, with black wings. 2. The medius, with a yellowiſh body, white behind, and the wings ſpotted with yellow. 3. The minor, with unſpotted wings. 4. The ater, has red wings, but a little blackiſh at the baſe; and green feet. The above four are natives of Europe. 5. The capenſis, with the wings ſpotted with black, an aſh-coloured body, and white behind. It is a native of the Cape of Good Hope. See Pl. 80.

BOMENE, a ſea-port town of the United Provinces in Zealand, ſeated on the northern ſhore of the iſland of Schonen, oppoſite to the iſland of Goree, in E. long. 4. 0. N. lat. 51. 50.

BOMMEL, a town of Dutch Guelderland, ſituated on the northern ſhore of the river Waal, in E. long. 5. 50. N. lat. 52. 0.

BOMONICI, in Grecian antiquity, young men of Lacedæmon, who contended at the ſacrifices of Diana which of them was able to endure moſt laſhes; being ſcourged before the altar of that goddeſs.

BONA, by the Moors called *Balederna*, a ſea-port town of the kingdom of Algiers in Africa, ſituated in E. long. 7. 57. N. lat. 36. 5. It was formerly rich, populous, capital of the province of the ſame name under the kingdom of Conſtantina, and is ſuppoſed by ſome to be the ancient Hippo, once the ſeat of the great St. Auſtin, and a ſea-port built by the Romans.

BONA *Dea*, the good goddeſs, in Pagan mythology, one of the names of Cybele. Others ſay, ſhe was a Roman lady, the wife of one Faunus, and was famous for her chaſtity, and that after her death ſhe was deified. Her ſacrifices were performed only by matrons; and in ſo ſecret a manner, that it was no leſs than death for any man to be preſent at the aſſembly. See CYBELE. Cicero reproaches Clodius with having entered into this temple diſguiſed as a ſinging woman, and having by his preſence polluted the myſteries of the good goddeſs. What kind of myſteries theſe were, we may learn from Juvenal, Sat. vi. 313.

BONA *Fides*, in law, is indicated when a perſon performs any action without diſguiſe or equivocation. In that caſe he is ſaid to have acted *bona fide*.

BONA *Mobilia*, the ſame with moveable effects or goods.

BONA *Notabilia*, are ſuch goods as a perſon dying has in another dioceſe than that wherein he dies, amounting to the value of 5l. at leaſt; in which caſe the will of the deceaſed muſt be proved, or adminiſtration granted in the court of the archbiſhop of the province, unleſs by compoſition or cuſtom, any dioceſes are authorized to do it, when rated at a greater ſum.

BONA *Patria*, an aſſize of countrymen or good neighbours, where 12 or more are choſen out of the country to paſs upon an aſſize, being ſworn judicially in the preſence of the party.

BONA *Peritura*, periſhable goods. By ſtat. 13 Ed. I. cap. 4. the cargo of a ſhip that has been caſt away ſhall be kept for a year and a day, and reſtored to the rightful owner; but if the goods be ſuch as will not endure ſo long, they are *bona peritura*, which the ſheriff is allowed to ſell, and to account in money for the value.

BONA *Vacantia*, goods; ſuch as royal-fiſh, ſhipwrecks, treaſure-trove, waifs, and eſtrays, in which no one can claim a property. Theſe goods, by the law of nature, and by the imperial law, belonged to the firſt occupant or finder; but in the modern conſtitutions of European governments, they are annexed to the ſupreme power by the poſitive laws of the ſtate.

BONAIRE, an iſland of South America, near the north coaſt of Terra Firma. It belongs to the Dutch; and abounds in kabritoes and ſalt. W. long. 66. 18. N. lat. 20. 16.

BONAIS, very high mountains of Italy, in the duchy of Savoy, not far from Laſſoreburg: in ſome ſeaſons they cannot be aſcended without great danger.

BONARELLI (Gui Ubaldo), an Italian count. He was intruſted with ſeveral important negotiations, and was eſteemed an able politician and learned philoſopher. He was the author of a fine Italian paſtoral, intitled, *Filli di Sciro*. He died at Fano, in 1608, aged 45.

BONAVENTURA (the bay of), in America, on the coaſt next the South Sea, in the Popayan. It has a port and harbour for ſhips; but the air is very unwholeſome. W. long. 75. 18. N. lat. 3. 20.

BONAVENTURE, a celebrated cardinal, called, from his works, the *Seraphic Doctor*. He was born at Bagnarea, a ſmall town of Tuſcany, in 1221; and his original name was *John Fidanze*. He took the habit of a monk of the order of St. Francis in 1243, became doctor of Paris in 1255, and the next year general of his order. After the death of Clement IV. the cardinals diſagreeing about the election of a new pope, engaged themſelves by a ſolemn promiſe to elect him

who ſhould be named by Bonaventure, even though it ſhould be himſelf; but he choſe Theobald archdeacon of Liege, who was then in the Holy Land, and took the name of *Gregory X.* This pope, in return, in 1272, made him-cardinal and biſhop of Alba, and ordered him to aſſiſt at the ſecond general council of Lyons, where he died in 1274. His works were printed at Rome in 8 vols folio.

BONAVISTA, an iſland in the Atlantic ocean, the moſt eaſterly and firſt diſcovered of the Cape de Verd iſlands. It is 20 miles long, and 13 broad; has plenty of goats and cotton, and ſome indigo. The inhabitants are remarkable for ſlothfulneſs: they have a town and two roads where ſhips come to an anchor. W. long. 23. 6. N. lat. 16. 5.

BOND (John), a commentator on Horace and Perſius, was born in Somerſetſhire in the year 1550, and educated at Wincheſter ſchool. In 1569 he was entered a ſtudent of the univerſity of Oxford, probably in the New college, of which he became either one of the clerks or one of the chaplains. He took his bachelor of arts degree in 1573, and that of maſter in 1579; ſoon after which he was appointed by his college, maſter of the free ſchool in Taunton in Somerſetſhire. In this employment he continued many years with great reputation: but being at length weary of his laborious employment, he commenced phyſician, and we are told became eminent in that capacity. He died in the year 1612, poſſeſſed of ſeveral lands and tenements in his neighbourhood; but whether acquired by the practice of phyſic, does not appear. He wrote, 1. *Commentarii in Poemata Q. Horatii*, 8vo. 2. *Commentarii in Sex Satyras Perſii*, Lond. 1614, 8vo.

Bond, in law, is a deed whereby the obligor obliges himſelf, his heirs, executors, and adminiſtrators, to pay a certain ſum of money to another at a day appointed. If this be all, the bond is called a ſimple one, *ſimplex obligatio*. But there is generally a condition added, that if the obligor does ſome particular act, the obligation ſhall be void, or elſe ſhall remain in full force: as payment of rent; performance of covenants in a deed; or repayment of a principal ſum of money borrowed of the obligee, with intereſt; which principal ſum is uſually one half of the penal ſum ſpecified in the bond. In caſe this condition is not performed, the bond becomes forfeited, or abſolute at law, and charges the obligor while living; and after his death the obligation deſcends upon his heir, who (on defect of perſonal aſſets) is bound to diſcharge it, provided he has real aſſets by deſcent as a recompenſe. If the condition of a bond be impoſſible at the time of making it, or be to do a thing contrary to ſome rule of law that is merely poſitive, or be uncertain, or inſenſible, the condition alone is void, and the bond ſhall ſtand ſingle and unconditional: for it is the folly of the obligor to enter into ſuch an obligation from which he can never be releaſed. If it be to do a thing that is *malum in ſe*, the obligation itſelf is void: for the whole is an unlawful contract, and the obligee ſhall take no advantage from ſuch a tranſaction. And if the condition be poſſible at the time of making it, and afterwards becomes impoſſible by the act of God, the act of law, or the act of the obligee himſelf, there the penalty of the obligation is ſaved: for no prudence or foreſight of the obligor could guard againſt ſuch a contingency. On the forfeiture of a bond, or its becoming ſingle, the whole penalty was recoverable at law: but here the courts of equity interpoſed, and would not permit a man to take more than in conſcience he ought, viz. his principal, intereſt, and expences, in caſe the forfeiture accrued by non-payment of money borrowed; the damages ſuſtained upon non-performance of covenants; and the like. And the ſtatute 4 and 5 Ann. c. 16. has alſo enacted, in the ſame ſpirit of equity, that in caſe of a bond, conditioned for the payment of money, the payment or tender of the principal ſum due, with intereſt and coſts, even though the bond be forfeited and a ſuit commenced thereon, ſhall be a full ſatisfaction and diſcharge.

Bond, in maſonry and brick-laying, is when bricks or ſtones are as it were knit and interwoven; and when they ſay, make *good bond*, they mean that the joints are not made over, or upon other joints; but reach at leaſt ſix inches, both within the wall and on the ſurface, as the art of building requires.

BONDAGE, properly ſignifies the ſame with ſlavery, but in old law books is uſed for villenage (ſee Villenage). Tenants in bondage paid kenots, and did fealty; they were not to fell trees in their own garden, without licence of the lord. The widow of a tenant in bondage held her huſband's eſtate *quamdiu vixerit ſine marito*, "as long as ſhe lived ſingle."

Bondage *by the Forelock*, or *Bondagium per anteriores crines capitis*, was when a freeman renounced his liberty, and became ſlave to ſome great man: which was done by the ceremony of cutting off a lock of hair from the forehead, and delivering it to his lord; denoting that he was to be maintained by him for the future. Such a bondman, if he reclaimed his liberty, or were fugitive from his maſter, might be drawn again to his ſervitude by the noſe; whence the origin of the popular menace to pull a man by the noſe.

BONDMAN, in the Engliſh law, is uſed for a villain, or tenant in villenage. The Romans had two kinds of bond-men; one called *ſervi*, who were thoſe either bought for money, taken in war, left by ſucceſſion, or purchaſed by ſome other lawful acquiſition; or elſe born of their *bondwomen*, and called *vernæ*. We may add a third kind of bondmen mentioned by Juſtinian, called *adſcriptii glebæ*, or *agricenſiti*; who were not bound to the perſon, but to the ground or place, and followed by him who had the land. Theſe in our law are called *villains regardants*, as belonging to the manor or place. See Villain and Villenage.

BONE-ace, a game at cards played thus: The dealer deals out two cards to the firſt hand, and turns up the third, and ſo on through all the players, who may be ſeven, eight, or as many as the cards will permit: he that has the higheſt card turned up to him carries the bone; that is, one half of the ſtake; the other half remaining to be played for. Again, if there be three kings, three queens, three tens, &c. turned up, the eldeſt hand wins the bone. But it is to be obſerved, that the ace of diamonds is bone-ace, and wins all other cards whatever. Thus much for the bone: and as for the other half of the ſtake, the neareſt to 31 wins it; and he that turns up or draws 31 wins it immediately.

BONES, their origin, formation, compoſition, texture, variety, offices, &c. See Anatomy, Part I. From a diſcovery made by Mr. Scheele, of a method of producing the phoſphoric acid in large quantity from bones, it has been aſſerted, that this acid is naturally contained in the bones, united with a calcareous earth. From many experiments, however, it appears that no acid is naturally contained in calcined bones; nor can the acid of phoſphorus be extracted from them but by means of the vitriolic acid: whence it ſeems probable, that the phoſphoric acid in this caſe is produced by the combination of a certain quantity of earth with the vitriolic acid. With regard to the earth of bones itſelf, it appears to be very different from the calcareous kind: it is much more ſoluble in the vitriolic acid, and may be precipitated from that or any other by means of the cauſtic volatile alkali, which cannot be done with the calcareous earth.

Bones *Whitened for Skeletons*. Two proceſſes are deſcribed in the *Acta Hoffnienſia* for whitening bones. Profeſſor Rau had a method of giving them a great degree of whiteneſs. By bare expoſure to the air, ſun, and rain, for a length of time, they become notably white; but the whiteſt bones, kept in rooms liable to ſmoke or fuliginous vapours, grow in a

little time yellowish, brownish, and unsightly. It is customary, for the purification of bones, to boil them in alkaline liquors; which, by dissolving and extracting the superfluous fat, improve their whiteness.

Bones *Hardened and Softened.* Boerhaave observes, that alkaline salts render bones harder and firmer, and that acids make them softer and more flexible. These effects succeed in certain circumstances, but not universally; for bones may be hardened and softened both by acids and by alkalis, according to the quantity of saline matter employed, and the manner in which it is applied. Newmann made bones harder and more compact by treating them with the strongest of the mineral acids; though, when the acid is in sufficient proportion, it destroys or dissolves them. In Papin's digester (a strong close vessel, in which the steam of boiling liquors is confined, and the fluid by this means made to undergo a greater degree of heat than it could otherwise sustain), the hardest bones are reduced in a short time, by the action of simple water, into a soft pap or jelly; and alkaline liquors produce this effect still sooner. In 1743, Mr. Geoffroy produced before the French academy a small ivory spoon, which, by long lying in mustard, was become flexible and transparent like horn. Mr. Fouchy also saw an ivory spoon, which, by lying for a considerable time in milk, was become supple like leather; and Mr. Hunauld produced bones, which had been softened by steeping in vinegar, but afterwards hardened to their natural state by steeping in water, and softened a second time by steeping in vinegar. Dr. Lewis observed that the nitrous and marine acids diluted, and the acetous acid, make bones flexible and tough like leather; but that the diluted vitriolic acid, though it renders them notably soft, makes them at the same time brittle. It seems as if a great part of the earthy matter, which is the basis of the bone, and on which its hardness depends, was dissolved and extracted by the three first; whilst the latter, incapable of dissolving this kind of earth into a liquid form, only corrodes it into a kind of selenitic concrete, which remains intermixed in minute particles among the gelatinous matter. Dr. Lewis did not find that the softened bones, whatever acid they were softened by, recovered their hardness by steeping in water. Slips of softened ivory, after lying above a month in water, continued nearly as soft as when they were taken out of the acid liquor. There is a singular induration of bones produced by fire; the effects of which agent are here remarkably different according to its degree and the circumstances of its application. Bones exposed to a moderate fire, either in open vessels, or in contact with the burning fuel, become opaque, white, and friable throughout; and an increase of fire, after they have once suffered this change, renders them only more and more friable. But if they are urged at first with a strong fire, such as that in which copper or iron melts, they become hard, semitransparent, and sonorous, like the hard mineral stones. This curious experiment deserves to be further prosecuted.

Colouring of Bones. Bones may be stained of a variety of colours by the common dyeing infusions and decoctions of animal and vegetable substances. They are stained also, without heat, by metallic solutions; and by means of these may be spotted or variegated at pleasure. Thus, a solution of silver in aquafortis gives a brown or black according to its quantity; solution of gold in aqua regia, or in spirit of salt, a fine purple; solution of copper in the acetous acid, a fine green; and solutions of the same metal in volatile alkalis, a blue, which at first is deep and beautiful, but changes, upon exposure to the air, into a green or blueish-green. If the bone is but touched with the two first solutions, and exposed to the air, it does not fail to acquire the colour in a few hours: in the two latter, it requires to be steeped for a day or longer in order to its imbibing the colour. In these and other cases where immersion for some time is necessary, the bone may be variegated, by covering such parts as are to remain white, with wax or any other matter that the liquor will not dissolve or penetrate.

Oeconomical Uses of Bones. Bone is a very useful substance, not only for making different kinds of toys, but likewise in several of the chemical arts; as, for making cast iron malleable, for absorbing the sulphur of sulphureous ores; for forming tests and cupels, or vessels for refining gold and silver with lead (burnt bones composing a mass of a porous texture, which absorbs the vitrified lead and other matters, while the unvitrescible gold and silver remain entire behind); for the preparation of milky glasses and porcelains; for the rectification of volatile salts and empyreumatic oils; and for making glue. The bones of different animals are not equally fit for these uses: even the glue, or gelatinous part of the bones of one animal is different both in quantity and cohesiveness from that of another.

Bones *in the Funeral Solemnities of the Ancients.* Various usages and ceremonies relating to the bones of the dead have obtained in different ages; as gathering them from the funeral pile, washing, anointing, and depositing them in urns, and thence into tombs; translating them, which was not to be done without the authority of the pontiffs; not to say worshipping of them, still practised to the bones of the saints in the Romish church. Among the ancients, the bones of travellers and soldiers dying in foreign countries were brought home to be buried; till, by an express law made during the Italic war, it was forbid, and the soldiers bodies ordered to be buried where they died. The Romans had a peculiar deity under the denomination of *Ossilago*, to whom the care of the induration and knitting of the human bones was committed; and who, on that account, was the object of the adoration of all breeding women.

Fossil or Petrified Bones; are those found in the earth, frequently at great depths, in all the strata, even in the bodies of stones and rocks; some of them of a huge size; usually supposed to be the bones of giants, but more truly of elephants or hippopotami. It is supposed they were deposited in those strata when all things were in a state of solution; and that they incorporated and petrified with the bodies where they happened to be lodged.

In the museum of the Russian Academy of Sciences, there is a vast collection of fossil bones, teeth, and horns, of the elephant, rhinoceros, and buffalo, which have been found in different parts of this empire, but more particularly in the southern regions of Siberia. Naturalists have been puzzled to account for so great a variety being found in a country where the animals of which they formerly made a part were never known to exist. The celebrated Bayer conjectures, that they belonged to elephants common in that country during the wars carried on with the Persians and Indians; and this plausible supposition seems in some measure to be corroborated by the discovery of the entire skeleton of an elephant in one of the Siberian tombs. But this opinion, as Mr. Pallas very justly observes, is sufficiently refuted by the consideration, that the elephants employed in the armies of all India could never have afforded the vast quantities of teeth which have been discovered, not to mention those which it is justly to be presumed may still be buried. They have been already dug up in such plenty as to make a considerable article of trade. The same ingenious naturalist has given an ample description of these fossil bones, and has endeavoured to account for their origin. Upon examining those in the museum, he was led to conclude, that as these bones are equally dispersed in all the northern regions of Europe, the climate probably was in the earlier ages less severe than at present, and then possibly sufficiently warm to be the native countries of the elephant, rhinoceros, and

other quadrupeds, now found only in the ſouthern climates. But when he viſited, during his travels, the ſpots where the foſſil bodies were dug up, and could form a judgment from his own obſervations, and not from the accounts of others, he renounced his former hypotheſis; and, in conformity with the opinions of many modern philoſophers, aſſerted, that they muſt have been brought by the waters; and that nothing but a ſudden and general inundation, ſuch as the deluge, could have tranſported them from their native countries in the ſouth, to the regions of the north. In proof of this aſſertion, he adds, that the bones are generally found ſeparate, as if they had been ſcattered by the waves, covered with a ſtratum of mud evidently formed by the waters, and commonly intermixed with the remains of marine plants, and ſimilar ſubſtances; inſtances of which he himſelf obſerved during his progreſs through Siberia, and which ſufficiently prove that theſe regions of Aſia were once overwhelmed with the ſea.

We often find in the earth petrified bones, the greateſt part of their gelatinous matter being extracted by the moiſture, and a ſtony one introduced in its room. In ſome parts of France petrified bones are met with which have an impregnation of copper. Hence, on being calcined in an open fire, a volatile ſalt is produced from the remains of their gelatinous principle, and the bone is tinged throughout of a fine greeniſh-blue colour, copper always ſtriking a blue with volatile alkalis. The French turcoiſe ſtones are no other than theſe bones prepared by calcination: they are very durable, and bear to be worked and poliſhed nearly in the ſame manner as glaſs; without the imperfection, inſeparable from glaſſy bodies, of being brittle. See the article TURCOISE.

There have been lately diſcovered ſeveral enormous ſkeletons, five or ſix feet beneath the ſurface, on the banks of the Ohio, not far from the river Miume in America, 700 miles from the ſea-coaſt. Some of the tuſks are near ſeven feet long; one foot nine inches at the baſe, and one foot near the point; the cavity at the root or baſe, 19 inches deep. Beſides their ſize, there are ſeveral other differences which will not allow the ſuppoſition of their having been elephants: the tuſks of the true elephant have ſometimes a very ſlight lateral bend; theſe have a larger twiſt, or ſpiral curve, towards the ſmaller end: but the great and ſpecific difference conſiſts in the ſhape of the grinding teeth; which, in theſe newly found, are faſhioned like the teeth of a carnivorous animal; not flat and ribbed tranſverſely on their ſurface like thoſe of the modern elephant, but furniſhed with a double row of high and conic proceſſes, as if intended to maſticate, not to grind, their food. A third difference is in the thigh-bone, which is of great diſproportion in thickneſs to that of the elephant; and has alſo ſome other anatomical variations. Theſe foſſil bones have been alſo found in Peru and the Brazils; and when cut and poliſhed by the workers in ivory, appear in every reſpect ſimilar. It was the opinion of Dr. Hunter, that they muſt have belonged to a larger animal than the elephant; and differing from it, in being carnivorous. But as yet this formidable creature has evaded our ſearch; and if, indeed, ſuch an animal exiſts, it is happy for man that it keeps at a diſtance; ſince what ravage might not be expected from a creature, endowed with more than the ſtrength of the elephant, and all the rapacity of the tiger? See MAMMOTH.

BONE-*Spavin*. See FARRIERY.

BON-ESPERANCE, the name with the Cape of Good Hope. See GOOD HOPE.

BONET (Theophilus), an eminent phyſician born at Geneva, March 15th 1620. He took his degree in phyſic in 1643, after he had gone through moſt of the famous univerſities, and was for ſome time phyſician to the duke of Longueville. He wrote, 1. *Polyalthes, ſive Theſaurus Medico-Practicus*, 3 vols folio. 2. *Labyrinthi Medici Extricati*. 3. *Medicini Septentrionalis Collatitia*; and other works.

BONFADIO (James), one of the moſt polite writers of the 16th century, was born in Italy, near the lake Garda. He was ſecretary to the cardinal de Bari, and after his death to the cardinal Ghinucci. He afterwards read public lectures on Ariſtotle's politics, and on rhetoric; and was made hiſtoriographer to the republic of Genoa. He applied himſelf to compoſe the annals of that ſtate, in which he wrote too ſatirically on ſome families. This creating him enemies who were reſolved to ruin him, they accuſed him of an unnatural crime; and, as witneſſes were found to convict him of it, he was condemned to be burnt. Some ſay that this ſentence was executed; and others, that his puniſhment was changed, and that he was beheaded. This was in the year 1560. Upon the day of his execution he wrote a note to John Baptiſt Grimaldi, to teſtify his gratitude to the perſons who had endeavoured to ſerve him; and promiſed to inform them how he found himſelf in the other world, if it could be done without frightening them. But it does not appear that he performed his promiſe, any more than the many who had promiſed the like before him. His hiſtory of Genoa is eſteemed. We have alſo ſome letters, ſome orations, and Latin and Italian poems, of his, which were printed at Bologna in the year 1744, in octavo.

BONFINIUS (Anthony), flouriſhed in the 15th century. He was a native of Aſcoli in Italy, and attached himſelf to the ſtudy of the belles lettres. Matthias Cowin king of Hungary, having heard of his learning, ſent for him, retained him, and ſettled upon him a penſion. He wrote, 1. A Hiſtory of Aſcoli; 2. A Treatiſe of Virginity and Conjugal Chaſtity; 3. An Hiſtory of Hungary; and other works.

BONFRERIUS (James), a learned Jeſuit, born at Dinant, in 1573. He wrote a commentary on the Pentateuch, and learned notes on the Onomaſticon of the places and towns mentioned in the Scripture. He died at Tournay in 1643, aged 70.

BONGARS (James), in Latin *Bongarſius*, a native of Orleans, was one of the moſt learned men of the 16th century. He applied himſelf to the ſtudy of critical learning, and was for near 30 years employed in the moſt important negotiations of Henry IV. whoſe reſident he was ſeveral times at the courts of the princes of Germany, and at length his ambaſſador. He was of the Proteſtant religion; and, when very young, had the courage to write and poſt up in Rome a very ſpirited anſwer to a bull of Pope Sixtus V. The public is obliged to him for the edition of ſeveral authors who have written the Hiſtory of the Expeditions to the Holy Land; he alſo publiſhed, among other works, an edition of Juſtin, in which he reſtored ſeveral paſſages that had been corrupted, by conſulting valuable manuſcripts, and added notes which explained many difficulties. He died in 1612, aged 58.

BONIFACE, the name of ſeveral eminent men, particularly of nine popes. To the firſt of theſe, who was choſen pope in 418, St. Auguſtine dedicated his four books againſt the two epiſtles of the Pelagians. The third of that name prevailed upon the emperor Phocas to conſent that the title of *Univerſal Biſhop* ſhould be conferred on no other than the biſhop of Rome. Boniface IV. obtained from the ſame emperor, the pantheon, a famous heathen temple built by Agrippa, and converted it into a church which is now called "Our Lady Della Rotunda." Several works are alſo attributed to him, but they appear to be ſpurious. Boniface VII. has the title of *Antipope*; becauſe, in 974, he cauſed Benedict VI. to be ſtrangled in priſon, and after the election of Benedict VII. removed the treaſures of the church to Conſtantinople. He, however, at length returned after the death of Benedict, and cauſed his ſucceſſor John XIV. to be murdered; but died him-

ſelf ſoon after, and was dragged naked by the feet about the ſtreets. Boniface VIII. canonized St. Lewis in 1297, and in 1300 appointed the jubilee to be ſolemnized every 100 years after. Boniface is alſo the name of a ſaint, who before he took that name was called *Winifred*, and was born at Kirton in Devonſhire.

BONIFACIO, a town in the iſland of Corſica, beyond the mountains, near the ſtrait called *Bocca di Bonifacio*. It is well fortified, and rather populous. E. long. 9. 20. N. lat. 41. 25.

BONIS non amovendis, in law, is a writ directed to the ſheriffs of London, &c. charging them, that a perſon againſt whom judgment is obtained, and proſecuting a writ of error, be not ſuffered to remove his goods until the error is determined.

BONITO, in ornithology. See Scomber.

BONN, an ancient and ſtrong city of Germany, in the electorate of Cologn, and the uſual reſidence of the elector. It is of great conſequence in the time of war; becauſe it is ſituated on the Rhine, in a place where every thing that comes down that river can be ſtopped. It is among the conqueſts lately made by the French Republican army. E. long. 7. 5. N. lat. 50. 44.

BONNEFONS (John), a Latin poet born at Clermont in Auvergne, and lieutenant-general of Bar ſur Seine, acquired great reputation by his *Pancharis*, and other poems. He died under the reign of Lewis XIII. He ought not to be confounded with John Bonnefons his ſon, another Latin poet.

BONNER (Edmund), biſhop of London, of infamous memory, was born at Hanley in Worceſterſhire, and generally ſuppoſed to be the natural ſon of one Savage a prieſt; and that prieſt was the natural ſon of Sir John Savage of Clifton in the ſame county. Strype, however, ſays, he was poſitively aſſured that Bonner was the legitimate offſpring of a poor man, who lived in a cottage known to this day by the name of *Bonner's Place*. About the year 1512 he entered ſtudent of Broadgate Hall in Oxford. In 1519 he was admitted bachelor of the canon and civil law. About the ſame time he took orders, and obtained ſome preferment in the dioceſe of Worceſter. In 1525 he was created doctor of canon law. Having now acquired the reputation of a ſhrewd politician and civilian, he was ſoon diſtinguiſhed by cardinal Wolſey, who made him his commiſſary for the faculties, and heaped upon him a variety of church-preferments. He poſſeſſed at the ſame time the livings of Blaydon and Cherry-Burton in Yorkſhire, Ripple in Worceſterſhire, Eaſt Dereham in Norfolk, prebend of St. Paul's, and the archdeaconry of Leiceſter. Bonner was with the cardinal at Caw-wood, when he was arreſted for high treaſon. After the death of that miniſter, he ſoon found means to inſinuate himſelf into the favour of Henry VIII. who made him one of his chaplains, and employed him in ſeveral embaſſies abroad, particularly to the pope. In 1532 he was ſent to Rome, with Sir Edward Kame, to anſwer for the king, whom his Holineſs had cited to appear in perſon or by proxy. In 1533 he was again diſpatched to pope Clement VII. at Marſeilles, upon the excommunication of king Henry on account of his divorce. On this occaſion he threatened the pope with ſo much reſolution, that his Holineſs talked of burning him alive, or throwing him into a caldron of melted lead; upon which Bonner thought fit to decamp. His infallibility did not foreſee that the man whom he thus threatened was predeſtined to burn heretics in England. In 1538, being then ambaſſador at the court of France, he was nominated biſhop of Hereford; but, before conſecration, was tranſlated to the ſee of London, and enthroned in April 1540. Henry VIII. died in 1547, at which time Bonner was ambaſſador with the emperor Charles V. During this reign he was conſtantly zealous in his oppoſition to the pope; and, in compliance with the king, favoured the Reformation. Henry VIII. was not to be trifled with; but, on the acceſſion of young Edward, Bonner refuſed the oath of ſupremacy, and was committed to the Fleet; however, he ſoon thought fit to promiſe obedience to the laws, and was accordingly releaſed. He continued to comply with reformation; but with ſuch manifeſt neglect and reluctance, that he was twice reprimanded by the privy council, and in 1549, after a long trial, was committed to the Marſhalſea, and deprived of his biſhopric. The ſucceeding reign gave him ample opportunity of revenge. Mary was ſcarce ſeated on the throne before Bonner was reſtored to his biſhopric; and ſoon after appointed vicegerent and preſident of the convocation. From this time he became the chief inſtrument of papal cruelty: he is ſaid to have condemned no leſs than 200 Proteſtants to the flames in the ſpace of three years. Nor was this monſter of a prieſt more remarkable for his cruelty than his impudence. When Queen Elizabeth came to the crown, he had the inſolence to meet her, with the reſt of the biſhops, at Highgate. In the ſecond year of her reign, refuſing to take the oath of allegiance and ſupremacy, he was again deprived, and committed to the Marſhalſea; where he died in 1569, after ten years confinement. There cannot be a ſtronger inſtance of the comparative lenity of the proteſtant church, than its ſuffering this miſcreant to die a natural death. Several pieces were publiſhed under his name.

BONNESTABLE, a town of France, in the department of Sarte and late province of Maine. It carries on a great trade in corn, and is 15 miles N. E. of Mans. Long. 0. 30. E. Lat. 48. 11. N.

BONNET, in a general ſenſe, denotes a cover for the head, in common uſe before the introduction of hats. Bonnets are ſtill uſed in many parts of Scotland.

Bonnet, in fortification, a ſmall work conſiſting of two faces, having only a parapet with two rows of paliſadoes, of about 10 or 12 feet diſtance; it is generally raiſed before the faliant angle of the counterſcarp, and has a communication with the covered way, by a trench cut through the glacis, and paliſadoes on each ſide.

Bonnet *à Prêtre*, or *Prieſt's Bonnet*, in fortification, is an out-work, having at the head three faliant angles, and two inwards. It differs from the double tenaille only in this, that its ſides, inſtead of being parallel, are like the *queue d'aronde*, or ſwallow's tail; that is, narrowing, or drawing cloſe at the gorge, and opening at the head.

Bonnet, in the ſea-language, denotes an addition to a ſail; thus we ſay, lace on the bonnet, or ſhake off the bonnet.

BONNEVAL, a town of France, in the department of Eure and Loire, and late province of Beauce. It had lately a fine Benedictine abbey. It is ſeated on the Loire, eight miles N. of Chateaudun. Long. 1. 20. E. Lat. 48. 12. N.

BONNEVILLE, a town of Savoy, capital of Faucigny, on the N. ſide of the river Arve, at the foot of a mountain called the Mole, which, from its height, and fine ſloping peaks, is an object of great beauty, when ſeen from the lake of Geneva. It is 20 miles S. of Geneva. Long. 6. 10. W. Lat. 46. 32. N.

BONNY, among miners, a bed of ore, differing only from a ſquat as being round, whereas the ſquat is flat. See Squat.

BONONCINI (Giovanni), an eminent compoſer of muſic, for ſome time divided the opinions of the *conoſcenti* of this kingdom with reſpect to the comparative merits of himſelf and the great Handel, which gave occaſion for the well known epigram of *Twoodle Dum* and *Twoodle Dee*, ſaid to have been written by Swift. There is an Italian opera publiſhed with his name prefixed to it, intitled *Pharnaces*; but whether the

words, or only the muſic, are his compoſition, is uncertain.

BONONIA, a town of Italy, in the Gallia Ciſpadana; a name probably given by the Gauls, there being a *Bononia* in Gallia Belgica. Its ancient name, when in the hands of the Tuſcans, who were expelled by the Gauls, was *Falſina*. In the 563d year of the city, the Romans led a colony thither; which, about the beginning of the Actiac war, was increaſed by Auguſtus, and is the *Colonia Bononienſis* of Tacitus, now *Bologna*; which ſee.

BONONIAN. See Bolonian.

BONOSIANI, or Bonosiaci, an ancient branch of *Adoptiani*, in the fourth century, denominated from their leader Bonoſus, a biſhop of Macedonia. The Bonoſiani were prior to the Feliciani, and even to Neſtorius; whence ſome rather conſider them as a branch of Arians. They allowed Chriſt to be no otherwiſe the Son of God than by adoption.

BONPOURNICKEL, a coarſe kind of bread uſed in Weſtphalia.

BONS-hommes, or Bon-*hommes*, a ſort of hermits of St. Auguſtin, founded by F. de Paula. They were brought over into England in 1283, by Edmund earl of Cornwall, and ſettled at Aſhorug in Bucks, beſides which they had only one houſe more at Edingdon in Wiltſhire. They followed the rule of St. Auſtin, and wore a blue habit. The name is ſaid to have ariſen from Lewis XI. of France, who uſed to call F. de Paula, prior of the order, *Le bon homme*. Till then they had been diſtinguiſhed by the appellation of the *Minimi*, or the order of Grammont.

BONTIA, wild olive of Barbadoes; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquepartite; the corolla is bilabiated, the inferior lip tripartite and revolute; the plum is ovate and monoſpermous, with the apex turned to one ſide. Of this genus there are two ſpecies, the daphnoides and the germinans. The firſt has a woody ſtem and branches; riſing to the height of ten feet, with narrow, ſmooth, thickiſh leaves, crenated at the edges; and flowers from the ſides of the branches, ſucceeded by large oval fruit that ſometimes ripens in England. This ſpecies is greatly cultivated in the gardens at Barbadoes for making of hedges; for which purpoſe it is exceedingly proper, it being an evergreen of very quick growth. It is ſaid, that from cuttings planted there in the rainy ſeaſon, when they have immediately taken root, there has been a complete hedge, four or five feet high, in 18 months. The ſecond ſort has been reckoned by many botanic writers to be a ſpecies of the mangrove tree, as it grows in ſwamps, which they alſo do. It riſes 14 or 16 feet high, ſending out ſeveral ſmall branches which incline downward toward the water, and, as ſoon as they reach that, put out roots into the mud, whereby they propagate very faſt: theſe branches are garniſhed with leaves placed oppoſite; they are of a thick ſubſtance like thoſe of the bay tree about two inches long and one broad, very ſmooth on their ſurface: the flowers are white, and come out in ſpikes from the upper branches. This has been alſo by ſome ſuppoſed to be the plant which produces the *Malacca*-Bean formerly kept in the ſhops. Theſe plants are eaſily propagated, either by ſeeds or cuttings, ſown or planted on a hot-bed; but they muſt be kept conſtantly in the ſtove.

BONVINCINO, called Le Moretto, (Aleſſandro), hiſtory and portrait painter, was born at Rovate in 1514. He was firſt the diſciple of Titian, under whoſe direction he ſtudied diligently for ſome years. But, having accidentally ſeen the deſigns of Raphael, he felt an elevation of mind that he never had before experienced. He therefore gave himſelf up entirely to ſtudy thoſe maſter-pieces of art and genius; and his obſervations were guided with ſuch judgment, as well as attention, that his improvement was truly ſurpriſing, and he became an exceeding good painter. His works were eagerly bought up, as being extremely admired for the tenderneſs of the pencilling; for the correctneſs and ſpirited expreſſion of the figures; for the neatneſs of the finiſhing; and for the rich variety of his draperies, which uſually conſiſted of velvets, damaſks, or ſattins, all copied after nature, and being wonderfully imitated. He was alſo equally excellent in portrait, and by many was placed in competition even with Titian. He died in 1564.

BONUS henricus. See Chenopodium.

BONZES, Indian prieſts. The Tonquineſe have a pagod or temple in each town; and each pagod has at leaſt two bonzes belonging to it: ſome have 30 or 40. Theſe bonzes, in order to diſtinguiſh themſelves from the laity, wear a chaplet about their necks conſiſting of 100 beads; and carry a ſtaff, at the end of which is a wooden bird. They live upon the alms of the people; yet are very charitably diſpoſed, and maintain ſeveral orphans and widows out of their own collections. The bonzes of China are the prieſts of the Foliſts, or ſect of Fohi. It is one of their eſtabliſhed tenets, that there are rewards allotted for the righteous, and puniſhments for the wicked, in the next world; and that there are various manſions in which the ſouls of men will reſide, according to their different degrees of merit. But, in order to deſerve the favour of heaven, the bonzes inſtruct the people to treat the prieſts with reſpect and reverence, to ſupport and maintain them, and to erect temples and monaſteries for them. They tell them, that, unleſs they comply with theſe injunctions, they will be cruelly tormented after death, and paſs through a diſagreeable variety of tranſmigrations: in ſhort, that they will be changed into mules, aſſes, rats, and mice.

The Chineſe bonzes, according to F. Le Compte, are no better than a gang of diſſolute idle fellows. All their aim is to incite people to commiſerate their abject condition: to which end they have recourſe to ſeveral tricks and impoſtures. When the common arts of addreſs fail them, they try what public acts of penance will do. Some of them drag heavy chains 30 feet long after them; ſome ſit in the highway, knocking their heads againſt flint ſtones; others ſet particular drugs on fire upon their heads: all theſe are ſeveral ways of drawing the attention and exciting the compaſſion of the people, and they ſeldom fail of ſucceſs. But the bonzes of Japan are, for the generality, gentlemen of the higheſt extraction; for when a gentleman of quality finds his family grow too numerous, nay, when he has only two ſons, he generally makes the youngeſt a bonze, to prevent all domeſtic broils and confuſions. Theſe prieſts are dreſſed in various colours; their apartments are very commodious, and ſituated in the healthieſt parts of the country. Navarette tells us, that the bonzes are obliged to chaſtity; and that, on the 2d of April 1667, a petty king of Canton had condemned 11 of them to be burnt alive for incontinence. He adds, that it was reported of an empreſs of the laſt reigning family, who had a particular kindneſs for the bonzes, that ſhe granted them a diſpenſation for the uſe of women during three days. The bonzes of China, according to the ſame author, are computed at 50,000.

BOOBY, in ornithology. See Pelicanus.

BOOK, the general name of almoſt every literary compoſition; but, in a more limited ſenſe, applied only to ſuch compoſitions as are large enough to make a volume. As to the origin of books or writing, thoſe of Moſes are undoubtedly the moſt ancient that are extant: but Moſes himſelf cites many books which it behoved to be written before his time. Of profane books, the oldeſt extant are Homer's poems, which were ſo even in the time of Sextus Empiricus; though we find mention in Greek writers of ſeventy others prior to Homer;

as Hermes, Orpheus, Daphne, Horus, Linus, Muſæus, Palamedes, Zoroaſter, &c. but of the greater part of theſe there is not the leaſt fragment remaining; and of others, the pieces which go under their names are generally held, by the learned, to be ſuppoſititious.

Several ſorts of materials were uſed formerly in making books: plates of lead and copper, the barks of trees, bricks, ſtone, and wood, were the firſt materials employed to engrave ſuch things upon as men were willing to have tranſmitted to poſterity. Joſephus ſpeaks of two columns, the one of ſtone, the other of brick, on which the children of Seth wrote their inventions and aſtronomical diſcoveries. Porphyry makes mention of ſome pillars, preſerved in Crete, on which the ceremonies preſerved by the Corybantes in their ſacrifices were recorded. Heſiod's works were originally written upon tables of lead, and depoſited in the temple of the Muſes, in Bœotia: the ten commandments, delivered to Moſes, were written upon ſtone; and Solon's laws upon wooden planks. Tables of wood, box, and ivory, were common among the ancients: when of wood, they were frequently covered with wax, that people might write upon them with more eaſe, or blot out what they had written. The leaves of the palm-tree were afterwards uſed inſtead of wooden planks, and the fineſt and thinneſt part of the bark of ſuch trees as the lime, the aſh, the maple, and the elm; from hence comes the word *liber*, which ſignifies the inner bark of the trees: and as theſe barks are rolled up, in order to be removed with greater eaſe, theſe rolls were called *volumen*, a volume; a name afterwards given to the like rolls of paper or parchment.

Thus we find books were firſt written on ſtones, witneſs the Decalogue given to Moſes: then on the parts of plants; as leaves, chiefly of the palm-tree; the rind and barks, eſpecially of the tilia, or phillyrea, and the Egyptian papyrus. By degrees wax, then leather, were introduced, eſpecially the ſkins of goats and ſheep, of which at length parchment was prepared: then lead came into uſe; alſo linen, ſilk, horn, and laſtly paper itſelf. The firſt books were in the form of blocks and tables; but as flexible matter came to be wrote on, they found it more convenient to make their books in the form of rolls. Theſe were compoſed of ſeveral ſheets faſtened to each other, and rolled upon a ſtick, or *umbilicus*; the whole making a kind of column, or cylinder, which was to be managed by the umbilicus as a handle, it being reputed a crime to take hold of the roll itſelf. The outſide of the volume was called *frons*; the ends of the umbilicus, *cornua*, which were uſually carved, and adorned with ſilver, ivory, or even gold and precious ſtones. The title συλλαβος was ſtruck on the outſide; and the whole volume, when extended, might make a yard and a half wide, and fifty long. The form which obtains among us is the ſquare, compoſed of ſeparate leaves; which was alſo known, though little uſed, by the ancients.

To the form of books belongs alſo the internal œconomy, as the order and arrangement of points and letters into lines and pages, with margins and other appurtenants. This has undergone many varieties. At firſt the letters were only divided into lines; then into ſeparate words; which by degrees were noted with accents, and diſtributed, by points and ſtops, into periods, paragraphs, chapters, and other diviſions. In ſome countries, as among the Orientals, the lines began from the right and ran leftward; in others, as the northern and weſtern nations, from left to right; others, as the Greeks, followed both directions, alternately going in the one, and returning in the other, called *bouſtrophedon*: in moſt countries, the lines run from one ſide to the other; in ſome, particularly the Chineſe, from top to bottom.

The *Multitude of* Books has been long complained of: and the complaint is as old as Solomon, who lived 3000 years ago: they are grown too numerous not only to procure but read, but to ſee, to learn the names of, or even to number. England has more to fear on this ſcore than other countries ſince, beſides our own produce, we have for ſome years paſt drained our neighbours. However, as biſhop Caramuel's ſcheme miſcarried, which was to write about an hundred volumes in folio, and then prevail on the civil and military powers to oblige all their ſubjects to read them, we need not much regret the multitude of books. As knowledge, however, is naturally advantageous, and as every man ought to be in the way of information, even a ſuperfluity of books is not without its uſe, ſince thereby they are brought to obtrude themſelves on us, and engage us when we had leaſt deſign.

Of the *ſcarcity* and *value* of books during the ſeventh and many ſubſequent centuries, a moſt curious account is given by Mr. Warton in his Hiſtory of Engliſh Poetry, vol. i.

Books, *burning of*, was a kind of puniſhment much in uſe among the Romans, by legal ſentence: ſometimes the care of the execution was committed to *triumviri* appointed on purpoſe; ſometimes to the prætors, and ſometimes to the ædiles. Labienus, whom from his ſatirical ſpirit ſome have called *Rabienus*, is ſaid to have been the firſt who underwent the ſeverity of it. His enemies procured a *ſenatuſconſultum*, whereby all his books publiſhed during ſeven years were ordered to be collected and burnt. "The thing (ſays Seneca) then appeared new and ſtrange, to take revenge on learning!" *Res nova & inſueta! ſupplicium de ſtudiis ſumi.* Caſſius Servius, a friend of Labienus, hearing the ſentence pronounced, cried aloud, "That they muſt burn him too, ſince he had got all the books by heart:" *Nunc me vivum uri oportet, quia illos didici.* Labienus could not ſurvive his books, but, ſhutting himſelf up in the tomb of his anceſtors, pined away, and was buried alive. Various other ancient teſtimonies concerning the burning of books are given in Reimm. Idea Syſt. Antiq. Liter. p. 389.

Book is alſo uſed for a part or diviſion of a volume or large work. In this ſenſe we ſay, the *book of Geneſis*, the *firſt book of Kings*, the *five books of Moſes*, &c. The Digeſt is contained in fifty books, the Code in twelve books. Books are uſually ſubdivided into chapters, ſometimes into ſections or paragraphs: accurate writers quote chapter and book.

Book-*Binding*. The art of gathering together and ſewing the ſheets of a book, and covering it with leather, &c. It is performed thus.—The leaves are firſt folded with a folding-ſtick, and laid over each other in the order of the ſignature; then beaten on a ſtone with an hammer, to make them ſmooth and open well; and afterwards preſſed. They are ſewed upon bands, which are pieces of cord or packthread; ſix bands to a folio book; five to a quarto, octavo, &c. which is done by drawing a thread through the middle of each ſheet, and giving it a turn round each band, beginning with the firſt and proceeding to the laſt. After this the books are glued, and the bands opened and ſcraped, for the better fixing the paſteboards; the back is turned with a hammer, and the book fixed in a preſs between two boards, in order to make a groove for fixing the paſteboards; theſe being applied, holes are made for fixing them to the book, which is preſſed a third time. Then the book is at laſt put to the cutting preſs, betwixt two boards; the one lying even with the preſs, for the knife to run upon; the other above it, for the knife to run againſt: after which the paſteboards are ſquared. The next operation is the ſprinkling the leaves of the book; which is done by dipping a ſtiff-haired bruſh into a vermilion-coloured liquid, holding the bruſh in one hand, and ſpreading the hair with the other, by which motion the edges of the leaves are ſprinkled in a regular manner with ſpots. There remain the covers, which are either of calf-ſkin or of ſheep ſkin: theſe being moiſtened in water, are cut out to the ſize of the book; then ſmeared over

with paſte made of wheat-flour; and afterwards ſtretched over the paſteboard on the outſide, and doubled over the edges within-ſide; after having firſt taken off the four angles, and indented and platted the cover at the head-band: which done, the book is covered, and bound firmly between two boards, and then ſet to dry. Afterwards it is waſhed over with a little paſte and water, and then ſprinkled with a fine bruſh, unleſs it ſhould be marbled; when the ſpots are to be made larger by mixing the ink with vitriol. After this the book is glazed twice with the white of an egg beaten, and at laſt poliſhed with a poliſhing iron paſſed hot over the glazed cover.

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